# Victorian Essential Learning Standards

# LEVEL 6

REVISED EDITION OCTOBER 2009

Victoria
The Place To Be

VICTORIAN CURRICULUM AND ASSESSMENT AUTHORITY

## Contents




**Revised Edition October 2009**

This edition incorporates an addition of a sixth language category, Aboriginal Languages, to the Languages Other Than English domain.

Protocols and standards for the teaching of Aboriginal Languages appear in a separate booklet available for download from the LOTE domain section of the VELS website (http://vels.vcaa.vic.edu.au/lote)

This edition also contains revisions from January 2008 where the fifth language category, Classical languages, was added.

This edition incorporates minor amendments to the domain introductions and learning focus statements to indicate their relationship with the National Statements of Learning.

# Stages of Learning

While it is recognised that student learning is a continuum from Years Prep to 10, and different students develop at different rates, they broadly progress through three stages of learning from:

### Years Prep to 4 – Laying the foundations

In these years the curriculum focuses on developing the fundamental knowledge, skills and behaviours in literacy and numeracy and other areas including physical and social capacities which underpin all future learning.

### Years 5 to 8 – Building breadth and depth

In these years students progress beyond the foundations and their literacy and numeracy becomes more developed. An expanded curriculum program provides the basis for in depth learning within all domains in the three learning strands.

### Years 9 to 10 – Developing pathways

In these years students develop greater independence of mind and interests. They seek deeper connections between their learning and the world around them and explore how learning might be applied in that world. They need to experience learning in work and community settings as well as the classroom. They are beginning to develop preferred areas for their learning.

### Levels

Assessment against the different standards from Prep to Year 10 enables teachers, schools and parents to form a clear picture of student progress throughout the stages of learning from Years Prep to 10. The Standards include standards for student achievement at six levels over the 11 years of compulsory schooling. General expectations of when students will achieve the various standards are as follows:

| Standards | Stages of Learning |
|---|---|
| Level 1 – End of Preparatory Year<br>Level 2 – End of Year 2<br>Level 3 – End of Year 4 | Years Prep to 4 –<br>Laying the Foundations |
| Level 4 – End of Year 6<br>Level 5 – End of Year 8 | Years 5 to 8 –<br>Building breadth and depth |
| Level 6 – End of Year 10 | Years 9 to 10 – Developing pathways |

# Years 9 to 10

The *Victorian Essential Learning Standards* include standards at six levels. The level broadly associated with schooling at Years 9 and 10 is Level 6.

By the time students reach Year 9 they are well into adolescence and beginning to see their future as adults. These years are developmentally distinct from Years 7 to 8 in the sense that, when beginning secondary school, children are predominantly in a stage of developmental transition from childhood to adolescence. In Years 9 to 10, however, not only are most students well into adolescence, they are beginning to think of themselves as adults, looking towards their future roles in life. They are experiencing profound physical, social, emotional and intellectual development changes as they move to greater levels of challenge and independence.

Parents and teachers have often become less important models, especially with regard to issues that are of immediate concern. In contrast, peers have become more important as models.

Added responsibility and expectation can be a time of adventure, learning and growth. It can also be a time of fear, loss of confidence and insecurity. It has been noted that the rites of passage from childhood to adulthood are becoming more poorly defined, as adolescents mature physically at younger ages and enter the adult world of work and family at older ages; this has led to less clear roles for both parents and adolescents.

The post-compulsory years of schooling are a key developmental point to improve coping skills. The greatest shift in coping occurs between 14 and 16 years which make it the optimum time for adolescents to contemplate their coping behaviour.

Students in this stage often pass the compulsory age of attendance at school. They have a growing interest in the future and, in particular, the pathways they intend to pursue, so they increasingly are aware of the world outside the school. For some this means preparation for work or work-specific training, and for others it means preparation for post-compulsory schooling on the way to a career. In this sense, adolescents are more likely to judge learning activities and experiences in terms of where they will lead, and respond positively to a curriculum that links with, and has meaning for their lives outside as well as in the school.

School is more likely to become a means to an end. Many activities and experiences at school may not trigger curiosity, activate information seeking or develop competence. However, in relation to a broader perspective of the self, it is important to do well in the pursuit of lifestyle choices and/or career goals. This is the last moment in their schooling when we can guarantee students access to the knowledge and skills which all young Australians need as they take their first steps into adult life.

Competent learners begin to use more sophisticated cognitive strategies than in earlier years. For instance, they are aware of, and capable of, reflecting on the differences between mathematic, scientific, literary, historical and artistic methods. They are flexible learners who apply a number of approaches to understanding information in different methods. They value opportunities to explore new ideas in depth, commonly in cooperation with their peers, in an environment where they are encouraged to take intellectual risks.

At this stage, learning is enhanced by opportunities for students to participate in projects they believe to be relevant and important to their lifestyle or career goals that occur over extended periods and are learner directed. These projects encourage deep thinking, a process that gives students an opportunity to apply knowledge and skills flexibly, and to develop a meaningful sense of their application and purpose. To think deeply, students need to relax and consider all of the relevant angles from which an idea might be considered. Students construct a thinking framework that follows a process from conception to application.

As well as developing skills for increasingly sophisticated and specialised learning, students require the skills to effectively participate in their communities and workplaces. Students will have commenced learning these skills previously but require a level of competence for them to participate in projects where they may initiate and apply skills. These skills include: basic fundamental skills (for example, literacy, numeracy, technology); people skills (for example, communication, team-work, customer service); thinking skills (for example, organising, problem-solving, creating, planning); personal attributes (for example, responsibility including for one's own health and physical wellbeing, flexibility, self-esteem); business skills (for example, innovation and enterprise); and community skills (for example, civics).

# Level 6 statement

In the Victorian Essential Learning Standards Level 6 is broadly associated with Years 9 and 10 of schooling.

Learners begin to see themselves as young adults. They are independent thinkers able to use formal methods of inquiry. They seek to apply learning to the world outside school, 'discriminate in the way they use a variety of sources (and) generate questions that explore perspectives' (Thinking Processes: *Reasoning, processing and inquiry*). They set personal health and fitness goals and undertake activities to achieve them including being aware of 'identify and explain the rights and responsibilities associated with developing greater independence (and) mental health issues relevant to young people' (Health and Physical Education: *Health knowledge and promotion*).

Key characteristics of students at this level include:

- looking towards adulthood
- making choices about the future
- having a career orientation
- employing a range of coping skills
- increasing differentiation and specialisation across domains
- building expertise through formal methods of inquiry
- participating as a community member both within and beyond the school.

Students become independent of family by acquiring a personal point of view in relation to civics, ethics, beliefs and values. They 'articulate and defend their own opinions (and they) contest where appropriate, the opinions of others' (Civics and Citizenship: *Community engagement*). Peers become an increasing source of support and influence. Making connections with pro-social peer groups, and having the corresponding social and emotional skills to make these connections, has a significant bearing on the nature of choices students make in terms of school and career, responsibilities and social aspirations.

Students develop effective organising skills for life and school. They 'identify their interests, strengths and weaknesses and use these to determine future learning needs, especially in relation to the post-compulsory school pathways' (Personal Learning: *The individual learner*). They exhibit respect for others, possess self-esteem, have developed an internal locus of control, and have established trusting relationships with others. They 'evaluate their own behaviour in relationships, identify potential conflict and employ strategies to avoid and/or resolve it' (Interpersonal Development: *Building social relationships*). Motivation and effort is linked to a sense of identity, purpose, and beliefs about self.



 

Competent learners begin to use more sophisticated cognitive strategies than in earlier years. For instance, they are aware of, and capable of reflecting on, the differences between mathematic, scientific, literary, historical and artistic methods. They begin to build expertise and develop coherent structures of knowledge, methodologies, language, skills and behaviours associated with discrete domains. They express preferences for particular styles of thinking and learning, and these preferences tend to inform motivation and competence. They develop beliefs about their personal strengths and weaknesses, whether they are physical, emotional or cognitive. These beliefs are reinforced by the development of strategies and habits that support learning.

Previously flexible approaches such as collecting relevant information, researching, questioning, using creativity and analysis, rehearsing, elaborating, organising, judging and applying all develop into formal methods of inquiry. These include qualitative and quantitative research and action research. More formal skills facilitate deep learning where students exhibit the capacity to maintain focus over an extended period, build evaluation and reflection into processes, use a variety of strategies to explore diverse perspectives and possibilities, as well as create and analyse, organise and judge information, make predictions and estimations, and apply, test and transfer knowledge and skills. This includes a capacity to 'use evaluation criteria they have previously developed, and critically analyse processes, materials/ingredients, systems components and equipment used' (Design, Creativity and Technology: *Analysing and evaluating*). They also use more complex information and communications technology tools and techniques to represent, reframe and refine their ideas as they develop new understanding and products that 'demonstrate a clear sense of purpose and respect for the audience' (Information and Communications Technology: *ICT for creating*).

Students develop the knowledge, skills and behaviours to effectively participate in their communities and workplaces. They participate in work place learning and civic projects developing social competence, resilience and confidence in the setting. They are cooperative team members capable of problem solving and self-direction and motivation. They reflect on the nature of work and community in the context of its moral and ethical dimensions and are aware of rights and responsibilities, and health and safety issues. They have the self-efficacy, assertiveness, negotiation and communication skills to 'consider alternative views, recognise multiple possible interpretations and respond with insight' (Communication: *Listening, viewing and responding*). They take increased responsibility for their own physical wellbeing as well as their own intellectual growth, values and beliefs.

Students' growing focus on their intended pathways in the post-compulsory years sees their study across the five broad discipline areas (that is, English and Languages Other Than English, Mathematics, Science, the Humanities and the Arts) complemented by the choice of specialised programs and the standards associated with the relevant domains.

Accompanying increased specialisation is the development of routine study, organisational, note taking and examination preparation habits. These gradually increase in complexity, manifesting in cognitive skills such as the use of deliberate memory and concentration techniques, and the adaptable use of graphic representations for ideas, thinking processes and frameworks.

# Physical, Personal and Social Learning

A curriculum designed to equip students for the challenging world of the twenty-first century needs to ensure that students develop as people who take increasing responsibility for their own physical wellbeing, learning, relationships with others and their role in the local, national and global community.

Within the Physical, Personal and Social Learning strand the learning domains are:

## Health and Physical Education

A healthy, physically active lifestyle is conducive to more effective participation in all that society has to offer and greater levels of success within and beyond school. This requires students to develop the knowledge, skills and behaviours that enable them to:

- maintain good health and live a healthy lifestyle
- understand the role of physical activity in ensuring good health
- engage in physical activity.

## Interpersonal Development

In our highly interconnected and interdependent world, students must learn to work with others by:

- building positive social relationships
- working and learning in teams
- managing and resolving conflicts.

## Personal Learning

As students progress through school they need to be encouraged and supported to take greater responsibility for their own learning and participation at school. This involves developing as individual learners who:

- acquire self knowledge and dispositions which support learning
- can learn with peers, including by seeking and responding appropriately to feedback
- increasingly manage their own learning and growth including by setting goals and managing resources to achieve these
- recognise and enact appropriate values within and beyond the school context.

## Civics and Citizenship

Students need to develop the knowledge, skills and behaviours that enable them to take action as informed, confident members of a diverse and inclusive Australian society. They need to understand the political and legal systems and processes and the history that underpins them. This involves a focus on students:

- understanding their identity and roles in their community
- knowing their rights and responsibilities as citizens
- appreciating Australia's role in the global community
- having the knowledge, skills and behaviours to participate in society and take responsible action in relation to other citizens and the environment at a local and broader level.



 

# Health and Physical Education

## Introduction

The domain of Health and Physical Education provides students with knowledge, skills and behaviours to enable them to achieve a degree of autonomy in developing and maintaining their physical, mental, social and emotional health. This domain focuses on the importance of a healthy lifestyle and physical activity in the lives of individuals and groups in our society.

This domain is unique in having the potential to impact on the physical, social, emotional and mental health of students. It promotes the potential for lifelong participation in physical activity through the development of motor skills and movement competence, health-related physical fitness and sport education.

Engaging in physical activity, games, sport and outdoor recreation contributes to a sense of community and social connectedness. These are vital components of improved wellbeing.

Students' involvement in physical activity can take many forms, ranging from individual, non-competitive activity through to competitive team games. Emphasis is placed on combining motor skills and tactical knowledge to improve individual and team performance. Students progress from the development of basic motor skills to the performance of complex movement patterns that form part of team games. They learn how developing physical capacity in areas such as strength, flexibility and endurance is related to both fitness and physical performance.

Students progress from learning simple rules and procedures to enable them to participate in movement and physical activity safely, to using equipment safely and confidently. Students undertake a variety of roles when participating in sports such as umpire, coach, player and administrator and assume responsibility for the organisation of aspects of a sporting competition.

This domain explores the developmental changes that occur throughout the human lifespan. It begins by identifying the health needs necessary to promote and maintain growth and development, followed by discussion of significant transitions across the lifespan including puberty, to gaining an understanding of human sexuality and factors that influence its expression. The exploration of human development also includes a focus on the establishment of personal identity, factors that shape identity and the validity of stereotypes.

Students develop an understanding of the right to be safe and explore the concepts of challenge, risk and safety. They identify the harms associated with particular situations and behaviours and how to take action to minimise these harms.

Through the provision of health knowledge, this domain develops an understanding of the importance of personal and community actions in promoting health and knowledge about the factors that promote and protect the physical, social, mental and emotional health of individuals, families and communities. Students investigate issues ranging from individual lifestyle choices to provision of health services by both government and non-government bodies. In investigating these issues, they explore differing perspectives and develop informed positions.

This domain examines the role of food in meeting dietary needs and the factors that influence food choice. Students progress from learning about the importance of eating a variety of foods to understanding the role of a healthy diet in the prevention of disease.

The Health and Physical Education domain provides students with the knowledge, skills and behaviours necessary for the pursuit of lifelong involvement in physical activity, health and wellbeing.

# Structure of the domain

The Health and Physical Education domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Health and Physical Education, standards for assessing and reporting on student achievement apply from Level 1.

## Dimensions

Standards in the Health and Physical Education domain are organised in two dimensions.

- Movement and physical activity – from Level 1
- Health knowledge and promotion – from Level 3.

### Movement and physical activity

The *Movement and physical activity* dimension focuses on the important role that physical activity, sport and recreation need to play in the lives of all Australians by providing opportunities for challenge, personal growth, enjoyment and fitness. It promotes involvement in a manner that reflects awareness that everyone has the right to participate in a healthy and active lifestyle. It develops students' confidence in using movement skills and strategies to increase their motivation to become active as well as improve their performance and maintain a level of fitness that allows them to participate in physical activity without undue fatigue. It builds understanding of how training and exercise in areas such as strength, flexibility and endurance relate to physical performance.

### Health knowledge and promotion

The *Health knowledge and promotion* dimension examines physical, social, emotional and mental health and personal development across various stages of the lifespan. It focuses on safety and the identification of strategies to minimise harms associated with particular situations or behaviours. Students examine the promotion of health of individuals and the community through the use of specific strategies and the provision of health resources, services and products. They examine the factors that influence food selection and the role of nutrition on health growth and development.

# National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Health and Physical Education, they develop proficiency in a range of high-level movement and manipulative skills such as a smash in tennis, and focus on identifying and implementing ways of improving the quality of their performance during games, physical activities and sports. They may be introduced to new sports, games or activities which will require them to learn new skills or adapt previously learnt skills in a new context.

They investigate different components of fitness, how these vary between activities and how they contribute to the wellbeing of people at different stages of their lives. Students learn to set personal physical activity and/or fitness goals, develop an activity and/or fitness program and evaluate its success. They investigate community facilities available for health and physical fitness activities, engage in a variety of recreational and outdoor adventure activities, and develop skills, knowledge and behaviours for enhancing safe participation in these activities.

They learn and practise tactics and strategies relevant to the sports and activities in which they are participating, including the development of strategies to counter tactical challenges in game situations. Students participate in peer teaching or coaching situations with a focus on skill development and improvement. They discuss sporting conduct, and implement fair play and good sporting behaviours. They undertake a variety of roles in team games (for example, player, coach, umpire and administrator) and assume responsibility for the organisation of aspects of a sporting competition.

Students extend their learning about the major tasks in establishing personal identity. They describe social and cultural factors, such as family, the media, community expectations influencing the development of personal identity, including the development of identity as it relates to gender. They discuss ways to express independence and the rights and responsibilities associated with the development of increasing independence. They rehearse strategies for being assertive when protecting their own and others' health.

Students discuss relationships and how the different aspects of relationships vary between people and over time. They consider how the different roles and responsibilities in sexual relationships can affect their health and wellbeing. They explore a range of issues related to sexuality and sexual health such as safe sex practices, sexual negotiation, same sex attraction and the impact of alcohol on sexual and personal safety. Students explore assumptions, community attitudes and stereotypes about young people and sexuality. They learn strategies for supporting themselves and other young people experiencing difficulties in relationships or with their sexuality, and learn about the community services available to assist. Students investigate and evaluate the policies and practices in their school in relation to sexual and racial harassment, homophobia and/or discrimination, and consider their rights and responsibilities in these areas.

Students examine mental health issues relevant to young people and consider the importance of family and friends in supporting their mental health and emotional health needs. They consider the stigma of mental illness as well as the challenges for those with a mental illness and for those caring for them.

Students examine perceptions of challenge, risk and safety in a variety of settings such as in the home, school, the workplace and the community. They contrast risks that promote personal and social growth with those that endanger health. They discuss ways to balance risk and safety, and refine and evaluate harm-minimisation strategies. They examine strategies to promote safety such as those associated with occupational health and safety. Students examine the concept of adventure in outdoor activities as well as perceived and actual risk. They learn basic first aid skills such as cardiopulmonary resuscitation (CPR), asthma management and sports injury management.

Students explore assertiveness and resilience strategies that could be used in a range of situations. Using techniques such as role-play or simulation games, students are provided with opportunities to practise and reflect on the usefulness of these strategies.

Students learn to use simple health data to identify the major causes of illness, injury and death in Australia. They investigate personal behaviours and community actions that may contribute to the health of specific groups. Students investigate the work of government departments and non-government bodies in promoting and protecting the health of young people, including laws, policies and provision of health services. They identify the services provided through Medicare.

Students examine the relationship between nutrition and stages of growth and development, and the eating practices associated with different stages in life. They learn to analyse the links between diet and current community health issues, and consider special dietary needs, and ways of improving their own diet. They research patterns of food consumption in Australia and investigate factors that influence food choice, such as changes in family life.

## Standards

### Movement and physical activity

At Level 6, students demonstrate proficiency in the execution of manipulative and movement skills during complex activities. They demonstrate advanced skills in selected physical activities. They use training methods to improve their fitness level, and participate in sports, games, recreational and leisure activities that maintain regular participation in moderate to vigorous physical activity. They employ and devise skills and strategies to counter tactical challenges in games situations. They assume responsibility for conduct of aspects of a sporting competition in which roles are shared and display appropriate sporting behaviour.

### Health knowledge and promotion

At Level 6, students identify and describe a range of social and cultural factors that influence the development of personal identity and values. They identify and explain the rights and responsibilities associated with developing greater independence, including those related to sexual matters and sexual relationships. They describe mental health issues relevant to young people. They compare and evaluate perceptions of challenge, risk and safety. They demonstrate understanding of appropriate assertiveness and resilience strategies. They analyse the positive and negative health outcomes of a range of personal behaviours and community actions. They identify the health services and products provided by government and non-government bodies and analyse how these can be used to support the health needs of young people. They identify and describe strategies that address current trends in the nutritional status of Australians. They analyse and evaluate the factors that affect food consumption in Australia.

# Interpersonal Development

## Introduction

Learning in the Interpersonal Development domain supports students to initiate, maintain and manage positive social relationships with a range of people in a range of contexts. It is through the development of positive social relationships that individuals become linked to society, develop a sense of belonging and learn to live and work with others. In a pluralistic, multicultural society such as Australia, with varying interests, values and beliefs, it is essential that individuals learn to participate in groups whose members are from diverse backgrounds. In this domain there is a particular focus on developing students' capacity to work cooperatively as part of a team as this is widely acknowledged as being a core requirement for success in the workplace and in the community.

Building effective social relationships and relating well to others requires individuals to be empathetic, and to be able to deal effectively with their own emotions and inner moods. It also requires them to be aware of the social conventions and responsibilities that underpin the formation of effective relationships. All social relationships have the potential to create conflict. Students need to develop the skills and strategies to manage and resolve conflict in a sensible, fair and effective manner and not see it as something to avoid or eliminate.

Working cooperatively as part of a team requires the skills outlined above. In addition, it requires individuals to be able to balance commitment to the group and its norms with their own needs. This requires competence in presenting their own ideas and listening to those of others, approaching topics from different viewpoints, and understanding their specific role and responsibilities in relation to those of others and the overall team goal.

Relationships with peers and adults at the school provide students with opportunities for reflection and growth. Adults at the school can reinforce this learning by providing positive role models. Interactions should be positive, fair, respectful and friendly and be supported by a classroom culture which is open, honest and accepting.

The Interpersonal Development domain provides students with learning opportunities and experiences that will support their learning across the curriculum, particularly in relation to working in teams where collaboration and cooperation, sharing resources and completing agreed tasks on time are highlighted. Learning related to building social relationships encourages students to maintain positive learning environments across their learning programs.

# Structure of the domain

The Interpersonal Development domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, where applicable, a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Interpersonal Development, standards for assessing and reporting on student achievement apply from Level 1, although at this level they are not organised by dimension.

## Dimensions

Standards in the Interpersonal Development domain are organised in two dimensions:

- Building social relationships
- Working in teams.

### Building social relationships

Learning in the *Building social relationships* dimension supports students to initiate, maintain and manage positive social relationships with a diverse range of people in a range of contexts. Students learn about and practise the social conventions which underpin relationships and learn how to act in socially responsible ways. Strategies for understanding, managing and resolving conflict are also an important focus.

### Working in teams

In the *Working in teams* dimension students develop the knowledge, skills and behaviours to cooperate with others to contribute to the achievement of group goals. The focus is not only task achievement, but also on contributing to, and reflecting on, the learning which occurs through being part of a team.

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# Level 6

### Learning focus

As students work towards the achievement of Level 6 standards in Interpersonal Development, they develop their knowledge of local and global values and beliefs and consider the idea of values as social constructs and principles. They explore barriers to achieving positive relationships, especially between groups with differing values and beliefs, and discuss the importance of empathy. They explore strategies that they and others could use to overcome these barriers, and practise using such strategies and reflecting on their effectiveness.

They learn to consider feelings and behaviour in a broader context that is influenced by social conventions and cultures. They understand individual and group behaviour in the context of motivating factors when students participate in activities, including role-plays, which allow them to explore the impact of peers on relationships. They explore strategies to manage peer influence and to develop positive relationships with a wide range of peers, gaining confidence in stating clearly their own views and opinions, and the rationale for these. They develop specific skills and a variety of strategies to

prevent or resolve conflict, and explore the nature of conflict resolution in a range of contexts. They learn to recognise when conflict, including conflict in workplaces, is likely to occur, and learn to be proactive in initiating strategies to avoid and/or resolve it.

Students take opportunities to work in diverse teams within and beyond school, including the workplace, to complete tasks with several interrelated components. Some of these tasks are managed by the team, with limited teacher input. This allows students to take responsibility for selecting a team that is likely to function effectively, allocating tasks, assigning and taking leadership roles, determining timelines and action plans, and monitoring and evaluating task achievement. Where required, students initiate strategies to deal with any problems they encounter. They assess their own contribution to the team and provide useful feedback to peers. Students also reflect on the success of team management and learning in achieving agreed goals.

Students may be involved in acting as peer mediators for younger students with minimal guidance once initial training is completed.

### National Statements of Learning

This Learning focus statement incorporates aspects of the National Statements of Learning for Civics and Citizenship, Year 9

## Standards

### Building social relationships

At Level 6, students demonstrate awareness of complex social conventions, behaving appropriately when interacting with others. They describe how local and global values and beliefs determine their own and others' social relationships. They evaluate their own behaviour in relationships, identify potential conflict and employ strategies to avoid and/or resolve it.

### Working in teams

At Level 6, students work collaboratively, negotiate roles and delegate tasks to complete complex tasks in teams. Working with the strengths of a team they achieve agreed goals within set timeframes. Students describe how they respect and build on the ideas and opinions of team members and clearly articulate or record their reflections on the effectiveness of learning in a team. They develop and implement strategies for improving their contributions to achieving the team goals.

# Personal Learning

## Introduction

Learners are most successful when they are mindful of themselves as learners and thinkers within a learning community. The Personal Learning domain focuses on providing students with the knowledge, skills and behaviours to be successful, positive learners both at school and throughout their lives. They are supported to develop the confidence and ability to be adaptive and take an active role in shaping their own futures in a world of constant change.

Students can learn many things by will and effort, particularly if they see that the learning is relevant; however, the learning of students is enhanced when they are supported to develop intentional strategies that promote learning. They need to understand what it means to learn, who they are as learners and how emotions affect learning. They also need to develop skills in planning, monitoring and revising their work, and reflecting on and modifying their learning practices.

Consequently, as students progress through school they need to be encouraged and supported to take greater responsibility for their own learning, their participation in learning activities and the quality of their learning outcomes. They need to develop a sense of themselves as learners and develop the knowledge and skills to manage their own learning and emotions. As they do this, they move from being supported learners to autonomous learners.

Students learn to seek and use feedback from their teachers to develop their content knowledge and understanding. They also learn to seek and use feedback from their peers and draw on other members of the community who may provide feedback, knowledge and advice about skills that support their learning. They need to develop the capacity to reflect on their learning in systematic ways.

This domain supports the development of autonomous learners, with a positive sense of themselves as learners, by providing all learners with the knowledge, skills and behaviours to:

- develop an understanding of their strengths and potential
- seek and respond appropriately to feedback from their teachers, peers and other members of the community
- develop skills of goal setting and time and resource management
- increasingly manage their own learning and growth by monitoring their learning, and setting and reflecting on their learning goals
- learn to understand and to manage their own emotions

- develop resilience and dispositions which support learning
- recognise and enact learning principles within and beyond the school
- prepare for lifelong learning.

The achievement of these outcomes requires the creation of a school and classroom culture where all students are respected and valued as individuals with the capacity to learn and think, and where self-regulated effort in learning is promoted.

# Structure of the domain

The Personal Learning domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 3, a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Personal Learning, standards for assessing and reporting on student achievement apply from Level 3.

## Dimensions

Standards in the Personal Learning domain are organised in two dimensions:

- The individual learner
- Managing personal learning.

### The individual learner

*The individual learner* dimension focuses on students developing knowledge about their personal characteristics and capabilities, and those they need to develop to support their approaches to and reflections about learning. Students explore and practise skills and behaviours which support learning. They develop the capacity to monitor their own learning, identifying learning strengths and areas requiring improvement. They seek and use teacher feedback to develop their content knowledge and understanding. They explore the ways in which personal values affect learning and recognise the need to develop ethical frameworks for operating fairly within the classroom and recognising and respecting individual differences of class members. Students

recognise their learning preferences and needs and respect that these may differ from those of others. They develop confidence in making informed decisions about their learning.

### Managing personal learning

The *Managing personal learning* dimension focuses on the knowledge, skills and behaviours required to enable successful management of personal learning. Students develop skills in goal setting and time and resource management and focus on task achievement. They increasingly develop the skills to work independently, becoming autonomous learners. Students develop strategies to manage their emotions and develop positive attitudes towards learning.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Personal Learning, they demonstrate increasing independence in the completion of tasks as they work towards becoming autonomous learners. They participate in reflective activities that enable them to consider the progress they are making with their learning and to acknowledge their potential for learning beyond the post-compulsory school years.

Students are encouraged to use appropriate strategies to maximise their learning in a range of contexts and to review and refine their study habits. They complete projects that require them to work both independently and as part of a team, and are actively encouraged by their teachers to initiate learner-directed projects.

Using an ethical framework, students address ambiguous and hypothetical situations and gain insights and skills for exploring conflicts and dilemmas. They control their emotions, understanding the negative impact of mood swings and impulsive behaviour on learning and behaviour. They participate in activities that require them to make informed and responsible choices, considering the impact on themselves and others; they may, for example, explore choices for their future pathways. They are proactive in contributing to the creation of positive learning environments, with the expectation that learning continues beyond the post-compulsory school years.

Students initiate and negotiate long-term goals, recognising the constraints of competing needs and priorities, and acknowledging the need for responsible risk-taking in some situations. They work with their teacher or a mentor to develop measures for evaluating achievement of goals. They select from the range of planning and organisational skills and processes they have developed, and use those which best meet the needs of particular tasks. They develop their time-management, resource management and task-completion strategies, by undertaking learner-directed projects which are related to their areas of interest and future pathways. They use, evaluate and modify the criteria they use to check that their work is relevant, accurate and meets task objectives. Students review and amend, as appropriate, their study and revision strategies.

## Standards

### The individual learner

At Level 6, students work independently to implement a range of strategies, as appropriate, to maximise their learning. They monitor and reflect on and discuss their progress as autonomous learners, identifying areas for improvement in their learning and implementing actions to address them. Students seek and respond to feedback from peers, teachers and other adults

to develop and refine their content knowledge and understanding, identifying areas for further investigation. They evaluate the effectiveness of their learning strategies, study techniques and learning habits, and make appropriate modifications. They identify their interests, strengths and weaknesses and use these to determine future learning needs, especially in relation to the post-compulsory pathways.

Students identify the ethical frameworks that underpin their own and others' beliefs and values and describe how the conflicts and dilemmas they identify may affect learning. They determine, monitor and modify learning improvement goals, taking into account current and future learning needs. They determine the factors that contribute to the creation of positive learning environments and establish, follow and monitor protocols for a variety of learning situations.

### Managing personal learning

At Level 6, students initiate personal short-term and long-term learning goals and negotiate appropriate courses of action to achieve them. Students allocate appropriate time and identify and utilise appropriate resources to manage competing priorities and complete tasks, including learner-directed projects, within set timeframes. They initiate and negotiate a range of independent activities with their teachers, providing progress and summative reports for teachers and stakeholders. They monitor and evaluate the effectiveness of their task and resource management skills, reflecting on their progress and suggesting and implementing appropriate management strategies for improvement. They take responsibility for their learning environments, both at school and at home, anticipating the consequences of their actions. They demonstrate control of impulses and mood modulation. Students review and modify the criteria they use to check that their work is relevant, accurate and meets task objectives and make appropriate changes to completed tasks using these criteria. They identify and refine the strategies they use to study, organise and revise their work, both at school and at home.

# Civics and Citizenship

## Introduction

The Civics and Citizenship domain provides students with knowledge, skills and opportunities to understand and practise what it means to be a citizen in a democracy. Citizens require knowledge and understanding of civic institutions and the skills and willingness to actively participate in society. They need knowledge of political and legal systems and processes and the history that underpins them in order to achieve civic understanding. They need to understand their rights and responsibilities as citizens, and democratic values and principles such as democratic decision making, representative and accountable government, freedom of speech, equality before the law, social justice and equality. This domain facilitates the practice of citizenship skills, the exploration and development of values and dispositions to support citizenship and the empowerment of informed decision making. Teaching of civics engages students in active interaction with the community.

In a world where people, environments, economics and politics are inextricably linked, and where dislocation and change is accelerating, a strong sense of personal identity developed through participation in communities is a sound basis from which to connect with the world. Civics and Citizenship education strengthens understanding and valuing of the self. It teaches why citizens need a sense of personal identity within their own community and how they can contribute to local, national and global communities. Through Civics and Citizenship students develop an appreciation for the uniqueness and diversity of Australia's multicultural society and the efforts of individuals and groups to achieve political rights and equality. They value what it means to be an Australian and explore Australia's role in the global community. They consider human rights and social justice issues at local, national and global levels.

In Civics and Citizenship students investigate how, in a democratic tradition, informed and diverse contributions and participation by citizens are important. They learn about, contest and enact the values that are important to be an engaged citizen within a community. They are provided with opportunities to investigate and participate in activities that support sustainable practices, social justice and underpin the future wellbeing of societies from a local to a global level. Civics and Citizenship provides a vehicle for students to challenge their own and others' views about Australian society and to formally participate in and practise activities and behaviours which involve democratic decision making.

# Structure of the domain

The Civics and Citizenship domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 3, a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Civics and Citizenship, standards for assessing and reporting on student achievement apply from Level 3.

## Dimensions

Standards in the Civics and Citizenship domain are organised in two dimensions:

- Civic knowledge and understanding
- Community engagement.

### Civic knowledge and understanding

The *Civic knowledge and understanding* dimension focuses on the principles and practices that underpin civic institutions and civic life in communities and societies. Students explore concepts of democracy and the key features of Australian and other democracies. They develop knowledge and understanding of the origins and key features of the Australian political, government and legal systems. They develop understanding of the origins, uniqueness and diversity of Australia's multicultural society. They learn about the principles and values which underpin Australian democracy, such as equality before the law, freedom of speech, democratic representation, accountability of government, social justice and respect for others. They explore the elements of sustainability in local, national and global contexts. They learn about the contribution democracy has made to Australia's history and national identity and Australia's place in the world.

### Community engagement

The *Community engagement* dimension focuses on the development of skills and behaviours students need to interact with the community and to engage with organisations and groups. Students participate in processes associated

with citizenship such as decision making, voting and leadership, using their knowledge of rules and laws of governance, and concepts such as human rights and social justice. They think critically about their own values, rights and responsibilities and those of organisations and groups across a range of settings, and explore the diversity in society.

Students explore and consider different perspectives and articulate and justify their own opinions on local, national and global issues. They refine their own opinions, values and allegiances. They apply their knowledge and skills in a range of community-based activities.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Civics and Citizenship, they explore the development of Australia's democracy from Federation, the development of the Australian Constitution and the federal system of government. They investigate some historical and contemporary issues, such as the republican debate, the inclusion of a bill of rights in the Australian Constitution, the design of the Australian flag, Aboriginal and Torres

Strait Islander (ATSI) recognition in the Australian Constitution, and the division of federal and state powers. They compare Australia's democracy with other democracies.

Students investigate the nature and history of the concept of human rights. They become aware of national and international legislation designed to protect those rights. They explore human rights issues at the national and international level, including an investigation of the human rights of ATSI communities and other groups within Australia.

They explore key elements of modern democracy, such as the origins, purposes, objectives and constituencies of political parties, and the characteristics and operation of the electoral system. Students consider the ways that these allow citizens to participate in governance and how well these elements support democratic principles and values. They consider other processes for influencing the views and actions of others; for example, through participation in organisations such as unions, environmental and other interest groups. They consider the role of the media in a democratic society and the importance of a free press.

Students explore Australia's multicultural society. They learn about the past and present policies of government in relation to ATSI people and immigration, and the values and beliefs which support a harmonious multicultural society. They explore the concept of Australian identity and the contributions of various cultural groups. They consider the development of Australian citizenship over time and reasons why people choose to become Australian citizens. They link their understanding of multiculturalism to contemporary issues, such as the global refugee problem and population growth.

Students evaluate the role of the Australian Government in the global community including Australia's role in the United Nations, through contexts such as government responses to environmental concerns such as global warming or other issues of environmental sustainability, natural disasters, peacekeeping operations, world poverty and national and global security issues.

Students explore the roles and responsibilities of state and Commonwealth courts and the High Court of Australia. They learn about the differences between different types of law including statute, common, ATSI and international law. They examine case studies of changes in the law such as Mabo, the Franklin Dam, or combating terror or other contemporary examples. They consider the views of individuals and groups in the community about the change and the effects of the change. They examine the processes for bringing about change in Australia's legal and political systems including the role of open debate in a democracy. They evaluate the effectiveness of democratic processes in bringing about changes in the law.

Students apply their knowledge about representative democracy and systems of government by researching and proposing possible action on an issue relevant to them at the local, state or national level. They explore the potential impact of the issue on different groups within the community, and the effectiveness of the democratic process in balancing individual and community rights in resolving the issue.

Students understand the regional, global and environmental implications of being a citizen in a democracy. They explore Australia's relationship with other nations and examine the influence of global events and issues on these relationships. They examine how people's views on the environment influence government policy and non-government organisations and the ways in which governments attempt to address issues of development and sustainability. They investigate ways in which citizens can influence government and consider opportunities to take civic action on issues, including the environment.

Students explore what it means to be a leader, considering different leadership styles and learn how they can lead by example. Students are provided with opportunities to participate in leadership activities and projects that contribute to the wellbeing of others and which may have a local, national or global focus.

**Statements of Learning**

This learning focus statement, with the following elaborations and in conjunction with the learning focus statements for Interpersonal Development, Communication and History, incorporates the Year 9 National Statement of Learning for Civics and Citizenship.

**Elaborations:**

They compare Australia's democracy with other democracies.

They consider the development of Australian citizenship over time and reasons why people choose to become Australian citizens.

Students understand the regional, global and environmental implications of being a citizen in a democracy. They explore Australia's relationship with other nations and examine the influence of global events and issues on these relationships. They examine how people's views on the environment influence government policy and non-government organisations and the ways in which governments attempt to address issues of development and sustainability. They investigate ways in which citizens can influence government and consider opportunities to take civic action on issues, including the environment.

## Standards

### Civic knowledge and understanding

At Level 6, students describe the origins and nature of Australia's federal political system and present a considered point of view on an issue about change in the political system and the law. They explain how the Australian Constitution affects their lives, and human rights issues, both national and international. They explain how citizens influence government policy through participation in political parties, elections and membership of interest groups. They explain the development of a multicultural society and the values necessary to sustain it. They describe the election processes in Australia and how to vote. They explain the roles and responsibilities of courts at state and federal levels and evaluate a change in the law. They analyse how well democratic values are reflected in aspects of the Australian political system. They take a global perspective when analysing an issue, and describe the role of global organisations in responding to international issues.

### Community engagement

At Level 6, students draw on a range of resources, including the mass media to articulate and defend their own opinions about political, social and environmental issues in national and global contexts. They contest, where appropriate, the opinions of others. They develop an action plan which demonstrates their knowledge of a social or environmental issue and suggest strategies to raise community awareness of it. They participate in a range of citizenship activities including those with a national or global perspective, at school and in the local community.

# Discipline-based Learning

The domains within the Discipline-based Learning strand form a body of knowledge with associated ways of seeing the world and distinct methods of exploring, imagining and constructing that world.

Broadly in line with academic literature and consistent with practice in many schools, the Victorian Essential Learning Standards identify the Arts, the Humanities, English and Languages Other Than English, Mathematics and Science as the disciplines for the curriculum over the stages of learning from Prep to Year 10.

Within the Discipline-based Learning strand the learning domains are:

The Arts
English
The Humanities – Economics
The Humanities – Geography
The Humanities – History
Languages Other Than English (LOTE)
Mathematics
Science

Students who develop a deep understanding of the concepts contained in the discipline-based domains are able to apply their knowledge in many different ways. The degree to which they are able to transfer their knowledge depends largely on the degree to which students have achieved mastery over Physical, Personal and Social and Interdisciplinary learning.

Research suggests that students develop deeper understanding of discipline-based concepts when they are encouraged to reflect on their learning, take personal responsibility for it and relate it to their own world. These approaches are explicitly defined in the Physical, Personal and Social Learning domains such as physical education and personal learning.

Students are better able to develop, demonstrate and use discipline-based knowledge and skills when they are able to employ interdisciplinary knowledge, skills and behaviours described in the domains of Communication; Design, Creativity and Technology; Information and Communications Technology; and Thinking Processes.

# The Arts

## Introduction

The Arts are unique, expressive, creative and communicative forms that engage students in critical and creative thinking and help them understand themselves and the world. In every society the Arts play a pivotal role socially, economically and culturally. The Arts encourage the development of skills and the exploration of technologies, forms and processes through single and multimodal forms. They fuel the exploration of ideas that cross the gamut of human emotions and moods through holistic learning using cognitive, emotional, sensory, aesthetic, kinaesthetic and physical fields.

The Arts domain encompasses a diverse and ever-changing range of disciplines and forms that can be used to structure teaching and learning programs. The domain allows students to create and critically explore visual culture, performances in contemporary and traditional genres, and works that involve the fusion of traditional forms with digital media. Schools use the arts disciplines of Art, Dance, Drama, Media, Music and Visual Communication to plan programs. These programs reflect the cultural diversity of students and school communities and the vast growth in information and communications technology that has made arts forms increasingly visible. They recognise the multicultural world saturated with imagery, sounds and performances that students inhabit. Engagement in the Arts involves the inspired and passionate exploration of ideas and the resultant products and performances. By their very nature, the Arts nurture cultural understanding, invention, new directions and new technology. Imagination and creativity, pivotal to the Arts, are essential to our wellbeing because we create much of our world in order to enhance our experiences and understandings of the diverse perspectives that constitute our cultural heritage. For students, interaction through the Arts brings contact with the Indigenous cultures of Australia and the cultures of our nearest neighbours.

Learning in the Arts allows students to communicate their perceptions, observations and understanding of structures, functions and concepts drawn from other areas of the curriculum. The Arts are a vehicle for confronting and exploring new ideas. Through learning in the Arts, students prepare for their roles in a post-industrial economy that depends on innovative ideas, creative use of technologies and the development of new and blended forms. Arts learning expects ethical conduct in the creating, making, presenting and responding to arts works; for example, adherence to agreed approaches by individuals in a collaborative performance or acknowledgment of the use of other artists' products.

Learning in the Arts is sequential and students should have continuous experience in the different arts disciplines they undertake at a particular level. At Levels 1, 2 and 3 all students should experience learning in Performing Arts

Definitions of underlined terms are provided in the Glossary (page 121)

(Dance, Drama and Music) and Visual Arts (Art, including two-dimensional and three-dimensional, and Media) disciplines and forms. The arts disciplines may be offered by schools individually and/or in combination; for example, in a cross-disciplinary manner or using new arts forms that combine traditional arts disciplines. At Levels 4 and 5, the study of a range of arts disciplines broadens and deepens students' understanding of the Arts as an area of human activity and provides increased opportunities for personal expression and communication. All students should have continuous experience in at least two arts disciplines at each of these levels. At Level 6, learning programs should provide opportunities for students to continue sequential development of learning in the arts disciplines they have undertaken at Levels 4 and 5. Opportunities should also be provided for students to explore personal interests and develop skills, knowledge and understanding relevant to specific arts forms and disciplines in increasingly sophisticated ways.

At all levels, learning programs in the arts disciplines should provide opportunities for students to experience a range of traditional, contemporary (including digital) and new media/multi-disciplinary forms and genres.

# Structure of the domain

The Arts domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and a set of standards. A glossary is included which provides definitions of or information about underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities. Advice regarding the range of arts disciplines that students should experience is included as an introduction to each learning focus statement.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In the Arts, standards for assessing and reporting on student achievement apply from Level 1.

## Dimensions

Standards in the Arts domain are organised in two dimensions:

- Creating and making
- Exploring and responding.



Definitions of underlined terms are provided in the Glossary (page 121)

Standards for the *Exploring and responding* dimension are introduced from Level 3.

The frames of reference – interpreting, responding, performing, presenting, ideas, skills, techniques, processes, context, aesthetics and criticism – are integral to both dimensions as *Exploring and responding* draws on students' experiences as creators, makers, performers and/or audience.

Advice will be published for each arts discipline to accompany the standards.

### Creating and making

The *Creating and making* dimension focuses on ideas, skills, techniques, processes, performances and presentations. It includes engagement in concepts that emerge from a range of starting points and stimuli. Students explore experiences, ideas, feelings and understandings through making, interpreting, performing, creating and presenting. Creating and making arts works involves imagination and experimentation; planning; the application of arts elements, principles and/or conventions; skills, techniques and processes; media, materials, equipment and technologies; reflection; and refinement. Individually and collaboratively, students explore their own works and works by other artists working in different historic and cultural contexts.

### Exploring and responding

The *Exploring and responding* dimension focuses on context, interpreting and responding, criticism and aesthetics. It involves students analysing and developing understanding about their own and other people's work and expressing personal and informed judgments of arts works. Involvement in evaluating meaning, ideas and/or content in finished products is integral to engagement in the Arts.

Exploration of, and response to, expressive qualities of arts works is informed by critical analysis of the use of elements, content and techniques and discussion about the nature, content, and formal, aesthetic and/or kinaesthetic qualities of arts works. Exploring the qualities of arts works involves use of arts language and also draws on research into the purposes and functions for which the works are created and audiences to whom they are presented. This involves students developing an understanding of social, cultural, political, economic and historic contexts and constructs, and developing a consideration of ways that arts works reflect, construct, reinforce and challenge personal, societal and cultural values and beliefs.

## National Statements of Learning

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Definitions of underlined terms are provided in the Glossary (page 121)

Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

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During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

Learning in the Arts draws on the arts disciplines of Art, Dance, Drama, Media, Music, and Visual Communication, both individually and in combination. At this level learning and teaching programs allow students to explore personal interests and develop skills, knowledge and understanding relevant to specific arts forms and disciplines in increasingly sophisticated ways, and provide opportunities for students to continue sequential development of learning in arts disciplines they have undertaken in previous arts programs.

## Learning focus

As students work towards the achievement of Level 6 standards in the Arts, they design, make and present arts works. In doing so, they develop skills in making decisions about creative ways of generating and implementing ideas. They reflect on their experiences and observations, consider what they have learned about styles and forms and explore issues and concrete and abstract concepts to generate ideas. They keep their intended aesthetic qualities in mind when they experiment with, select, vary combinations of and manipulate arts elements, principles and/or conventions to effectively realise their ideas, represent their observations and communicate their interpretations of issues and concepts. For example:

- in Music, in response to learning and performing songs, that reflect the 'human spirit' students, individually or collaboratively, compose and using conventional or unconventional notation, write down, then present their musical response to an issue holding personal interest for them.



Definitions of underlined terms are provided in the Glossary (page 121)

Students consider others' perspectives when seeking solutions and contributing to collaborative arts tasks. For example:

- in Art, students research installation artists who use natural settings as their gallery, then collaboratively design and present an installation art work that uses found forms and works in harmony with the selected site.

Students begin to develop a personal style and become more independent in their approach to exploring, developing and refining arts works. For example:

- in Dance, students individually develop their own dance sequence and teach it to others, then, working collaboratively, they combine the sequences and present as one work.

Within and across specific arts disciplines and arts forms, students experiment with imaginative and innovative ways of using traditional and contemporary skills, techniques and processes and a variety of media, materials, equipment and technologies drawn from a range of contexts. For example:

- in Visual Communication, students develop a website home page for a fictitious organisation.

Students consider the purpose and presentation context when they prepare and present arts works to different audiences. For example:

- in Drama, students devise, rehearse, and design an ensemble performance. They construct sets, costumes and props suitable for a selected performance space, and present the performances.

Students use evaluation and reflection on their arts experiences to improve the making and presenting of their arts works. They maintain a record of their exploration, development and refining of ideas, use of elements and principles and/or conventions and application of techniques and processes when making and presenting their arts works.

When exploring and responding, students focus on the development of knowledge and understanding of key concepts, techniques, processes and practices associated with particular arts forms. They develop aesthetic and critical awareness through observation, research, discussion and analysis of arts works from different social, historical and cultural contexts. They compare arts works to consider similarities and differences in the styles, themes, intentions and aesthetic qualities of works by particular artists and arts works made at a particular time within specific cultural contexts. They develop skills in presenting and justifying personal interpretations of, and opinions about, arts works using appropriate arts language. They investigate and discuss the contribution of the arts to society and other disciplines, such as Mathematics



Definitions of underlined terms are provided in the Glossary (page 121)

and History, focusing on ways contemporary, and traditional arts disciplines, forms and works reinforce and challenge social, cultural, personal and artistic practices and values. For example:

- in Media, students research issues related to 'body image' and the visual media's role in the construction of the 'ideal body form', then they identify, analyse and discuss images found in popular magazines that contribute to 'body image' issues.

Further examples of arts discipline-specific learning approaches for Level 6 will be available on the Standards website at <http://vels.vcaa.vic.edu.au> in 2006.

## Standards

### Creating and making

At Level 6, within and across areas of specialisation, students apply decision making skills to find the most effective way to implement ideas, design, create and make arts works devised from a range of stimuli, demonstrating development of a personal style. They evaluate, reflect on, refine and justify their work's content, design, development and their aesthetic choices. Students realise their ideas, represent observations and communicate their interpretations by effectively combining and manipulating selected arts elements, principles and/or conventions to create the desired aesthetic qualities. Independently and collaboratively, they apply their knowledge and understanding to design, create and produce arts works influenced by the style of particular artists or cultures. They vary the content, structure and form of their arts works to suit a range of purposes, contexts, audiences and/or the conventions of a specific style, and demonstrate technical competence in the use of skills, techniques and processes. They effectively use a range of traditional and contemporary media, materials, equipment and technologies. They maintain a record of how ideas develop in the creating, making and presenting of their arts works.

### Exploring and responding

At Level 6, students observe, research and critically discuss a range of contemporary, traditional, stylistic, historical and cultural examples of arts works in the disciplines and forms in which they are working. They analyse, interpret, compare and evaluate the stylistic, technical, expressive and aesthetic features of arts works created by a range of artists and made in particular times and cultural contexts. They describe and discuss ways that their own and others' arts works communicate and challenge ideas and meaning. They use appropriate arts language and, in the arts works they are exploring and responding to, refer to specific examples. They comment on the impact of arts works, forms and practices on other arts works and society in general.

# English

## Introduction

In the English domain, *texts* and *language* constitute the central and essential concepts. The concept of texts focuses equally on creating and analysing texts, understanding and interpreting texts, and moving beyond interpretation to reflection and critical analysis. The concept of *language* includes the use of language and the development of linguistic competence, and the development of knowledge about language.

Students learn to appreciate, enjoy and use language and develop a sense of its richness and its power to evoke feelings, to form and convey ideas, to inform, to discuss, to persuade, to entertain and to argue.

The English domain is centred on the conscious and deliberate study of language in the variety of texts and contexts in which it is spoken, read, viewed and written. It is concerned with a wide range of written and spoken texts in print and electronic forms including literary texts such as novels, short stories, poetry, plays and non-fiction; film and other multimodal texts; media texts; information, commercial and workplace texts; everyday texts; and personal writing.

The study of English involves students in reading, viewing, listening to, writing, creating, comparing, researching and talking about a range of text types from the simple to the complex, from texts dealing with concrete and straightforward information to those dealing with increasingly complex and abstract issues and ideas. English teachers encourage students to explore the meaning of texts and how meaning is conveyed. They introduce critical approaches to the ideas and thinking contained in texts and support students in the development of critical understanding about the ways writers and speakers control language to influence their listeners, readers and viewers.

Students develop an understanding of the way purpose, audience and situation influence the structures and features of language and learn to apply their knowledge in their reading, writing, viewing, speaking and listening. They come to understand that different kinds of texts are appropriate for different occasions and learn to appreciate the variety of English usage in different times and places. They also learn about the ways language shapes and reflects attitudes in different times and places. Students are provided with opportunities to use language effectively in a range of contexts from informal to formal.

Students learn terminology or metalanguage to describe and discuss particular structures and features of language produced in a variety of contexts. They learn to control language by applying their understanding of the grammatical



Definitions of underlined terms are provided in the Glossary (page 121)

structures of Standard Australian English, by learning to spell accurately and use punctuation effectively, as well as by imitating good writers and speakers.

Understanding texts and recognising how language works within them is necessary for success at school and beyond for an active, informed and fulfilling life in modern Australian society and the global community. By understanding and working with texts, students acquire the knowledge, skills and personal qualities that enable them to read, view and listen critically and to think, speak and write clearly and confidently.

# Structure of the domain

The English domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and a set of standards organised by dimension. A glossary is included which provides definitions of or additional information about underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In English, standards for assessing and reporting on student achievement apply from Level 1.

## Dimensions

Standards in the English domain are organised in three dimensions:

- Reading
- Writing
- Speaking and listening.

The learning in these dimensions is interrelated. For example, speaking and listening contribute to the development of students' reading responses. Writing contributes to communication about texts read or viewed and to reflection and learning. To help support student progress in all three dimensions, learning contexts are diverse and include situations that are informal, formal, planned and spontaneous.

### Reading

The *Reading* dimension involves students understanding, interpreting, critically analysing, reflecting upon, and enjoying written and visual, print and non-print texts. It encompasses reading and viewing a wide range of texts and media, including literary texts such as novels, short stories, poetry and plays as well as popular fiction and non-fiction works, newspapers and magazines, illustrations, posters and charts, film and television and the texts associated with information and communications technology. Reading involves active engagement with texts and the development of knowledge about the relationship between them and the contexts in which they are created. It also involves the development of knowledge about a range of strategies for reading.

### Writing

The *Writing* dimension involves students in the active process of conceiving, planning, composing, editing and publishing a range of texts including writing for print and electronic media and performance. Writing involves using appropriate language for particular purposes or occasions, both formal and informal, to express and represent ideas, issues, arguments, events, experience, character, emotion and information and to reflect on such ideas. It involves the development of knowledge about strategies for writing and the conventions of Standard Australian English. Students develop a metalanguage to discuss language conventions and use.

### Speaking and listening

This dimension refers to the various formal and informal ways oral language is used to convey and receive meaning. It involves the development and demonstration of knowledge about the appropriate oral language for particular audiences and occasions, including body language and voice. It also involves the development of active-listening strategies and an understanding of the conventions of different spoken texts including everyday communication, group discussion, formal presentations and speeches, storytelling and negotiating.

## Learners of English as a Second Language

Many students in Victorian schools learn English as a Second Language (ESL). They are of all ages and at all stages of learning English and have varying educational backgrounds in their first languages. While the broad objectives of English programs will ultimately be the same for all students, those learning English as a Second Language need time, support and exposure to English before being expected to reach the standards described in the English domain, and will come to this achievement via a range of pathways.

Standards have been developed to assist teachers to devise effective learning and assessment programs for ESL students. The document includes an

Definitions of underlined terms are provided in the Glossary (page 121)

overview of the broad stages of English language development with learning focus statements and standards for each stage. The standards for ESL students are available at <http://vels.vcaa.vic.edu.au/support/esl/esl.html>.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

## National Literacy Benchmarks

National Literacy Benchmarks are used for reporting achievement in three aspects of literacy – reading, writing and spelling – at Years 3, 5 and 7. The benchmarks define nationally agreed minimum acceptable standards for literacy at these years.

Full details of the National Literacy Benchmarks are available in *Literacy Benchmarks Years 3, 5 and 7, Writing, Spelling and Reading*, Curriculum Corporation, 2000 at <www.curriculum.edu.au/projects/numbench.php>.

The benchmarks describe minimum standards. For this reason, the Year 3 benchmarks relate to Level 2 English standards, the Year 5 benchmarks relate to Level 3 English standards and the Year 7 benchmarks relate to Level 4 English standards. Links to the literacy benchmarks are located in the English standards.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in English, they produce, study and respond critically to spoken, written, and visual texts created for a wide range of audiences and purposes. Their focus is on a close examination of the critical and sociocultural dimensions of language, and they learn to be critical and independent users of texts and language appropriate to situations in school, in their daily lives and in the workplace.

Students read and respond to a range of classic, contemporary and popular texts, including literary texts such as novels, short stories, plays and poetry; informative and persuasive texts including everyday texts; media texts and workplace texts. They develop a critical understanding of the contemporary mass media and the difference between different media texts, such as current affairs, news articles, features, editorials, documentaries and reviews. They explore and interpret different perspectives on complex issues, analysing how different texts are likely to be interpreted by different groups. They develop a critical understanding of the contextual factors involved in the construction and interpretation of texts, including the role of audience in shaping meaning. They extend their use of metalanguage to encompass explicit discussion of the style and tone of a text.

Students use writing to explore different perspectives on complex and challenging issues. They develop their skills in writing appropriately and effectively in a range of text types for a variety of purposes and audiences. They practise writing expressively about thoughts, feelings, opinions and ideas, and constructing considered arguments to persuade others to share a point of view. Through an increasing use and control of complex linguistic structures and features, students develop their skills in conveying meaning and meeting the demands of purpose, context and audience.

Students listen to and are provided with opportunities to produce a range of spoken texts in a variety of formal and informal situations characterised by complexity of purpose, and subject matter. They critically examine the variety of ways in which spoken language influences audiences and, in their own presentations, experiment with a range of persuasive techniques.

In spoken, written and multimodal texts students apply their skills to planning and developing formal arguments about complex issues, and use evidence systematically to justify points of view and develop logical conclusions. They make increasingly effective use of a range of word-processing and editing software to produce texts that incorporate digital still images, digital audio and video, and print.



Definitions of underlined terms are provided in the Glossary (page 121)

### National Statements of Learning

This learning focus statement, in conjunction with aspects of the Communication Level 6 learning focus statement, incorporates aspects of the Year 9 National Statement of Learning for English.

## Standards

### Reading

At Level 6, students read, view, analyse, critique, reflect on and discuss contemporary and classical imaginative texts that explore personal, social, cultural and political issues of significance to their own lives. They also read, view, analyse and discuss a wide range of informative and persuasive texts and identify the multiple purposes for which texts are created. They explain how texts are shaped by the time, place and cultural setting in which they are created. They compare and contrast the typical features of particular texts and synthesise information from different texts to draw conclusions.

### Writing

At Level 6, students write sustained and cohesive narratives that experiment with different techniques and show attention to chronology, characterisation, consistent point of view and development of a resolution. They write persuasive texts dealing with complex ideas and issues and control the linguistic structures and features that support the presentation of different perspectives on complex themes and issues. They select subject matter and begin to use a range of language techniques to try to position readers to accept particular views of people, characters, events, ideas and information. They compose a range of other texts, such as feature articles, webpages and workplace texts. They plan and deliver presentations, sequencing and organising complex ideas. They write accurately punctuated, grammatically written and complex sentences with embedded clauses and phrases. They are able to maximise the effects of rhythm and tone, and write with developing fluency. They proofread and edit their own writing for accuracy, consistency and clarity.

### Speaking and listening

At Level 6, students analyse critically the relationship between texts, contexts, speakers and listeners in a range of situations. When engaged in discussion, they compare ideas, build on others' ideas, provide and justify other points of view, and reach conclusions that take account of aspects of an issue. In their presentations, they make effective use of the structures and features of spoken language to deal with complex subject matter in a range of situations.

They draw on a range of strategies to listen to and present spoken texts, including note-taking, combining spoken and visual texts, and presenting complex issues or information imaginatively to interest an audience.



 

# The Humanities

## Introduction

The Humanities in Prep to Year 10 involve the study of human societies and environments, people and their cultures in the past and the present. The Humanities provide a framework for developing in students the key ideas and concepts that enable them to understand the way in which people and societies have organised their world under particular conditions and made meaning of it.

The Humanities take as their subject matter human behaviour. They provide unique ways to understand how and why groups of people have settled where they have, organised their societies, developed means of generating and distributing wealth, developed codes, laws and belief systems, related to other groups of people and interacted with their physical environment.

The Humanities encourage use of research skills and inquiry processes. Students learn to plan an investigation and ask key questions. They question and analyse a range of data and sources including artefacts, photographs, maps, stories, special events, interviews, site visits and electronic media. They form conclusions supported by evidence and present information in a variety of ways.

## Structure of the Humanities

The Humanities discipline is organised into four domains:

- The Humanities – (Levels 1–3)
- The Humanities – History (Levels 4–6)
- The Humanities – Geography (Levels 4–6)
- The Humanities – Economics (Levels 4–6).

During Levels 1 to 3, students are introduced to basic concepts related to history, geography and economics under a general umbrella of 'The Humanities'. Each level includes a learning focus statement with standards introduced from Level 3. Specific learning focus statements and standards for Economics, Geography and History are introduced at Level 4.

The following table provides a summary of the structure of the Humanities.

<table>
<tr><th>DOMAIN</th><th>DIMENSION</th><th colspan="2">LEVEL 1</th><th colspan="2">LEVEL 2</th><th>LEVEL 3</th><th>LEVEL 4</th><th>LEVEL 5</th><th>LEVEL 6</th></tr>
<tr><td rowspan="2">The Humanities</td><td>Humanities knowledge and understanding</td><td colspan="4" rowspan="2">Learning focus statement only</td><td></td><td colspan="3" rowspan="2">Not applicable</td></tr>
<tr><td>Humanities skills</td><td></td></tr>
<tr><td rowspan="2">The Humanities – Economics</td><td>Economic knowledge and understanding</td><td colspan="5" rowspan="6">Not applicable</td><td></td><td></td><td></td></tr>
<tr><td>Economic reasoning and interpretation</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">The Humanities – Geography</td><td>Geographical knowledge and understanding</td><td></td><td></td><td></td></tr>
<tr><td>Geospatial skills</td><td></td><td></td><td></td></tr>
<tr><td rowspan="2">The Humanities – History</td><td>Historical knowledge and understanding</td><td></td><td></td><td></td></tr>
<tr><td>Historical reasoning and interpretation</td><td></td><td></td><td></td></tr>
</table>

Shaded boxes represent levels in each domain that have formal standards against which student achievement will be assessed and reported.

A glossary is included which provides definitions of underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. Standards that focus on historical and geographical knowledge and understanding are introduced at Level 3.

Specific standards for Economics, Geography and History are introduced at Level 4.

## Dimensions

Standards in the Humanities are organised in two dimensions:

- Humanities knowledge and understanding
- Humanities skills.

### Humanities knowledge and understanding

The *Humanities knowledge and understanding* dimension focuses on key humanities knowledge and concepts. Students learn about their immediate and local community and environment and are introduced to the history and geography of their country and the diversity of culture and environment. Through structured activities they learn the concepts of time – chronology and sequencing, change and continuity – and spatial concepts of location, distance, scale and distribution.

### Humanities skills

The *Humanities skills* dimension focuses on the development of basic inquiry skills including observation, the collection of various types of evidence, asking and answering questions about evidence and presenting information in a variety of ways.

# National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.



Definitions of underlined terms are provided in the Glossary (page 121)

# The Humanities – Economics

## Introduction

Economics is the study of how different societies allocate scarce resources to satisfy the wants and needs of its members. As with any social science, economics is concerned with human social behaviour: the behaviour of individuals and the interaction among them. Economics is also concerned with how to best manage resource scarcity and addresses the requirements for human survival and economic sustainability.

Economic decisions taken by individuals, groups, businesses and governments have implications for the welfare of individuals, families, communities, countries, regions and geopolitical unions of nations. All people are touched by economic decisions on multiple occasions every day. Economics plays a critical and, often, contested role in local, state, national and international public policy. Life globally is dominated by economic transactions and it is the quality of economic decision-making at all levels of society that significantly determines the wellbeing of individuals and nations.

The study of Economics assists students to better understand how wealth is generated and distributed, and to understand:

- microeconomic concepts that explain how businesses and markets operate
- macroeconomic concepts that help to explain how a nation's economy works.

It enables students to understand the importance of entrepreneurship and enterprise in generating a healthy economy.

Economics provides students with the knowledge and skills to engage with economic matters and to consider the effects of alternative economic decisions on themselves and others. They are then in a better position to:

- act rationally and ethically when making economic and personal financial decisions
- appreciate the complexity of economic decision making
- understand the economic decisions made by others.

Not only can they manage their personal affairs better, they can be more effective and productive members of society as they are capable of making reasonable judgments on public policy issues that have a bearing on their personal prospects and those of the nation.

LEVEL 6

Definitions of underlined terms are provided in the Glossary (page 121)

# Structure of the domain

The Economics domain is organised into three sections, one for each level of achievement from Level 4 to 6. Each level includes a learning focus statement and a set of standards organised by dimension. A glossary is included which provides definitions of underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each of Level 4, 5 and 6. At Levels 1 to 3, basic concepts related to history, geography and economics are included under a general umbrella of 'The Humanities'. Learning focus statements outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In the Humanities, standards for assessing and reporting on student achievement are introduced at Level 3. These focus on historical and geographical knowledge and understanding. Specific standards for Economics apply from Level 4.

## Dimensions

Standards in the Economics domain are organised in two dimensions:

- Economic knowledge and understanding
- Economic reasoning and interpretation.

### Economic knowledge and understanding

The *Economic knowledge and understanding* dimension focuses on economic concepts, principles, methods and models. Students learn how their needs and wants are met and understand their roles as producers, workers and consumers and recognise the impact of market forces. They learn that economic decisions are about the allocation of resources in producing goods and services and about the distribution of the proceeds of production and that these decisions have local, national and global consequences. They explore the importance and the role of enterprise and entrepreneurship in the production process and in the construction, development and prosperity of an economic system.

Students learn how to manage their personal finances and how to be informed consumers. They explore the world of work in order to develop the ability to make informed decisions about their future education and training needs, and employment.

Students investigate factors affecting the Australian and international economies and the role of government in establishing conditions for economic activity and they develop the ability to use economic knowledge and understanding to evaluate economic decisions and policies.

### Economic reasoning and interpretation

The *Economic reasoning and interpretation* dimension covers the nature of economic thinking. Students learn to use and practise rational, objective decision making by applying economic reasoning, including the fundamental economic concepts of opportunity cost and cost-benefit analysis, to solve problems which assist them in understanding the economy, society and environment. They develop an ability to identify, collect and process data from a range of sources, including electronic media, and to interpret tables, charts and graphs displaying economic data. They learn to clarify and justify personal values and attitudes about issues affecting the economy, society and environment. They develop an understanding of the strengths and limitations of economic reasoning and its relationship to other sources of decision making.

## National Statements of Learning

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Definitions of underlined terms are provided in the Glossary (page 121)

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Economics, they develop their understanding of how the Australian economy is managed, particularly within the international economic context. They analyse how macroeconomic and microeconomic policies and programs advanced by governments and other institutions affect them and their fellow citizens. They examine the role of exchange, trade and globalisation in influencing Australia's standard of living. They develop an understanding of enterprise attributes and skills, and describe the impact of innovation and enterprise on the economy and society.

Students investigate the relationship between economic growth, ecological sustainability and the standard of living, and explore what it means to be an ethical producer and consumer. They begin to reflect on the role of values in the economic decision making of producers, consumers and governments.

They develop skills in using economic reasoning, including cost-benefit analysis, to research economic issues and propose solutions for economic problems of global significance. They research economic problems and argue the validity or otherwise of their own hypotheses. Economic problems could include examples such as why the price of a can of soft drink varies depending on where it is sold; whether welfare is a right or a privilege; and whether tolls should be charged on new freeways. Such research assists students in understanding, clarifying and justifying values and attitudes about issues affecting the economy, society and the environment.

Students extend their personal financial literacy skills and understanding about the role of savings and investment. They examine vocational pathways and education and training requirements, considering possible work and career options. They develop skills and strategies for transition to employment and further education and training, including job seeking, job application and interview skills.

## Standards

### Economic knowledge and understanding

At Level 6, students describe how markets, government policies, enterprise and innovation affect the economy, society and environment in terms of employment, economic growth, the use of resources, exports and imports, and ecological sustainability.

They analyse how goods and services are produced and how markets work. They predict how prices will change when there is either a surplus or shortage, and explain how this might influence the behaviour of consumers

Definitions of underlined terms are provided in the Glossary (page 121)

and producers. They analyse the role and significance of exchange, trade and globalisation in influencing Australia's standard of living. They discuss and explain what it means to be an ethical consumer and producer and identify examples of ways values can affect the economic decision making of consumers, producers and governments.

Students analyse the role that governments and other institutions such as banks, the Australian Council of Trade Unions (ACTU) play in the economy, and evaluate their performance in achieving appropriate economic outcomes for individuals and for society. They explain the role and significance of savings and investment for individuals and for the economy, and demonstrate the skills required to successfully plan and manage personal finances.

Students predict the economic consequences of proposed government policies and make informed choices among alternative public policy proposals. Students explain the impact of macroeconomic and microeconomic policies on themselves and others, including businesses.

Students analyse vocational pathways and education and training requirements and identify possible career paths and opportunities. They demonstrate skills required for moving from school to employment or further education.

### Economic reasoning and interpretation

At Level 6, students use economic reasoning, including cost-benefit analysis, to research and propose solutions to economic issues and problems of global significance, and to clarify and justify values and attitudes. They plan and conduct investigations in order to research an economic problem and/or argue the validity or otherwise of their own hypotheses. They use relevant economic concepts and relationships to evaluate economic propositions, proposals and policies, and debate the costs and benefits of contentious economics-related issues of local, national or international concern.

Students interpret reports about current economic conditions, both national and global, and explain how these conditions can influence decisions made by consumers, producers and government policymakers. Students demonstrate an awareness of the impact of values and beliefs on economic issues, and how differences may be identified, negotiated, explained and possibly resolved.

# The Humanities – Geography

## Introduction

Geography is the study of physical and human environments from a spatial perspective. It provides students with the knowledge and skills to observe and describe places on the surface of the Earth and to analyse and provide explanations from a spatial perspective of human and physical phenomena and their complex interactions. Students' evolving understanding of their world provides a basis for evaluating strategies for the sustainable use and management of the world's resources.

Geographers use a number of spatial concepts (such as location, distribution, spatial interaction and scale) as tools to help them to investigate, interpret and explain patterns on the surface of the Earth and the processes that created them. These spatial concepts provide a unique conceptual structure and framework of ideas for a geographic investigation of phenomena and provide the key to determining measures of the spatial variation between places. The essence of the Geography domain is that it is an inquiry-based approach which focuses on questions of what, where, how, why, what impact, what ought.

The fundamental tool of geography is the map, and in a world where over 75 per cent of data is referenced spatially to a location, geographic understanding is a vital skill. The essential skills students develop in Geography are the ability to:

- identify and collect evidence from
  - primary sources through fieldwork
  - secondary sources, including maps at a variety of scales, photographs, satellite images, statistical data
  - information and communications technology based resources
- record, represent and interpret data in different types of maps, graphs, tables, sketches, diagrams and photographs.

## Structure of the domain

The Geography domain is organised into three sections, one for each level of achievement from Level 4 to 6. Each level includes a learning focus statement and a set of standards organised by dimension. A glossary is included which provides definitions of underlined terms (see page 121).

### Learning focus

Learning focus statements are written for each of Level 4, 5 and 6. At Levels 1 to 3, basic concepts related to history, geography and economics are included under the general umbrella of 'The Humanities'. Learning focus statements



Definitions of underlined terms are provided in the Glossary (page 121)

outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In the Humanities, standards for assessing and reporting on student achievement are introduced at Level 3. These focus on historical and geographical knowledge and understanding. Specific standards for Geography apply from Level 4.

## Dimensions

Standards in the Geography domain are organised in two dimensions:

- Geographical knowledge and understanding
- Geospatial skills.

### Geographical knowledge and understanding

The *Geographical knowledge and understanding* dimension covers the patterns and interactions of physical and human phenomena on the surface of the Earth and the processes that created them. It focuses on spatial concepts: location, distance, distribution, location, movement, region, scale, spatial change over time, spatial association, spatial interaction and scale. These concepts underpin the kinds of questions geographers ask and help students to organise the vast amount of information and ideas that geography uses to understand the regularities, intricacies and uncertainties of occurrences on the Earth's surface.

Students learn to ask a series of geographical questions and follow an inquiry-based approach incorporating identification, observation, description, analysis, explanation, synthesis and evaluation. This extends their understanding and provides students with a well-researched, informed spatial perspective to apply to local and global issues, including sustainable use and management of the world's resources.

### Geospatial skills

In the *Geospatial skills* dimension students read and interpret maps of different kinds and at different scales, including street directories, atlas maps, ordnance survey maps and topographic maps. Students identify and collect information from maps, plans, photographs, satellite images, statistical data, and information and communications technology based resources; and record and represent data in different types of maps, graphs, tables, sketches, diagrams and photographs. Students develop skills in gathering information first-hand from fieldwork studies. They make observations, take field measurements, conduct surveys and interviews, map and record phenomena in a range of settings.

## National Statements of Learning

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# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Geography, they develop knowledge about the operation of one of the major natural systems that are part of the biosphere and atmosphere; for example, the hydrologic cycle, plate tectonics or the weather. Students investigate the interaction of human activities with the natural environment through a study of issues such as global warming and climate change, land degradation and desertification, and air and water pollution. Students develop skills to evaluate the factors contributing to the development of these issues, identify strategies to address them and explore ways of managing them.

Students investigate the characteristics of development that occur across the globe. They use an inquiry-based approach to explore how combinations of various physical and human factors interact to produce observable and sometimes predictable patterns at local, regional and global scales. Students examine global patterns of development, considering classifications used by United Nation agencies, Non Government Organisations (NGOs) and other organisations, and evaluating the relevance of such classifications at global, national, regional and local scales.

Students research at least two development topics and the impact of globalisation in creating and reducing differences in development levels, for example, through technology transfers, resource use, and indebtedness. Examples of development topics include: poverty; the links between food, hunger and technology; and the social and economic consequences of development in creating rapidly growing cities, mega cities, informal settlements and rural depopulation.

Students investigate and learn to evaluate the impact and/or effectiveness of development-related projects, policies and strategies (such as large-scale water projects, tourism, the use of foreign aid, social reform and population control) on physical and human landscapes, locally, nationally and globally. They apply their knowledge and understanding to provide explanations and justify recommendations about local, national and global situations related to development, and their impact on living standards. They reflect on plans of action and past actions, considering the value positions underlying them, including a commitment to the principles of sustainability.

Students undertake field investigations in the local area to gather, collate, analyse and evaluate data relating to the natural environment. They collect evidence from the fieldwork site to explain and predict the effects of natural processes and human activities on the environment, including consideration of the ways people respond to change. Students develop a policy for the management of a local issue, including consideration of Aboriginal and Torres Strait Islander communities. Students apply geographical techniques, including representation of multi-variable data and complex mapping operations, to interpret environmental change and research, discriminate, evaluate and present arguments using electronic and other formats.

## Standards

### Geographic knowledge and understanding

At Level 6, students explain the operation of a major natural system and its interaction with human activities. They evaluate the consequences of the interaction and develop a policy to address an issue related to it. Students describe global patterns of development from a range of perspectives and identify and describe the factors that determine these patterns. They analyse development issues and formulate and evaluate comprehensive policies, including those for sustainable use and management of resources, to alter development patterns at a range of scales. They use evidence based on their inquiries and geographical language and concepts.

### Geospatial skills

At Level 6, students accurately interpret information on different types of maps and photographs at a range of scales, and use map evidence to support explanations, draw inferences and predict associated outcomes. They collect and collate information gathered from fieldwork observations and present their findings observing geographical presentation conventions.

# The Humanities – History

## Introduction

History is the study of the past from ancient civilisations to today's news. Learning in the History domain provides students with knowledge, skills and behaviours to understand themselves and their world, to apply their understanding in their present lives and consider futures they desire.

The past is a great narrative of people's lives, events both trivial and major, ideas and ways of thinking. The past gives students inspiration and alternatives for their own lives. It helps them understand how the world has changed in the past and how it might be changed again in the future. It assists students to distinguish between the ephemeral and what is of lasting worth.

The study of history encompasses the broad time sweep of human history from ancient and medieval times to today. It develops in students an understanding of cultures, ideas and values that are important to other societies as well as their own. It considers the way societies have changed and also the significant continuities which exist. Key concepts include time, continuity, change, motivation, cause and effect as well as concepts that relate to particular historical contexts.

Students learn that all history, including Australian history, reflects multiple influences and connections to an array of other countries, cultures and times. They learn about the key events in the history of the Australian nation and how it has evolved over time. Aboriginal and Torres Strait Islander (ATSI) history is an integral perspective within Australian history.

Students learn about the histories of the various people who live in Australia today, the diverse heritages, experiences, perspectives and aspirations. They learn that Australian identity is dynamic, has changed over time and is evolving still. This provides the basis for developing a sense of personal, cultural and national identity in a diverse multicultural nation and provides the understanding to develop perspectives on our nation, our region and our world.

Students explore the ATSI perspectives in Australian history and develop an understanding of traditional life encompassing social, political, economic and spiritual dimensions. They learn about the impact of, and response to, enforced change and the dynamism of current ATSI societies.

The study of history develops particular historical understanding – key concepts and skills that are fundamental to the everyday lives of students. These include skills in analysing and evaluating a range of primary and secondary sources such as artefacts, written documents, graphics, film, the Internet and media. Students learn that there are many perspectives on events and that explanations are often incomplete and contested. They develop

skills in research and critical inquiry: framing questions, organising inquiries, identifying the origins of sources, identifying values and beliefs underpinning them and using the language of history. They demonstrate their understanding in a variety of forms such as timelines, oral presentations, reports, essays, narratives, multimedia presentations and film.

# Structure of the domain

The History domain is organised into three sections, one for each level of achievement from Level 4 to 6. Each level includes a learning focus statement and a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each of Level 4, 5 and 6. At Levels 1 to 3, basic concepts related to history, geography and economics are included under the general umbrella of 'The Humanities'. Learning focus statements outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In the Humanities, standards for assessing and reporting on student achievement are introduced at Level 3. These focus on historical and geographical knowledge and understanding. Specific standards for History apply from Level 4.

## Dimensions

Standards in the History domain are organised in two dimensions:

- Historical knowledge and understanding
- Historical reasoning and interpretation.

### Historical knowledge and understanding

The *Historical knowledge and understanding* dimension focuses on particular concepts and contexts of history. Students learn the concept of time: chronology and sequencing; change and continuity; past, present and future in a range of historical contexts. Through studying the past they learn about change and its impact on people's lives and the significance of continuity – how aspects of past societies have been preserved. They learn about *cause and effect*, the relationship between events and people's actions and intentions. They learn about identity, personal, cultural, and national and the contributions of people past and present to that identity. They learn about evidence and the range of sources of information about the past.

Students gain a balanced coverage of historical content, including knowledge about Australian history, to provide a sense of chronology and to help them understand their present and shape their future.

### Historical reasoning and interpretation

The *Historical reasoning and interpretation* dimension focuses on the nature of historical thinking. Students learn to frame questions in the light of their own knowledge and experiences and to develop research and inquiry skills. These include gathering and documenting evidence from a variety of sources, including artefacts, documents and graphics, and interpreting evidence.

Students develop skills in making judgments about sources of evidence, including the ideas and voices expressed, the culture and values represented and the literal and symbolic meanings expressed. They learn that there are multiple, conflicting and often partial interpretations of events.

Students learn the language of history including using terms such as *primary* and *secondary* sources and terms relevant to particular periods of history such as *medieval* and *revolution*. They communicate their understanding of history using the conventions of a range of forms of representation such as timelines, media reports, multimedia presentations, oral presentations, posters, photographic and written essays.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

## Learning focus

As As students work towards the achievement of Level 6 standards in History, they investigate how Australia developed in terms of social, political and cultural structures and traditions. Students examine the impact of European colonisation of Australia, including the representation of that settlement as invasion. They learn about the struggles and successes of the Aboriginal and Torres Strait Islander communities to gain political and social rights, and their campaigns for land rights and self-determination. They learn about the impact of significant issues and events in Australia's development; for example, European settlement; the development of the colonies; self-government in the colonies; the gold rushes; the development of trade unions; the events leading to Federation; World War I; World War II; post-World War II immigration; the development of multiculturalism; and the Gulf Wars. They investigate the contribution of significant Australians such as Lachlan Macquarie, Peter Lalor, Edith Cowan, Sir Howard Florey, Edward (Weary) Dunlop, Captain Reg Saunders, Margaret Tucker and Charles Perkins.

Students analyse significant events and movements which have resulted in improvements in civil and political rights for groups of Australians such as the eight-hour day and the right to vote for women, and describe the contributions of key participants and leaders in these events.

Students also learn about key events, ideologies and social and cultural movements that have shaped the contemporary world. They consider the impact of war on people and countries in the twentieth and twenty-first centuries. They learn about the increasingly global interconnections in the twentieth century, international organisations such as the United Nations, and challenges to global security. Key events could include the Russian and Chinese revolutions; the world wars; the Cold War and Cold War conflicts such as the Korean and Vietnam wars; Middle East conflicts; the break up of the Union of Soviet Social Republics; the emergence of the United States as a dominant world power; and conflicts in the late twentieth and the twenty-first centuries. Ideologies could include communism, fascism, capitalism and democracy. Social and cultural movements could include civil rights, feminism, environmentalism and the development of the film and music industries. Key leaders could include Lenin, Hitler, Churchill, Mahatma Gandhi, F D Roosevelt, Mao Tse Tung, Martin Luther King, Nelson Mandela and Aung San Suu Kyi.

Students investigate the impact of changes in technology, medicine and communication on their lives, and make links in their study of history to contemporary issues and the world today.

In their study of history, students become aware of the importance of historiography and that there are competing interpretations and contested

narratives in history. They recognise the significance of different events within an historical context and learn how evidence and values produce different interpretations of events, people and institutions. They discover that history is not only a narrative but also a means of participating in the broader society. They use historical language and demonstrate understanding of the broad concepts of causation, motivation, continuity and change. They represent the past in a variety of forms.

Students frame research questions and locate relevant resources, including contemporary media and online resources. They continue to expand the range of primary and secondary sources they consult, and evaluate them in terms of origin, context, information, reliability, completeness, objectivity and bias. They use historical conventions to document sources including quotes, bibliographies and footnotes. They present their understanding in a variety of oral, written and electronic forms.

### Statements of Learning

This Learning focus statement incorporates aspects of the National Statements of Learning for Civics and Citizenship, Year 9.

## Standards

### Historical knowledge and understanding

At Level 6, students analyse events which contributed to Australia's social, political and cultural development. These events could include: European colonisation, the growth of the colonies, self-government, the gold rushes, the development of trade unions, the events leading to Federation, Federation, World War I, World War II, immigration, and the Gulf Wars. Students evaluate the contribution of significant Australians to Australia's development.

Students evaluate the impact of colonisation on Aboriginal and Torres Strait Islander communities and the fight for civil and political rights and land rights. They analyse significant events and movements which have resulted in improvements in civil and political rights for other groups of Australians such as the eight-hour day and the right to vote for women, and evaluate the contributions of key participants and leaders in these events. They compare different perspectives about a significant event and make links between historical and contemporary issues.

Students analyse the impact of some key wars and conflicts in the twentieth and twenty-first centuries. These could include the world wars, revolutions, the Cold War and post Cold War conflicts. They explain aspects of increasing global interconnections in the twentieth and twenty-first centuries. They demonstrate understanding of key ideologies and explain their influence on people's lives, national events and international relations. They explain why significant social and cultural movements have developed and evaluate their influence on societies. They analyse changes in technology, medicine and communication.

### Historical reasoning and interpretation

At Level 6, students frame research questions and locate relevant resources, including contemporary media and online resources. They identify, comprehend and evaluate a range of primary and secondary sources, including visual sources and use historical conventions such as footnotes and bibliographies to document sources. They critically evaluate sources of evidence for context, information, reliability, completeness, objectivity and bias. They recognise that in history there are multiple perspectives and partial explanations. They use appropriate historical language and concepts in historical explanations. They use evidence to support arguments and select and use appropriate written and oral forms to communicate develop historical explanations in a variety of oral, written and electronic forms.

# Languages Other Than English

## Introduction

Languages Other Than English (LOTE) contribute materially to the universal purposes of schooling and to the development of skills in thinking and reflection. They support the moral, social and economic initiation of young people into the culture and wider civilisation that surrounds them. Learning a language nurtures reflective, deep and creative thinking in specific ways, cultivates culturally distinctive fields of knowledge, and stimulates awareness of intellectual functioning. In unique ways, languages require learners to engage in self-reflection because effective communication in a new language requires the learner to move outside the norms, practices and acquired behaviours of their first language.

Languages infuse the entire curriculum with both taught and incidental insights into how knowledge is organised by different sociocultural communities, and introduce awareness of important distinctions in meaning, sound, and sound patterns, social arrangements, order and sequencing of information, categories and relations. These skills can directly enhance the general intellectual development of young people.

In learning a language, students develop communication skills and knowledge and come to understand social, historical, familial relationships and other aspects of the specific language and culture of the speakers of the language they are studying. Learners are also provided with the tools, through comparison and reflection, to understand language, culture and humanity in a broad sense. In this way, language learning contributes to the development of interculturally aware citizens, of increasing importance at a time of rapid and deep globalisation.

## Structure of the domain

The LOTE domain is organised into two pathways, the first consisting of six levels and the second of two levels. Each level includes a learning focus statement and a set of standards organised by dimension from Level 4 in Pathway 1 and Level 5 in Pathway 2.

### Pathways

As students may begin their LOTE studies at different stages, learning focus statements and standards are offered for two pathways which recognise the student's point of entry into the study:

**Pathway 1**: for students who begin learning a language in primary school and continue to study the same language to Year 10

**Pathway 2**: for students who begin learning a language in Year 7.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension.

In LOTE standards are introduced for assessment and reporting at Level 4. While it is clear that students gain most benefit from the study of another language when they begin this study in the early years, it is acknowledged that some schools choose to maximise the effect of their resources by introducing LOTE programs at different year levels with appropriate time allocations. In recognition of the cumulative nature of language learning, the LOTE domain includes progression measures (see Level 4 booklet) which provide a typical sequence of second language development leading to Level 4. Regardless of the level at which the study of a language other than English is introduced, students will need to develop the knowledge and skills described in the progression measures before they attempt the learning associated with the Level 4 standards. These progression measures also assist schools that provide LOTE programs prior to Years 5 and 6 to assess and report effectively on student achievement.

Standards relevant to each of the six language categories appear beside an icon (see language categories, page 66) from Level 4 onwards.

## Dimensions

This domain has two dimensions:

- Communicating in a language other than English
- Intercultural knowledge and language awareness.

The two dimensions of the LOTE domain are intimately linked. *Communicating in a language other than English* allows learners to reflect on language as a system and gain cultural insight. In turn, *Intercultural knowledge and language awareness* can provide cultural guidelines for effective communication.

### Communicating in a language other than English

In the *Communicating in a language other than English* dimension, students learn the knowledge, skills and behaviours relevant to the specific language being studied. The skills of this dimension include listening, speaking, reading, viewing, writing, and the use of body language, visual cues and signs. The application of these skills requires knowledge of linguistic elements, including vocabulary and grammar. This dimension requires familiarity with a wide variety of texts and genres in print and electronic form.

### Intercultural knowledge and language awareness

Communication skills in a language other than English foster intercultural knowledge and awareness of language as a system. The *Intercultural knowledge and language awareness* dimension develops students' knowledge of the connections between language and culture, and how culture is embedded throughout the communication system. Progress through this dimension is demonstrated through performance in the language being studied. The understandings are universal and are gained by comparing languages, including English.

Students gain an awareness of the influence of culture in the learner's own life and first language. Different languages and language communities organise social relations and information in different ways and values differ from one community to another. Through cultural self-awareness, the ability to rationally discuss and compare cultural differences is developed. This dimension involves developing curiosity about and openness to a variety of values and practices, as well as acquiring in-depth knowledge of the diverse cultural traditions of the source societies.

## Language categories

For the purposes of organising the learning demands on students, languages can be broadly grouped into six categories. Standards in the *Communicating in a language other than English* dimension include an initial section common to the Roman alphabetical, Non-Roman alphabetical, Character and Sign language categories and additional standards specific to each of these language categories. For Classical languages the complete standard is provided in the language category discription. The standards, learning focus statements and protocols for teaching Aboriginal Languages appear in a separate booklet available for download from the VELS website (http://vels.vcaa.vic.edu.au/aboriginal).

***A*** **Roman alphabetical languages** – languages whose writing system, or means of being visually recorded, is Roman alphabetic, and whose reading demands on learners are similar to those of English (examples include: French, German, Indonesian, Italian, Spanish, Vietnamese).

**Ω** **Non-Roman alphabetical languages** – languages whose writing system is alphabetic but non-Roman, and for which a learner needs to acquire a new alphabet (examples include: Arabic, Greek, Hebrew and Russian).

字 **Character languages** – languages whose writing system is either syllabic, ideographic, or a combination of syllables and ideograms, involving different reading processes from alphabet reading, and the learning of the new script (examples include: Chinese, Japanese).

 **Sign language** – Australian Sign Language, or Auslan. For most learners this will also involve reading in English.

**Classical languages** – ancient languages not used as a means of everyday communication by a contemporary community. Consisting of Roman alphabetical languages (for example, Latin) and non-Roman alphabetical languages (for example, Classical Greek). Standards in this category apply only in Pathway 2 Levels 5 and 6.

**Aboriginal languages** – Victorian Aboriginal Languages which involve the process of reclamation and the study of culture. Schools should follow the processes outlines in the *Aboriginal Languages, cultures and reclamation in Victorian schools: standards P–10 and protocols* booklet prior to incorporating this language category in their teaching programs. The booklet can be downloaded from the VELS website (http://vels.vcaa.vic.edu.au/aboriginal).

## Transition

Studies of LOTE are offered in a range of ways in schools. While studying one language other than English from Prep to the Victorian Certificate of Education (VCE) is ideal, some students change languages in the transition from primary to secondary schooling.

The development of the knowledge and skills acquired in the *Intercultural knowledge and language awareness* dimension is cumulative and continuity is maintained despite any change in the language studied. However, the *Communicating in a language other than English* dimension relates directly to knowledge and skills in a specific language.

## Background speakers

Many students bring an in-depth knowledge of another language to the classroom. Some of these students will have a language other than English as their first language and others may have lived in a country where the language is spoken. These students may progress more rapidly through some aspects of the standards in one or both dimensions.

# Languages Other Than English – Pathway 1

## Introduction

The language curriculum is organised through themes and topics which are arranged to provide progressive and cumulative opportunities for students to develop language and cultural understandings. Themes and topics form the main organising principle for language study. The sequencing of activities and language content allows learners to build new skills, knowledge and attitudes on the levels they have already attained. This cumulative process supplies continuity and sequence to the learner and coherence for the teacher.

Four principles should guide the selection of topics:

1. Topics that are culturally, socially or linguistically distinctive to the particular language concerned. This will vary for different languages.
2. Topics that extend or reinforce or complement topics already covered and that permit an extension of the language expectations.
3. Topics that are relevant and of interest to the students.
4. Topics that integrate with themes, topics, or key areas being addressed in other domains.

All topic selection should be governed by its potential to contribute to systematic acquisition of the language and cultural understandings in one or both of the dimensions.

Opportunities must be provided for students to demonstrate not only their communicative competence, but also their intercultural understandings and language awareness, through practical applications of the language.

Within each theme and topic, time is devoted to the acquisition of new language, structures, communication conventions, ways of thinking about the topic/s and their expression, as well as comparisons between languages and cultures.

### Years Prep to 4

Students study language through themes and topics that introduce the key idea of the language domain: that many societies and many people within Australia normally use languages other than English for communication.

The dimensions are integrated to provide opportunities for students to exchange information and ideas based on the theme and topic, and the individual student's language competence at this level.

Activities that are appropriate at these levels may vary. The particular writing system used in the language being studied will affect the emphasis of the activities.

## Years 5 to 8

Students build language cumulatively by expanding language and cultural understandings they already have. The awareness that languages other than English are the normal means of communication for many societies and people is reinforced.

Themes and topics are selected and sequenced to allow learners to build new skills, knowledge and attitudes and are culturally, socially and linguistically appropriate for the particular language being taught. The topics contribute to systematic acquisition of the language and cultural understandings in both dimensions in an integrated way. Topics should be of interest to students at these levels and most topics should be familiar to them. They may be productively integrated with themes, topics, or key areas being addressed in other areas of the curriculum.

Teaching activities are diverse and aim to consolidate language and cultural understandings, and use a diverse range of materials and genres, texts and media in defined contexts.

Some students change languages in the transition between primary and secondary schooling. For information about the stages of learning for students in this situation, please refer to the information for Pathway 2 (see page 31).

## Years 9 to 10

Students participate in communication forums as competent members of the target-language-speaking community.

Themes and topics are selected because of their potential to contribute to systematic acquisition of the language and cultural understandings in both dimensions. Most topics will be familiar to students, should relate to their interests, and provide opportunities for deep investigation of issues, drawing on skills and knowledge acquired in other areas of the curriculum.

Students are encouraged to research and create their own contexts for demonstrating their language and cultural understandings. They use a range of learning tools, including multimedia tools, to encounter a wide range of language and cultural forms and practices. Both directed and independent learning is focused on acquisition of new language, structures, communication conventions, ways of thinking about the topic/s and their expression, as well as comparisons between languages and societies.

Teaching activities are diverse and consolidate language and cultural understandings, encourage risk-taking, and use many materials and genres, texts and media.

# Pathway 1 Level 6

## Learning focus

As students work towards the achievement of standards in LOTE at Pathway 1 Level 6, they compare and contrast aspects of life in the LOTE-speaking country with those in multicultural Australia and other countries, and the impact of some of these aspects on the way people behave and use language.

They explore the extent and limitations of the language that they have learnt. They develop strategies for maximising and extending the skills and knowledge and cultural understanding they have acquired. They understand that language is a complex system with rules, and differences from English. They realise that words and concepts may not have a direct equivalent in another language.

Students extend their interactions to exchange information and opinions on topics such as leisure, relationships, study, careers and the media, and issues of concern to young people such as environmental issues, the impact of technology, and globalisation. They employ strategies for broadening their language awareness, and repertoire of script, structures and vocabulary, from reading materials. They draw on knowledge and skills from other domains to inform ways of applying language in new contexts.

They practise using language in an increasing range of contexts; for example, in the community, and begin to manipulate language to express their own personal meanings. They understand a range of spoken and written conventions in the language, and they initiate and participate in class and chat room discussion, conduct research using print and electronic resources, and reorganise information to produce effective extended spoken and written discourses in a range of forms.

Students become increasingly aware of the distinctive cultural, social and linguistic nature of the study of a language and acknowledge the need to extend and reinforce their own learning in a sequential and systematic way. They contribute to decisions about the context for learning and the sequencing of topics according to their interests and needs, including future studies and career goals.

Activities include a wide range of listening, speaking, reading and writing tasks as well as tasks that integrate these macro skills with intercultural understandings and language awareness.

Students communicate, referring to implicit and some explicit language modelling and in response to prompting. They learn to manage open-ended communications with effective approximations of accurate language for the context. They use a range of strategies for varying and extending language

applications, expressing opinion and organising information with careful consideration of audience, purpose and appropriate language for each communication task.

## Standards

### Communicating in a language other than English

At Pathway 1 Level 6, students identify relevant information and ideas from spoken texts. They spontaneously participate in interactions related to a specific topic, and employ insights from previous language learning in oral interactions.

Students effectively discriminate and use pronunciation, tone, intonation and metre. They initiate and maintain interactions to give and receive information and impressions.

Students reproduce the main features of grammar in the language, and identify differences between English and other languages. They identify ways in which intentions and ideas are expressed differently in different languages. They communicate information in translation and interpretation activities, demonstrating careful consideration of the needs of the listener or reader, and sensitivity to cultural similarity and differences in meaning and intent.

Students deduce relationships, mood, attitudes and social context from visual stimuli. They identify characteristics in the individual style of writers of the language in relation to the audiences and purposes for a particular text.

Students read texts and effectively extract main ideas and detailed information for use in new contexts.

*A* Students read selected texts with fluency. They read for meaning and to communicate information. They express themselves through extended writing in the language in print and electronic form. They recognise and use the conventions of a range of text types.

Ω Students read selected passages with fluency. They read for meaning and to communicate information. They apply their knowledge of accents and punctuation in both reading and writing. They express themselves in extended passages and linked paragraphs in print and electronic form.

字 Students read modified texts with fluency. They read for meaning and understand ways of using ideographic cues to extend understanding. They apply knowledge of characters and punctuation in new contexts and extend their range of familiar characters. They use a range of techniques for remembering and acquiring new character knowledge. They write linked paragraphs and some extended passages in print and electronic form. They use strategies for checking and self-correcting their character

use, including using information and communications technology applications.

Students identify opinions, events, roles and themes in descriptive and informative signed texts, and present them in another format in order to provide personal reflection, a solution or a comparison. They synthesise and present information on topics of social and cultural importance in narratives, discussions and conversations in order to persuade an audience of a point of view. They use information and communications technology applications for research and recording and communicating in signed language.

### Intercultural knowledge and language awareness

*Students demonstrate skills and knowledge in this dimension by the choices they make in formulating their response to, or use of, the language.*

At Pathway 1 Level 6, students demonstrate an awareness of the extent and limitations of the language through creation of realistic applications of knowledge and skills in a range of situations. They demonstrate knowledge of the effect of word order and context on meaning.

Through accurate and context-sensitive language use, students demonstrate understanding of cultural influences on the ways people behave and use language. They use illustrative examples in the language to explain the differences and similarities between languages.

They demonstrate understanding of language as a complex system through strategies such as reflection, drafting, questioning linguistic relationships, observing and hypothesising. They test the validity of their understanding by referring to other speakers of the language, research and/or observation.

Students contribute to discussions about the general concept of culture, and the relationships between cultures, including the effects of migration and travel, by presenting illustrative examples. They identify general cultural patterns that flow across specific settings and times. They recognise nuances in meaning and demonstrate an awareness of the dynamic nature of language through the language and mannerisms they use in interactions in a range of cultural settings. They demonstrate an understanding of variations in cultural perspectives between speakers of the language in different settings, by effectively interacting with members of the language community in Australia.

In the language, students describe some of their present personal values and opinions, and compare them with previously held views.

The learning focus statements and standards for the language category *Aboriginal Languages* are different to those written for the other five language categories. These are contained in the *Aboriginal Languages, cultures and reclamation in Victorian schools: standards P–10 and protocols* booklet available from the VELS website (http://vels.vcaa.vic.edu.au/aboriginal).

# Languages Other Than English – Pathway 2

## Introduction

Some students change languages in the transition between primary and secondary schooling. Pathway 2 describes programs designed for these students. Regardless of the language to be studied, the Pathway 1 Level 4 standard in the *Intercultural knowledge and language awareness* dimension is assumed as students commence the learning associated with Pathway 2 Level 5. Standards in the Classical languages category commence in Pathway 2.

The language curriculum is organised through themes and topics which are arranged to provide progressive and cumulative opportunities for students to develop language and cultural understandings. Themes and topics form the main organising principle for languages. The sequencing of activities and language content allows learners to build new skills, knowledge and attitudes on the levels they have already attained. This cumulative process supplies continuity and sequence to the learner and coherence for the teacher.

Four principles should guide the selection of topics:

1. Topics that are culturally, socially or linguistically distinctive to the particular language concerned. This will vary for different languages.
2. Topics which extend, reinforce or complement topics already covered and that permit an extension of the language expectations.
3. Topics that are relevant and of interest to the students.
4. Topics that integrate with themes, topics, or key areas being addressed in other domains.

All topic selection should be governed by its potential to contribute to systematic acquisition of the language and cultural understandings in one or both of the dimensions.

Opportunities must be provided for students to demonstrate not only their communicative competence, but also their intercultural understandings and language awareness through practical applications of the language.

Within each topic, time is devoted to the acquisition of new language, structures, communication conventions, ways of thinking about the topic/s and its expression, as well as comparisons between languages and cultures.

While students will develop at different rates, generally students will aim to achieve Pathway 2 Level 5 standards by the end of Year 8 and Pathway 2 Level 6 standards by the end of Year 10.

## Years 7 to 8

As students commence Year 7, they are expected to have studied another language other than English to Level 4 standard in both dimensions. Further development in the *Intercultural knowledge and language awareness* dimension is based on student familiarity with at least two languages, one of which is likely to be English, to the standard required by the Languages Other Than English domain at the end of primary schooling.

Students study language through themes and topics that introduce the key idea of the language domain: that many societies and many people within Australia normally use languages other than English for communication.

Language learning is organised around topics which provide opportunities for students to develop language and cultural understandings progressively. The topic/s are selected because of their importance in the systematic acquisition of the language and cultural understandings related to the specific target language, and may also relate to, or complement, aspects of study in other domains.

The dimensions are integrated and provide opportunities for students to exchange information and ideas based on the theme and topic and the individual student's language competence at this level.

Within each topic and between topics, time is dedicated to the acquisition of new language, structures, communication conventions, ways of thinking about the topic/s and its expression, cultural knowledge and language awareness.

A wide range of activities are included in the learning program to encourage risk-taking and consolidation of language and cultural understandings.

Activities that are appropriate at these levels may vary, depending on the writing system used in the language being studied.

# Pathway 2 Level 6

## Learning focus

As students work towards the achievement of standards in LOTE at Pathway 2 Level 6, they compare and contrast aspects of life in the LOTE-speaking countries with those in Australia and other countries, and identify similarities and differences.

Students learn to recognise the extent and limitations of their language proficiency and develop strategies for maximising and extending their language skills, knowledge and cultural understanding. They understand that language is a complex system with rules, and that there are subtle differences between languages. They appreciate that direct transposition from English cannot occur. They reflect on their own learning styles and strategies.

Students interact to exchange information and opinions on topics related to the world of adolescence including leisure, relationships, study, careers and the media, and issues of general interest to young people. They draw on knowledge and skills from other areas of the curriculum to inform their application of the language in new contexts. They communicate their own personal meanings through the language. They adapt their language to the task and reduce abstract ideas to the personal and concrete.

By initiating and participating in class and chat room discussion and writing tasks, students expand their knowledge of spoken and written conventions. They conduct research and reorganise information to present to others in a range of spoken and written forms.

Students understand the cumulative nature of language learning, and contribute to decisions about the sequencing of topics according to their interests and needs. They are aware of the distinctive cultural, social and linguistic nature of the study of a language. They acknowledge the need to extend and reinforce their own learning in a sequential and systematic way. They contribute to decisions about the context for learning and the sequencing of topics according to their interests and needs, including future studies and career goals.

Students consider the audience, purpose and appropriate language for a range of listening, speaking, reading and writing tasks, thereby gaining language awareness and intercultural understanding. They use a range of communicative tools and information and communicatons technology applications in their own research and development of original language.

Students communicate, referring to implicit and some explicit language modelling and in response to prompting. They extend their knowledge of language and cultural understanding and use this knowledge for self expression in oral and written communication. They experiment with language

and approximate accurate applications in new contexts and in open-ended situations. They use a variety of strategies for varying and extending language applications, expressing opinion and organising information.

## Standards

### Communicating in a language other than English

At Pathway 2 Level 6, students recall most of the main ideas, objects and details presented in a topic. They reproduce the main features of grammar in the language and identify differences with English and other languages. They identify ways in which intentions and ideas are expressed in different languages.

Students identify relevant information and ideas from spoken texts. They discriminate and use appropriate pronunciation, tone, intonation and metre. Students use a range of strategies to assist in listening comprehension. They participate in interactions related to a specific topic and recycle language to express information and impressions effectively in oral interactions.

Students demonstrate awareness of the language requirements of a range of situations associated with the topics being studied, and adapt language and gesture appropriately for the role, audience and purpose of the interaction. Students communicate information in translation and interpretation activities, demonstrating careful consideration of the needs of the listener or reader, and sensitivity to cultural aspects (similarity and differences in meaning and intent).

Students read texts and identify and extract main ideas and detailed information for use in new contexts. For a particular text, they identify characteristics of the writing style in relation to the audience/s and purpose/s.

Students create simple original text for specific audiences and purposes. They use appropriate script and accurate language related to the topic. They create draft materials in writing and locate information in the language from a variety of sources.

#### *A* Roman alphabetical languages

- Students read selected texts with fluency, both silently and aloud. They write and edit in the language in print and electronic form. They identify and use appropriate accent markers and punctuation. They write in linked paragraphs and produce extended text.

#### Ω Non-Roman alphabetical languages

- Students read short passages for meaning, silently and aloud. They read short selected passages with fluency. They apply their knowledge of a range of accent markers and punctuation in both reading and writing. They express themselves in extended passages and linked paragraphs related to specific text types in print and electronic form.

### 字 Character languages

- Students read short, modified texts related to a topic, silently and aloud, with fluency. They apply knowledge of characters and punctuation in new contexts, and extend their range of familiar characters. They use a range of techniques for remembering and acquiring new character knowledge. They write linked paragraphs and short passages in specific contexts. They use strategies for checking and self-correcting their character use, including using information and communications technology applications. They employ strategies for broadening their language awareness and repertoire of script, structures and vocabulary from reading materials. They read for meaning and show an understanding of ways of using ideographic cues to extend understanding.

###  Sign language

- Students identify ideas, opinions and themes in signed texts from other domains by outlining, summarising and classifying the information presented. They engage in conversation and/or negotiation in order to make choices, resolve a problem, plan an event, or make arrangements with others. They use information and communications technology applications for recording and communicating in signed language.

###  Classical languages

For Classical languages, the complete standard is provided below:

- Students read and interpret modified texts for meaning and identify complex linguistic structures, language use, content and context. They analyse modified and unseen texts, identifying and extracting main ideas and detailed linguistic information (using resources including information and communications technology). For a particular text, they identify characteristics of the writing style in relation to audience and purpose.

- Students manipulate modelled language at the level of complex sentences. They demonstrate an understanding of grammar through analysis of syntax and manipulation of morphology. They demonstrate an understanding of the use of mood in both main and subordinate clauses. They identify particular case-dependent structures such as the ablative and absolute in Latin and the genitive absolute in Classical Greek.

### Intercultural knowledge and language awareness

*Students demonstrate skills and knowledge in this dimension by the choices they make in formulating their response to, or use of, the language.*

At Pathway 2 Level 6, students generate their own applications for their language knowledge and skills in a range of realistic situations. They demonstrate understanding of cultural influences on the ways people behave and use language, through approximating accurate and context-sensitive

language use. They use illustrative examples in the language to explain the differences and similarities between languages.

Through reflection, drafting, questioning linguistic relationships, observations and hypothesising, students demonstrate an understanding that language is a complex system. They test the validity of their understanding by referring to other speakers of the language, by research and by observation.

Students contribute to discussions about the general concept of culture, and the relation of cultures to each other, including the effects of migration and travel, by presenting illustrative examples in the language. They identify general cultural patterns that flow across specific settings and times. They identify nuances in meaning, and demonstrate awareness of the dynamic nature of language through the language and mannerisms they use in interactions in a range of cultural settings.

In the language, students describe some of their present personal values and opinions, and compare them with previously held views.

Students of a Classical language describe and analyse aspects of social and political structures in ancient society and the development of these structures from a contemporary perspective. They identify issues of genre and purpose in writing by explaining, comparing and commenting on aspects of the historical and cultural background.

The learning focus statements and standards for the language category *Aboriginal Languages* are different to those written for the other five language categories. These are contained in the *Aboriginal Languages, cultures and reclamation in Victorian schools: standards P–10 and protocols* booklet available from the VELS website (http://vels.vcaa.vic.edu.au/aboriginal).

# Mathematics

## Introduction

Mathematics is a human endeavour that has developed by practice and theory from the dawn of civilisation to the present day. Many societies and cultures have contributed to the growth of mathematics, often in times of scientific, technological, artistic and philosophical change and development. Complementary to this broad perspective of mathematics are the various mathematical practices that take place day to day in communities around the world.

While the usefulness of mathematics for modelling and problem solving is well known, mathematics also has a fundamental role in enabling cultural, social and technological advances, and empowering individuals as critical citizens in contemporary society and for the future. Number, space and measurement, and chance and data are common aspects of most people's mathematical experience in everyday personal, study and work situations. Equally important are the essential roles that mathematical structure and working mathematically play in people's understanding of the natural and human worlds.

Mathematics can be described in terms of its objects, what they are and how they came to be; its established body of knowledge and why this is held to be true; its effective application in science, technology and other domains; and the practice and activities of mathematicians past and present. Aims for essential learning in school mathematics are for students to:

- demonstrate useful mathematical and numeracy skills for successful general employment and functioning in society
- solve practical problems with mathematics, especially industry and work-based problems
- develop specialist knowledge in mathematics that provides for further study in the discipline
- see mathematical connections and be able to apply mathematical concepts, skills and processes in posing and solving mathematical problems
- be confident in one's personal knowledge of mathematics, to feel able both to apply it, and to acquire new knowledge and skills when needed
- be empowered through knowledge of mathematics as a numerate citizen, able to apply this knowledge critically in societal and political contexts
- develop understanding of the role of mathematics in life, society and work; the role of mathematics in history; and mathematics as a discipline – its big ideas, history, aesthetics and philosophy.



 

Mathematical knowledge includes knowledge of concepts, objects, definitions and structures. A small collection of mathematical ideas, objects, structures, and relationships between these, is taken as undefined and given in a context. New mathematical objects, structures and relationships are developed from these moving from simple to more complex and sophisticated ideas and practices. The motivation for accepting certain things as given building blocks for mathematical knowledge may be initially related to intuitive understanding of particular ideas and objects experienced with respect to the natural or human worlds. These and their subsequent developments are not empirical knowledge, but abstract mathematical entities.

Whether mathematical knowledge is viewed as being essentially mind dependent or mind independent, discovered or constructed, its abstract nature gives rise to the applicability of mathematics in a wide range of contexts, as mathematical objects, structures and relationships do not depend on a particular context for their existence, but are interpreted to model key features of these contexts. This abstraction poses a challenge to the teacher and student alike, and both will need to draw on knowledge of the world and link this to mathematical knowledge and its application in various situations.

Mathematical reasoning and thinking underpins all aspects of school mathematics, including problem posing, problem solving, investigation and modelling. It encompasses the development of algorithms for computation, formulation of problems, making and testing conjectures, and the development of abstractions for further investigation.

Computation and proof are essential and complementary aspects of mathematics that enable students to develop thinking skills directed toward explaining, understanding and using mathematical concepts, structures and objects. They provide a framework for the development of mathematical skills and techniques exemplified in the use of algorithms for computation and for the development of general case arguments.

# Structure of the domain

The Mathematics domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and a set of standards organised by dimension. A glossary is included which provides definitions of or additional information about underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.



Definitions of underlined terms are provided in the Glossary (page 121)

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Mathematics, standards for assessing and reporting on student achievement apply from Level 1. Standards for *Structure* are introduced from Level 3.

## Dimensions

Standards in the Mathematics domain are organised in five dimensions:

- Number
- Space
- Measurement, chance and data
- Working mathematically
- Structure.

### Number

The *Number* dimension focuses on developing students' understanding of counting, magnitude and order. The natural (counting) numbers with zero extend to positive and negative signed whole numbers (integers) and through part-whole relations and proportions of whole numbers to the rational numbers (fractions and finite decimals or infinite recurring decimals).

Proportions of lengths involving sides and/or diagonals of right-angled triangles and rectangles and arcs of a circle lead to the introduction of certain irrational real numbers such as the square root of 2, the golden ratio *phi* and fractions or multiples of *pi*.

Principal operations for computation with number include various algorithms for addition (aggregation), subtraction (disaggregation) and the related operations of multiplication, division and exponentiation carried out mentally, by hand using written algorithms, and using calculators, spreadsheets or other numeric processors for calculation.

### Space

The *Space* dimension focuses on developing students' understanding of shape and location. These are connected through forms of representation of two- and three-dimensional objects and the ways in which the shapes of these objects and their ideal representations can be moved or combined through transformations. Students learn about key spatial concepts including continuity, edge, surface, region, boundary, connectedness, symmetry, invariance, congruence and similarity.



Definitions of underlined terms are provided in the Glossary (page 121)

Principal operations for computation with space include identification and representation, construction and transformation by hand using drawing instruments, and also by using dynamic geometry technology.

### Measurement, chance and data

The *Measurement, chance and data* dimension focuses on developing students' understanding of unit, measure and error, chance and likelihood and inference. Measure is based on the notion of unit (*informal*, *formal* and *standard*) and relates number and natural language to measuring characteristics or attributes of objects and/or events. Various technologies are used to measure, and all measurement involves error.

Students learn important common measures relating to money, length, mass, time and temperature, and probability – the measure of the chance or likelihood of an event. Other measures include area, volume and capacity, weight, angle, and derived rates such as density, concentration and speed.

Principal operations for computation with measurement include the use of formulas for evaluating measures, the use of technology such as dataloggers for direct and indirect measurement and related technologies for the subsequent analysis of data, and estimation of measures using comparison with prior knowledge and experience, and spatial and numerical manipulations.

### Structure

The *Structure* dimension focuses on developing students' understanding of set, logic, function and algebra. It is fundamental to the concise and precise nature of mathematics and the generality of its results. Key elements of mathematical structure found in each of the dimensions of Mathematics are membership, operation, closure, identity, inverse, and the commutative, associative and distributive properties as well as other notions such as recursion and periodic behaviour.

While each of these can be considered in its own right, it is in their natural combination as applied to elements of number, space, function, algebra and logic with their characteristic operations that they give rise to the mathematical systems and structures that are embodied in each of these dimensions.

Principal operations for computation with structure include mental, by hand and technology-assisted calculation and symbolic manipulation by calculators, spreadsheets or computer algebra systems, with sets, logic, functions and algebra.

### Working mathematically

*Working mathematically* focuses on developing students' sense of mathematical inquiry: problem posing and problem solving, modelling and investigation. It involves students in the application of principled reasoning in mathematics, in natural and symbolic language, through the mathematical processes of



Definitions of underlined terms are provided in the Glossary (page 121)

conjecture, formulation, solution and communication; and also engages them in the aesthetic aspects of mathematics.

In this dimension the nature, purpose and scope of individual work is connected to that of the broader mathematical community, and the historical heritage of mathematics through the discourse of working mathematically. Mental, by hand and technology-assisted methods provide complementary approaches to working mathematically.

## Relationships between the dimensions

*Number* is related to the other dimensions through the aspects of counting, magnitude and order. It has logical and natural connections with *Measurement, chance and data* , and *Space*. Number systems provide the basis for the development of algebraic relationships in *Structure* and the contexts and explorations used in *Working mathematically*.

*Space* is related to the *Number* and *Measurement, chance and data dimensions* through the aspects of shape and location. The properties of patterns, transformations, and symmetry provide links to *Structure* and *Working mathematically*.

*Measurement, chance and data* is related to the *Number* and *Space* dimensions through the aspects of units, error, approximation, likelihood, angle, and the properties of two- and three-dimensional shapes. The application of measurement formulas and functions provide a link to *Structure*. A varied collection of practical contexts for generating and testing conjectures provides links to *Working mathematically*.

*Structure* is related to the *Number*, *Space* and *Measurement, chance and data* dimensions through the use of algorithms, patterns and functions. It is linked to *Working mathematically* through the key elements of mathematical language, concepts and relationships used in modelling and investigations.

*Working mathematically* is related to the *Number*, *Space* and *Measurement, chance and data* dimensions through the exploration of algorithms, patterns and functions, shapes and dimensions. It provides the processes for the development of inferences and deductions and for the exploration and proof of conjectures related to the *Structure* dimension.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of



Definitions of underlined terms are provided in the Glossary (page 121)

Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

## National Numeracy Benchmarks

National Numeracy Benchmarks are used for reporting achievement in three aspects of numeracy – 'Number sense', 'Spatial sense' and 'Measurement and data sense' – at Years 3, 5 and 7. The benchmarks define nationally agreed minimum acceptable standards for numeracy at these years.

Full details of the National Numeracy Benchmarks are available in *Numeracy Benchmarks Years 3, 5 and 7*, Curriculum Corporation, 2000 at <www.curriculum.edu.au/projects/numbench.php>.

The benchmarks describe minimum standards. For this reason, the Year 3 benchmarks relate to Level 2 Mathematics standards, the Year 5 benchmarks relate to Level 3 Mathematics standards and the Year 7 benchmarks relate to Level 4 Mathematics standards. Links to the numeracy benchmarks are located in the Mathematics standards.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Mathematics, they extend their use of mathematical models to a wide range of familiar and unfamiliar contexts. They recognise the role of logical argument and proof in establishing mathematical propositions.

In *Number*, students investigate familiar and unfamiliar situations and contexts involving the use of all types of real numbers. They use irrational numbers such as $\sqrt{}$, $\pi$, and common surds in calculations in both exact and approximate

Definitions of underlined terms are provided in the Glossary (page 121)

form. They apply mental, written or technology-assisted forms of computation as appropriate, using estimation to validate their answers. They compute using large or small numbers expressed in scientific notation. They evaluate and use factorials in relevant contexts. They apply the concepts of rounding to either a given number of decimal places or significant figures to check the accuracy of computations.

In *Space*, students investigate the possible orientation of lines in space. They investigate the properties of angles formed when lines (including parallel lines) intersect. They learn how space is enclosed in two and three dimensions, and systematically investigate the properties of boundaries and regions on surfaces with shapes such as polygons and circles, prisms and polyhedra (including the platonic solids). They learn to use the concepts of congruency and similarity to compare the size and shape of polygons. They investigate the properties of similar triangles.

Students investigate the relationship between position, length and angle using the pythagorean relationship and trigonometry of right-angled triangles. They explore simple combinations of rotations, translations and reflections as transformations of geometric shapes in the plane. They investigate the paths (loci) formed by points, lines and shapes as they move in space according to various rules, conditions and/or constraints involving transformations. They use symmetry and other properties to create tessellations in two and three dimensions from regular and composite shapes. They investigate the effects of changing the scale of one characteristic of a geometric shape (for example, length or angle) on the size of related characteristics (for example, area and volume).

Students use maps and globes to investigate location and distances between places.

In *Measurement, chance and data*, students measure and estimate perimeter, area, surface area, mass, volume, capacity, angle, and the rates of speed, density and concentration. They use and convert units to suit the purpose of the measurements. They make judgments about errors in measurement. They use formulas (including trigonometry) to calculate perimeters, areas, angles in shapes, and the surface areas and volumes of solids. They use degrees and radians, as applicable, for units of measurement of angles.

Students apply probability concepts to aspects of chance and risk in everyday life. They represent event spaces that show the nature of events and their probabilities, and use these representations to assist in the computation of the probabilities of compound, independent and dependent events. They apply the concept of mathematical expectation to describe expected gain or loss in games of chance.

Students collect and use uni-variate and bi-variate data samples. They select



Definitions of underlined terms are provided in the Glossary (page 121)

appropriate representations to display data distributions, centrality, spread, and association between bi-variate data sets.

In *Structure*, students learn to categorise natural, integer, rational and irrational numbers in relation to real numbers. They use the concepts of order, discrete and continuous, and finite and infinite in relation to these sets of numbers.

Students apply algebraic properties (for example, closure, associative, commutative, identity, inverse and distributive) to expressions, formulas and equations.

They relate sets with one, two or three attributes, in four ways:

- diagrams and grids
- the logical connectives *and*, *or*, *not*, *implication* and *equivalence*
- the quantifiers none, some and all
- the set operations complement, intersection, union and inclusion.

Students work with functions (for example, linear, quadratic, reciprocal, exponential), simple transformations of these functions, their graphs and related algebraic properties. They solve equations of the form $f(x) = k$, where $k$ is a real constant. They solve simultaneous linear equations using algebraic, numerical and graphical approaches.

When *Working mathematically*, students develop generalisations by abstracting the features from situations, expressing these in words and symbols. They test propositions, and use formal mathematical arguments to test their truth, modifying them as required.

Students choose, use and develop mathematical models and procedures with attention to assumptions and constraints (for example, they test the suitability of the results of data analysis in terms of the context being modelled).

They solve problems in a wide range of practical, theoretical and historical contexts and communicate the results of these investigations. They extend their problem solutions by generalising, or changing the initial constraints of a situation for further investigation.

Students use technology (for example, geometry software, graphics calculators, spreadsheets and computer algebra systems) to develop mathematical ideas and solve problems.

They describe the major features of mathematical structure, and use of logical argument in mathematical discourse and applications of mathematics.

### National Statements of Learning

This learning focus statement, with the following elaboration, incorporates the Year 9 National Statement of Learning for Mathematics.



Definitions of underlined terms are provided in the Glossary (page 121)

# Standards

### Number

At Level 6, students comprehend the set of real numbers containing natural, integer, rational and irrational numbers. They represent rational numbers in both fractional and decimal (terminating and infinite recurring) forms (for example, $1\frac{4}{25} = 1.16$, $0.\overline{47} = \frac{47}{99}$). They comprehend that irrational numbers have an infinite non-terminating decimal form. They specify decimal rational approximations for square roots of primes, rational numbers that are not perfect squares, the golden ratio $\varphi$, and simple fractions of $\pi$ correct to a required decimal place accuracy.

Students use the Euclidean division algorithm to find the greatest common divisor (highest common factor) of two natural numbers (for example, the greatest common divisor of 1071 and 1029 is 21 since $1071 = 1029 \times 1 + 42$, $1029 = 42 \times 24 + 21$ and $42 = 21 \times 2 + 0$).

Students carry out arithmetic computations involving natural numbers, integers and finite decimals using mental and/or written algorithms (one- or two-digit divisors in the case of division). They perform computations involving very large or very small numbers in scientific notation (for example, $0.0045 \times 0.000028 = 4.5 \times 10^{-3} \times 2.8 \times 10^{-5} = 1.26 \times 10^{-7}$).

They carry out exact arithmetic computations involving fractions and irrational numbers such as square roots (for example, $\sqrt{18} = 3\sqrt{2}$, $\sqrt{(\frac{3}{2})} = (\frac{\sqrt{6}}{2})$) and multiples and fractions of $\pi$ (for example, $\pi + \frac{\pi}{4} = \frac{5\pi}{4}$). They use appropriate estimates to evaluate the reasonableness of the results of calculations involving rational and irrational numbers, and the decimal approximations for them. They carry out computations to a required accuracy in terms of decimal places and/or significant figures.

### Space

At Level 6, students represent two- and three-dimensional shapes using lines, curves, polygons and circles. They make representations using perspective, isometric drawings, nets and computer-generated images. They recognise and describe boundaries, surfaces and interiors of common plane and three-dimensional shapes, including cylinders, spheres, cones, prisms and polyhedra. They recognise the features of circles (centre, radius, diameter, chord, arc, semi-circle, circumference, segment, sector and tangent) and use associated angle properties.

Students explore the properties of spheres.

Students use the conditions for shapes to be congruent or similar. They apply isometric and similarity transformations of geometric shapes in the plane. They

identify points that are invariant under a given transformation (for example, the point (2, 0) is invariant under reflection in the *x*-axis, so the *x* axis intercept of the graph of $y = 2x - 4$ is also invariant under this transformation). They determine the effect of changing the scale of one characteristic of two- and three-dimensional shapes (for example, side length, area, volume and angle measure) on related characteristics.

They use latitude and longitude to locate places on the Earth's surface and measure distances between places using great circles.

Students describe and use the connections between objects/location/events according to defined relationships (networks).

**Measurement, chance and data**

At Level 6, students estimate and measure length, area, surface area, mass, volume, capacity and angle. They select and use appropriate units, converting between units as required. They calculate constant rates such as the density of substances (that is, mass in relation to volume), concentration of fluids, average speed and pollution levels in the atmosphere. Students decide on acceptable or tolerable levels of error in a given situation. They interpret and use mensuration formulas for calculating the perimeter, surface area and volume of familiar two- and three-dimensional shapes and simple composites of these shapes. Students use pythagoras theorem and trigonometric ratios (sine, cosine and tangent) to obtain lengths of sides, angles and the area of right-angled triangles.

They use degrees and radians as units of measurement for angles and convert between units of measurement as appropriate.

Students estimate probabilities based on data (experiments, surveys, samples, simulations) and assign and justify subjective probabilities in familiar situations. They list event spaces (for combinations of up to three events) by lists, grids, tree diagrams, venn diagrams and karnaugh maps (two-way tables). They calculate probabilities for complementary, mutually exclusive, and compound events (defined using *and, or* and *not*). They classify events as dependent or independent.

Students comprehend the difference between a population and a sample. They generate data using surveys, experiments and sampling procedures. They calculate summary statistics for centrality (mode, median and mean), spread (box plot, inter-quartile range, outliers) and association (by-eye estimation of the line of best fit from a scatter plot). They distinguish informally between association and causal relationship in bi-variate data, and make predictions based on an estimated line of best fit for scatter-plot data with strong association between two variables.

### Structure

At Level 6, students classify and describe the properties of the real number system and the subsets of rational and irrational numbers. They identify subsets of these as discrete or continuous, finite or infinite and provide examples of their elements and apply these to functions and relations and the solution of related equations.

Student express relations between sets using membership, $\in$, complement, $'$, intersection, $\cap$, union, $\cup$, and subset, $\subseteq$, for up to three sets. They represent a universal set as the disjoint union of intersections of up to three sets and their complements, and illustrate this using a tree diagram, venn diagram or karnaugh map.

Students form and test mathematical conjectures; for example, 'What relationship holds between the lengths of the three sides of a triangle?'

They use irrational numbers such as, $\pi$, $\varphi$ and common surds in calculations in both exact and approximate form.

Students apply the algebraic properties (closure, associative, commutative, identity, inverse and distributive) to computation with number, to rearrange formulas, rearrange and simplify algebraic expressions involving real variables. They verify the equivalence or otherwise of algebraic expressions (linear, square, cube, exponent, and reciprocal, (for example,

$4x - 8 = 2(2x - 4) = 4(x - 2)$; $(2a - 3)^2 = 4a^2 - 12a + 9$; $(3w)^3 = 27w^3$;

$\frac{(x^3y)}{xy^2} = x^2y^{-1}$; $\frac{4}{xy} = \frac{2}{x} \times \frac{2}{y}$ ).

Students identify and represent linear, quadratic and exponential functions by table, rule and graph (all four quadrants of the cartesian coordinate system) with consideration of independent and dependent variables, domain and range. They distinguish between these types of functions by testing for constant first difference, constant second difference or constant ratio between consecutive terms (for example, to distinguish between the functions described by the sets of ordered pairs {(1, 2), (2, 4), (3, 6), (4, 8) …}; {(1, 2), (2, 4), (3, 8), (4, 14) …}; and {(1, 2), (2, 4), (3, 8), (4, 16) …}). They use and interpret the functions in modelling a range of contexts.

They recognise and explain the roles of the relevant constants in the relationships $f(x) = ax + c$, with reference to gradient and $y$ axis intercept, $f(x) = a(x + b)^2 + c$ and $f(x) = ca^x$.

They solve equations of the form $f(x) = k$, where $k$ is a real constant (for example, $x(x + 5) = 100$) and simultaneous linear equations in two variables (for example, $\{2x - 3y = -4$ and $5x + 6y = 27\}$ using algebraic, numerical (systematic guess, check and refine or bisection) and graphical methods.

### Working mathematically

At Level 6, students formulate and test conjectures, generalisations and arguments in natural language and symbolic form (for example, 'if $m^2$ is even then $m$ is even, and if $m^2$ is odd then $m$ is odd'). They follow formal mathematical arguments for the truth of propositions (for example, 'the sum of three consecutive natural numbers is divisible by 3').

Students choose, use and develop mathematical models and procedures to investigate and solve problems set in a wide range of practical, theoretical and historical contexts (for example, exact and approximate measurement formulas for the volumes of various three dimensional objects such as truncated pyramids). They generalise from one situation to another, and investigate it further by changing the initial constraints or other boundary conditions. They judge the reasonableness of their results based on the context under consideration.

They select and use technology in various combinations to assist in mathematical inquiry, to manipulate and represent data, to analyse functions and carry out symbolic manipulation. They use geometry software or graphics calculators to create geometric objects and transform them, taking into account invariance under transformation.

# Science

## Introduction

To be human is to be curious about the world we live in, to wonder why it is that way, and to ask about our place in it. A fundamental goal for science education is to stimulate, respond to and nourish such curiosity, wonder and questioning. Science provides us with one view of the world – a view that changes as our knowledge and understanding of science evolves.

Science is a human process, influenced by and influencing social values. Science has a long and fascinating history of human attempts to appreciate, understand, control and manage our world. Scientists use techniques of scientific investigation to create an understanding of the world. The resulting cumulative knowledge is part of our human heritage.

Science is dynamic and progressive. Our society is being continually confronted, challenged and redirected by ideas borne from people's curiosity, imagination and dreams about what might be possible. The work of scientists such as Newton, Einstein, Curie, Darwin, Florey, Macfarlane Burnet and Oliphant began as 'why' and 'what if'. Their work challenged and subsequently changed accepted opinions in the areas of motion and gravity, radioactivity, evolution, medicine, immunology, structure of the nucleus of the atom, and nuclear energy. This and other accepted science knowledge continues to fuel the dreams of a new generation of scientists as they explore the expanding frontiers of science.

Science has had, and will continue to have, successes and setbacks as technologies that provide people with an improved quality of life are developed and implemented.

It is becoming increasingly important that students understand these challenges and redirections, and the implications of these for their own life choices, the environment and the community (local and global) in which they live. Building students' science capability is critical to help them develop the skills and understanding necessary to meet these challenges and make responsible, informed choices.

Science extends our understanding beyond what affects us to include what we can't see, feel, hear or touch but can only imagine. Science capability is multidimensional, consisting of dispositional facets (interest and curiosity), operational facets (creativity and problem solving) and cognitive facets (reasoning and critical thinking). The extent to which we as citizens understand and appreciate these interactions will shape our future.

A set of values inform and govern how scientists operate including respect for the environment (living and non-living) and the opinions and ideas of others,

honesty in collecting and presenting data and evidence, and acknowledgment of the work of others. These values are an integral part of a science curriculum that explores and encourages debate about the relationship between science, society and technology.

A major goal of science education is to develop citizens who are capable of engaging in informed debate about science and its applications. Increasing emphasis will be placed on the role of science and the work of Australian and other scientists in addressing issues of sustainability at a local and global level. Science education provides opportunities for students to develop the skills and understanding appropriate to service and good citizenship. It also encourages students to articulate science values and accept the ethical principles embedded in science research. While only some students directly pursue a career in science and scientific research, all students need to appreciate the significance of science for the long-term future of our society.

# Structure of the domain

The Science domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 3, a set of standards organised by dimension. A glossary is included which provides definitions of or additional information about underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Science, standards for assessing and reporting on student achievement apply from Level 3.

## Dimensions

Standards in the Science domain are organised in two dimensions:

- Science knowledge and understanding
- Science at work.

These two dimensions include the traditional science disciplines of biology, chemistry, earth science, environmental science, health sciences, neuroscience, physics and space sciences and the emerging sciences including

biotechnology, green chemistry, nanotechnology, and synchrotron science. The dimensions build students' understanding of how science knowledge in the disciplines has been constructed through time and is applied in practical contexts.

The development of *Science knowledge and understanding* necessarily involves conceptual and experiential understanding of Science at work, and understanding of the ways the concepts, theories and models of science are used throughout the society in which students live.

*Science at work* involves students learning the processes of science through the ways they undertake and reflect on their own investigations and those of others.

The two dimensions are interrelated in the ways science affects the broader society in which the students live. Students' own experience of science assists them to develop an understanding of these interactions. The two dimensions are also interrelated in ways that are central to both pedagogy and content.

### Science knowledge and understanding

The *Science knowledge and understanding* dimension focuses on building student understanding of the overarching conceptual ideas of science. These include understanding:

- the nature of the similarities between, and the diversity of, living things and their sustainable relationships with each other and their environment
- concepts related to matter – its properties and uses, and the production of different substances through chemical change
- concepts of energy and force as a way of explaining physical phenomena
- the place of the Earth in time and space and the interactions between the Earth and its atmosphere
- how scale is important in relating structure to function at microscopic and macroscopic levels.

These understandings enable students to build on their curiosity and answer their own questions about themselves and their interactions with the world while at the same time allowing them to think through contemporary challenges and issues. Through this, students come to understand how science relates to society and the environment.

### Science at work

The *Science at work* dimension focuses on students experiencing and researching how people work with and through science. Students learn to be curious and to use scientific understanding and processes to find answers to



Definitions of underlined terms are provided in the Glossary (page 121)

their questions. They design and pursue investigations ethically and safely; generate, validate and critique evidence; analyse and interpret ideas and link them with existing understanding; work and reason with scientific models and communicate their findings and ideas to others. They identify and practise the underlying values, skills and attributes of science.

Through their investigations, they gain insight into science as a human activity and the relationship between science, technology and society both now and in the future. They explore how science is used in multiple contexts throughout their lives and its pervasiveness throughout the workplace.

# National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

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## Safety

Students will be exposed to potentially hazardous materials and practices when undertaking scientific activities and investigations. Beginning with their first year at school, students are made aware of safe practices and are encouraged to act responsibly when conducting investigations. As students progress through their schooling they develop skills in the safe use of scientific apparatus, including heating and electrical equipment, the safe handling of living and non-living organic materials and the correct use and disposal of chemicals.



Definitions of underlined terms are provided in the Glossary (page 121)

Standards and practices should be consistent with legal requirements including Occupational Health and Safety (OH&S). Material Safety Data Sheets (MSDS) provide information about the safe handling of hazardous substances used at the workplace. A Scientific Procedures Premises License (SPPL) is required when animals are used to teach science. If keeping animals then the *Prevention of Cruelty to Animals Act 1986* and the *National Statement on Ethical Conduct in Research Involving Humans* – National Health and Medical Research Council (NHMRC) 2001 also apply.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Science, they extend their concept of science as a way of knowing to include an understanding of how scientific theories and models drawn from traditional and emerging sciences are based on evidence that may initially be tentative and limited. Examples include atomic structure, natural selection and evolution, development of medicines, genetic inheritance, and the genesis of the Universe. They explore the ways in which scientific theories are both powerful (in guiding thinking and investigation) and tentative (in being open to change) at the same time. They understand that the features of science as a way of knowing lead to it being: empirical and non-empirical, creative and methodical, and speculative and logical. They appreciate that people of diverse cultures have contributed to and shaped the development of science.

Students develop a qualitative and quantitative understanding of the relationships between force, mass and movement. They consider how coordination and regulation of functions occurs in plants and animals. They investigate the adaptive behaviours which enable plants and animals to survive in their environments, and consider possible adaptive behaviours which may be needed for future survival. They explore the role of DNA and genes in determining patterns of inheritance. They investigate how energy may be responsible for the changes observed in biological, chemical and physical processes and applications. Examples include electromagnetism; polarisation of light; the operation of electronic systems; endothermic and exothermic reactions; rate of reaction; production of new materials; photosynthesis and respiration; cell division (mitosis and meiosis); action of micro-organisms; global atmospheric changes; plate tectonics; optics; photonics; transmission of nerve impulses; energy flow through ecosystems; population dynamics; and the cycling of matter (including water, carbon and minerals) in ecosystems.

Students investigate sources of waste generated within the community and consider waste treatment and management options. They learn how wastes are generated in the processing of natural materials (for example, oil,



Definitions of underlined terms are provided in the Glossary (page 121)

water, brown coal and ores), and how the procedures used to manage these wastes contribute to environmental sustainability. They investigate, create and produce a range of strategies and products that explore, encourage and communicate the responsible use and management of natural and processed resources.

Students make links across related areas of science; for example, biotechnology (biology and chemistry); communication satellites (physics and astronomy); neuroscience (psychology, biology and chemistry); synchrotron science (biology, chemistry and physics); resource management and green chemistry (chemistry and earth and environmental science); and habitat renewal (earth and environmental sciences and biology). They explore the opportunities for employment in science-related occupations and industries in their community, and consider the dynamic and collaborative nature of these roles.

Students learn that scientific theories are both powerful and never final, that clarity is always assumed to be a significant attribute of science theories, and that the use of a theory to successfully predict the consequences of changes to situations is important in the validation of the theory. Students design and conduct scientific investigations of their choice in ways that lead to the collection, interpretation and presentation of valid data. They explain trends and patterns in data, identify discrepancies in experimental results and suggest improvements to their investigations. They learn to use correct units of measurement when recording quantities. They use Material Safety Data Sheets (MSDS). when appropriate. Using a variety of formats, students prepare investigation reports learning to use symbols and diagrams extensively to illustrate procedures and data analysis, and support the conclusions drawn and presented.

Students develop an understanding of the constancy of the 'big' ideas of science (matter, energy, time and space) and science methodologies across different areas and contexts. They debate, from the basis of scientific knowledge, the merits and problems of science-related issues that are reported in the popular media, particularly those that embrace a clear ethical dimension. They also explore the ways in which science concepts, language and perspectives can be misunderstood and misrepresented. Students cite instances in which social priorities have had an impact on or have been influenced by society. This involves students applying their conceptual understandings to the consideration of issues significant to themselves as individuals and to the broader society in which they live; for example, stem cell research, ecotourism, tourism in space, personal safety, a clean and healthy environment, energy use, ecological footprints, electronic gadgets, robotics, the history and philosophy of science, ethics and science research.

### National Statements of Learning

This learning focus statement, with the following elaborations, incorporates the Year 9 National Statement of Learning for Science. Some aspects of the year 9 Statement of Learning are incorporated in the Level 5 learning focus statement.

**Elaborations:**

- They appreciate that people of diverse cultures have contributed to and shaped the development of science.
- They investigate how energy may be responsible for the changes observed in biological, chemical and physical processes and applications. Examples include … global atmospheric changes; plate tectonics; … population dynamics….
- They explain trends and patterns in data, identify discrepancies in experimental results and suggest improvements to their investigations.
- Students cite instances in which social priorities have had an impact on or have been influenced by society.

## Standards

### Science knowledge and understanding

At Level 6, students explain the behaviour and properties of materials in terms of their constituent particles and the forces holding them together. They explain how similarities in the chemical behaviour of elements and their compounds and their atomic structures are represented in the way the periodic table has been constructed. They use the periodic table to write electronic configurations for a range of elements representative of the major groups and periods in the periodic table. They use atomic symbols and balanced chemical equations to summarise chemical reactions, including neutralisation, precipitation and combustion. They identify and classify the sources of wastes generated, and describe their management, within the community and in industry. They use a specific example to explain the sustainable management of a resource.

Students explain change in terms of energy in a range of biological, chemical and physical contexts. They demonstrate the link between natural selection and evolution. They explain the role of DNA and genes in cell division and genetic inheritance. They explain how the coordination and regulatory functions within plants and animals assist them to survive in their environments. They explain how the action of micro-organisms can be both beneficial and detrimental to society. Students apply concepts of geological time to elaborate their explanations of both natural selection and evolution, and the origin and evolution of the Universe. They give both qualitative and quantitative explanations of the relationships between force, mass and movement.

### Science at work

At Level 6, students describe the science base of science-related occupations in their local community. They use the relevant science concepts and relationships as one dimension of debating contentious and/or ethically based science-related issues of broad community concern. They demonstrate an

awareness of the ways in which scientific vocabulary is used incorrectly in the mass media, distinguishing between the intended meaning of such terms and their meaning in non-scientific contexts. They provide two examples of the work of scientists that demonstrate different approaches to developing scientific knowledge or solving a scientific problem.

Students formulate their own hypotheses and plan and conduct investigations in order to prove or disprove them. They use chemicals (including biomaterials), equipment, electronic components and instruments responsibly and safely. They select appropriate equipment and measurement procedures that will ensure a high degree of reliability in data collected and enable valid conclusions to be drawn. They construct working models and visual aids that demonstrate scientific ideas. They present experimental results using appropriate data presentation formats, and comment on the nature of experimental errors. They use Material Safety Data Sheets (MSDS) and risk assessment to evaluate the safety of their investigations. They evaluate the appropriateness of the experimental design and methodology used to investigate their predictions.



Definitions of underlined terms are provided in the Glossary (page 121)

# Interdisciplinary Learning

The Interdisciplinary Learning strand identifies a range of knowledge, skills and behaviours which cross disciplinary boundaries and are essential to ensuring students are prepared as active learners and problem-solvers for success at school and beyond. This strand focuses on ways of thinking, communicating, conceiving and realising ideas and information. It assists students to develop the capacity to design, create and evaluate processes as a way of developing creativity and innovation.

Within the Interdisciplinary Learning strand the learning domains are:

## Communication

Communication helps to construct all learning and is central to the capacity to demonstrate and convey what one has learned in different contexts and to different people. This domain assists students to understand that language and discourse differ in different disciplines and that there is a need to learn the particular literacies involved in each.

## Design, Creativity and Technology

Students develop the knowledge, skills and behaviours related to investigating and designing using appropriate planning processes and design briefs; creating and developing ideas, applying information, and seeking and testing innovative alternatives; producing, including the selection and safe use of appropriate tools, equipment, materials and/or processes to meet the requirements of design briefs; analysing and evaluating both processes and products including, where relevant, any broader environmental, social, cultural and economic factors.

## Information and Communications Technology

The knowledge, skills and behaviours in this domain enable students to use information and communications technology (ICT) to access, process, manage and present information; model and control events; construct new understandings; and communicate with others. Students use ICT and strategies to monitor learning patterns, to process data to create solutions and information products that demonstrate understanding, and to share their work with others in ethical, legal and respectful ways.

## Thinking Processes

This domain encompasses a range of cognitive, affective and metacognitive knowledge, skills and behaviours which are essential for effective functioning in society both within and beyond school. The study of thinking enables students to acquire strategies for thinking related to enquiry, processing information, reasoning, problem solving, evaluation and reflection.



 

# Communication

## Introduction

Communication is central to the capacity to construct meaning and to convey information and understanding to others in a range of ways and in a variety of settings. Successful communication requires students to be familiar with the forms, language and conventions used in different contexts and employ them to communicate effectively.

The Communication domain focuses on developing students who communicate clearly and confidently in a range of contexts both within and beyond school. It aims to assist students to develop awareness that language and discourse differ across the curriculum and that there is a need to learn literacies involved in each subject they undertake. To communicate successfully students need to develop the knowledge, skills and behaviours that empower them to respond to, make meaning of, and deconstruct a range of communication forms. They also need to develop the knowledge, skills and behaviours to effectively present information, ideas and opinions in a range of forms, including verbal, written, graphic, multimedia and performance, appropriate to their context, purpose and audience.

## Structure of the domain

The Communication domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 4, a set of standards organised by dimension.

### Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

### Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Communication, standards for assessing and reporting on student achievement apply from Level 4.



Definitions of underlined terms are provided in the Glossary (page 121)

## Dimensions

Standards in the Communication domain are organised in two dimensions:

- Listening, viewing and responding
- Presenting.

### Listening, viewing and responding

Effective communication demands that students develop the ability to listen, view and respond to communication forms with respect to content and context. The *Listening, viewing and responding* dimension focuses on developing student understanding of communication conventions, strategies to assist them to make meaning of communication forms and the ability to deconstruct and respond to a diversity of forms. This involves developing familiarity with forms, language and conventions used in different contexts across the curriculum.

### Presenting

The ability to present information and learning in a coherent and appropriate manner is critical for all learners. The *Presenting* dimension involves students gaining the knowledge, skills and behaviours to understand context, purpose and audience; select and use appropriate structure and organisation to convey meaning; and reflect on the style and content of the presentations they make.

# National Statements of Learning

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# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Communication, they listen to speakers in a range of contexts, including the school, the wider community and workplaces. They develop their skills in interpreting meaning; for example, by identifying inferences and assumptions. They know what it means to effectively respond both verbally and non-verbally in different contexts and are able to demonstrate this. Students elaborate on and clarify content of presentations, using pertinent questions to explore explicit and implicit meaning. In discussion with their peers, they evaluate the effectiveness of these presentations and note how they can apply the findings to their own presentations.

In structured activities, students explore the relationship between language and power; for example, by interpreting and analysing significant speeches. As their understanding of this concept develops, they apply their understanding when making meaning of a variety of media messages and when developing their own presentations.

Students respond to a range of aural, written and visual texts, reflecting on how cultural and societal norms and ideology influence the production of the material; for example, research papers and news items. They explore how effectively meaning has been communicated, analyse alternative interpretations and develop a rationale for their preferred opinion.

Students develop a high level of expertise and fluency in the language, forms and communication strategies of particular subjects across the curriculum as well as those associated with a range of occupations and career pathways. They reflect on why it is important to have this knowledge, how it enables more precise communication, but also how it can exclude audiences who are not familiar with the language of particular subjects.

Students experiment with communicating complex ideas in a variety of ways. They increasingly use metaphor and symbol to communicate. They organise their information, ideas and opinions into a coherent structure, select and adjust their mode of presentation to suit purpose and audience, and make appropriate adjustments in response to an audience. They use agreed criteria to reflect on the effectiveness of their own communications and articulate means by which they could be improved.

### National Statements of Learning

This Learning focus statement incorporates aspects of the National Statements of Learning for Civics and Citizenship, Year 9.

## Standards

### Listening, viewing and responding

At Level 6, students identify the ways in which complex messages are effectively conveyed and apply this knowledge to their communication. When listening, viewing and responding, they consider alternative views, recognise multiple possible interpretations and respond with insight. They use complex verbal and non-verbal cues, subject-specific language, and a wide range of communication forms. Students use pertinent questions to explore, clarify and elaborate complex meaning.

### Presenting

At Level 6, students demonstrate their understanding of the relationship between form, content and mode, and select suitable resources and technologies to effectively communicate. They use subject-specific language and conventions in accordance with the purpose of their presentation to communicate complex information. They provide constructive feedback to others and use feedback and reflection in order to inform their future presentations.

# Design, Creativity and Technology

## Introduction

The domain of Design, Creativity and Technology emphasises engagement in designing, creating and evaluating processes, products and technological systems using a range of materials as a way of developing creativity and innovation. Creativity in this domain can be described as applying imagination and lateral and critical thinking throughout design and development processes. Innovation is an outcome of the broad exploration of ideas, materials/ingredients, and technical processes that can occur when individuals are involved in investigating, designing, producing, analysing and evaluating their own and others' products and/or systems.

Design is a vital step in transforming ideas into creative, practical and commercial realities by optimising the value of products and systems. Designing and its application involve planning and organising production, and evaluating products in a real context. Contexts may relate to; for example, what we grow, eat, wear, build, make, our health and safety, and how we travel and spend our leisure time. Designers consider problems, needs, wants and opportunities and respond to them by developing a range of ideas, which are developed into utilitarian products or systems.

Development of capability in this domain includes the ability to use, manage, assess and understand design, creativity, technology, and their relationship to innovation. In more detail, this involves students:

- posing problems and actively identifying needs, wants, opportunities and areas for improvement
- gathering information and building knowledge about the nature of needs, wants, opportunities and areas for improvement and the best routes to take towards designing a solution
- developing and using design and technology skills, knowledge and processes, including proposing, experimenting, learning from results and synthesising, to create new and/or improved products and/or systems
- using tools, equipment, materials/ingredients and systems components safely and creatively to make quality products and/or systems
- understanding that design, creativity and technology leads to innovation
- assessing the outcomes of design and technology processes, and the resulting products and technological systems in relation to environmental, social and economic factors.



Definitions of underlined terms are provided in the Glossary (page 121)

This domain involves experiential, practical and applied knowledge as well as theoretical understanding. It requires students to be autonomous and creative problem-solvers, as individuals and as members of a team. Students combine an understanding of design, functionality, aesthetics, social, cultural, economic and environmental issues, and industrial practices with practical skills. As they do so, they reflect on and evaluate past and present design and technology, its uses and effects.

The Design, Creativity and Technology domain focuses on development of students' skills in managing and manipulating materials and resources using a range of tools, equipment and machines to make functional physical products or systems. These materials include food, wood, metal, timber, plastics, textiles, ceramics, plants and soil/growing media and components such as wheels and axles, pulleys and belts, gears, switches, lights, motors, connecting wires, batteries and printed circuits boards.

# Structure of the domain

The Design, Creativity and Technology domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 3, a set of standards organised by dimension. A glossary is included which provides definitions of underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Design, Creativity and Technology, standards for assessing and reporting on student achievement apply from Level 3.

## Dimensions

Standards in the Design, Creativity and Technology domain are organised in three dimensions:

- Investigating and designing
- Producing
- Analysing and evaluating.



Definitions of underlined terms are provided in the Glossary (page 121)

Activities associated with the three dimensions are linked and may be applied sequentially, where students move directly from investigating to designing, producing and evaluating. Or alternatively, students may move between the dimensions as they solve a problem. For example, to assist their decision making while designing a product or system, students may evaluate the potential impact on the environment of the intended use of materials/ ingredients, components or processes required to make the product or system. Additionally, after evaluating a product they have made, students may return to the *Investigating and designing* and *Producing* dimensions to improve the product. In this way, students may work in a non-sequential manner through the dimensions in this domain. In order for students to demonstrate knowledge, skills and behaviours in this domain a 'design and make' project-based learning approach must be taken, that focuses on meeting the problem, need/s or requirements defined in a design brief.

### Investigating and designing

In the *Investigating and designing* dimension, students identify ideas, problems, needs, wants and opportunities. A design brief can be a starting point or it can be developed to clearly define the idea, problem, need, want or opportunity and requirements for a solution. Students undertake research and investigation to identify the human, material, equipment, and/or energy resources available to meet the idea, problem, need, want or opportunity.

Students combine practical and design skills with knowledge, skills and behaviours from other domains to select and record creative methods of generating and depicting design possibilities and options. They devise a plan to outline the processes involved in making a product, and select and justify the option that best meets the requirements of the design brief.

### Producing

The *Producing* dimension involves students in the management of the production phase and includes the appropriate selection and safe manipulation and use of tools, equipment, materials/ingredients and components to carry out processes appropriate to the materials/ingredients or assembly of systems components to produce a quality product or technological system.

Students explore, share and use both traditional and more innovative techniques. They reflect upon their progress and alter plans as appropriate. Progress and changes to plans are reflected upon and altered as appropriate.

### Analysing and evaluating

In the *Analysing and evaluating* dimension, students compare the outcomes of design and production activities with earlier design work and planned intentions. Following the application of testing, improvements, modifications and alternative approaches are considered.



Definitions of underlined terms are provided in the Glossary (page 121)

This dimension also involves students in describing, analysing and evaluating the impact and value of both their own and others' technological products, technological systems, processes and innovations (past, present and predicted future) on the individual, society and culture, the environment and the economy. This includes consideration of sustainability issues.

## National Statements of Learning

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# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Design, Creativity and Technology, they specialise in a specific area of design and technology. Specialisations could focus on specific materials areas (such as wood, metal, plastics, food, ceramics or textiles) or technological systems (such as computer-controlled systems, electronics or mechanisms or combinations of these), or particular design/technology areas (such as home economics, fashion, robotics, furniture, agriculture and horticulture).

They continue to pose and define design problems by working with a variety of design briefs within various contexts including those that have transferability into the workplace and broader community.



Definitions of underlined terms are provided in the Glossary (page 121)

Students develop design briefs within open-ended design guidelines. Referring to the design brief, they consider and investigate aspects of function and aesthetics. Students become discerning and discriminating thinkers, able to address controversial, complex and ethical design and technology issues and dilemmas, such as trade-offs in the selection and use of materials. They further develop the capacity to model, assemble and disassemble products and systems, and communicate their ideas verbally, and with two-dimensional drawing and three-dimensional modelling, including computer-aided design (CAD).

Students, individually and in teams, investigate systematic and creative and critical thinking approaches for generating innovative technological products (for example, educational games, toys or equipment for a local kindergarten, or a solar model car), including time and resource management. They explore and assess the past, and potential future, consequences of technology on society, culture and the environment.

Using annotations (including the use of appropriate technical language) and through discussion, students explain and justify design features, characteristics and properties of selected materials/ingredients, systems components and their interrelationships, performance, energy requirements and production techniques in relation to the design brief. Students at this level are open to the iterative nature of the design process and the importance of continuous reflection when addressing design and technology situations and problems. They develop an increasing range of investigation (including testing), questioning and checking techniques when investigating, designing, planning and evaluating products and systems.

Students safely and efficiently construct products, models or prototypes to specifications and standards. They make decisions about safety precautions and wear personal protective clothing and equipment when necessary. Students further develop skills in using a range of techniques, equipment, tools, some of which are complex; for example, the lathe, computer-aided milling machine, and vacuum former. They also develop skills in using suitable materials/ ingredients and/or systems components (or combine simple sub-systems to produce more complex systems) to specified levels of accuracy and precision, and with consideration to risk assessment processes. They are encouraged to make adjustments to tools and equipment and carry out basic maintenance. They learn to use time and resources economically and try to minimise waste.

Students are encouraged to document their design, production and evaluation activities in an electronic or manually-produced portfolio. They participate in and lead discussions on evaluating their own and other people's thinking in relation to creative and innovative products. Through creative processes, reflection and evaluation, they examine and acknowledge a range of perspectives, and consider the value of diverse opinions about design and technology.



Definitions of underlined terms are provided in the Glossary (page 121)

Students develop appropriate evaluation criteria and use them to assess design ideas, choice of materials/ingredients and/or systems components, production techniques and/or performance of a system. They learn to analyse and evaluate a new material or process and discuss innovation and emerging technologies in primary industry or the manufacturing industry.

## Standards

### Investigating and designing

At Level 6, students identify considerations and constraints within a design brief. They undertake research relevant to the design brief. They locate and use relevant information to help their design thinking and identify the needs of a variety of client/user groups. When designing, they generate a range of alternative possibilities, use appropriate technical language, and justify their preferred option, explaining how it provides a solution to the problem, need or opportunity. They make critical decisions on materials/ingredients, systems components and techniques based on their understanding of the properties and characteristics of materials/ingredients and/or of the relationship between inputs, processes and outputs. They effectively use information and communications technology equipment, techniques and procedures to support the development of their design and planning. Students take account of function and performance, energy requirements, aesthetics, costs, and ethical and legal considerations that address the requirements of design briefs. They identify a range of criteria for evaluating their products and/or technological systems. Students plan a realistic and logical sequence of the production stages, incorporating time, cost and resources needed for production.

### Producing

At Level 6, students implement a range of production processes accurately, consistently, safely/hygienically and responsibly, and select and use personal protective clothing and equipment when necessary. They produce products/systems using complex tools, equipment, machines, materials/ingredients and/or systems components with precision. They clearly explain decisions about the suitability of materials/ingredients, systems components, energy requirements and production techniques based on their understanding of the properties and characteristics of materials/ingredients, and the inputs, processes and outputs of systems.

In response to changing circumstances, they adapt their methods of production and provide a sound explanation for deviation from the design proposal. They make products/systems that meet the quality, aesthetic, functionality and performance requirements outlined in the design brief.

### Analysing and evaluating

At Level 6, students use evaluation criteria they have previously developed, and critically analyse processes, materials/ingredients, systems components and equipment used, and make appropriate suggestions for changes to these that would lead to an improved outcome. They use a range of suitable safe testing methods in this analysis. They relate their findings to the purpose for which the product and/or system was designed and the appropriate and ethical use of resources.

They synthesise data, analyse trends and draw conclusions about the social, cultural, legal and environmental impacts of their own and others' designs and the products/systems, and evaluate innovative new technology in the manufacturing industry.



Definitions of underlined terms are provided in the Glossary (page 121)

# Information and Communications Technology

## Introduction

Information and communications technology (ICT) is the hardware and software that enables data to be digitally processed, stored and communicated. ICT can be used to access, process, manage and present information; model and control events; construct new understanding; and communicate with others.

Information and Communications Technology, as an interdisciplinary domain, focuses on providing students with the tools to transform their learning and to enrich their learning environment. The knowledge, skills and behaviours identified for this domain enable students to:

- develop new thinking and learning skills that produce creative and innovative insights
- develop more productive ways of working and solving problems individually and collaboratively
- create information products that demonstrate their understanding of concepts, issues, relationships and processes
- express themselves in contemporary and socially relevant ways
- communicate locally and globally to solve problems and to share knowledge
- understand the implications of the use of ICT and their social and ethical responsibilities as users of ICT.

Learning in this domain enables students to focus on the task to be accomplished rather than on the technology they are using to do the work. Through the selection and application of appropriate equipment, techniques and procedures, they process data and information skilfully to create information products in forms that are meaningful for themselves and their audience. These products effectively demonstrate their knowledge and understanding of the concepts, issues, relationships and processes that are the subject of the task.

Students are provided with tools and strategies to monitor learning patterns and problem solving strategies. This provides a sound foundation for transforming personal learning. They gain an understanding of Internet protocols and strategies for exchanging information, which enables them to share and challenge their own and other people's ideas and solutions with a global audience.



Definitions of underlined terms are provided in the Glossary (page 121)

# Structure of the domain

The Information and Communications Technology domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, where applicable, a set of standards organised by dimension. A glossary is included which provides definitions of underlined terms (see page 121).

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Information and Communications Technology, standards for assessing and reporting on student achievement apply from Level 2. Standards are organised by dimensions from Level 3.

## Dimensions

Standards in the Information and Communications Technology domain are organised in three dimensions:

- ICT for visualising thinking
- ICT for creating
- ICT for communicating.

### ICT for visualising thinking

In the *ICT for visualising thinking* dimension students use ICT tools to assist their thinking processes and reflect on the thinking strategies they use to develop understanding.

ICT provides a rich and flexible learner-centred environment in which students can experiment and take risks when developing new understanding. Its extensive capabilities allow students, by visually coding and representing their thinking, to clarify thoughts, and to identify patterns and form relationships between new and existing knowledge.



Definitions of underlined terms are provided in the Glossary (page 121)

ICT tools that facilitate visual thinking are ones that allow ideas and information in all areas of the curriculum to be easily and quickly drafted, filtered, reorganised, refined and systematically assessed in order to make meaning for students.

Students use linguistic and non-linguistic representations, such as graphic organisers, ICT-generated simulations and models and ICT-controlled models to help structure their thinking processes and assist in constructing knowledge.

Using ICT, students record their decisions and actions when solving problems and clarifying thoughts. They monitor the changes in their thinking and evaluate their own and others' thinking strategies. Students review these records to assess their suitability for new situations.

### ICT for creating

The *ICT for creating* dimension focuses on students using ICT tools for creating solutions to problems and for creating information products. Through the selection and application of appropriate equipment, techniques and procedures, students learn to:

- process data and information to create solutions to problems and information products that demonstrate their knowledge and understandings of the concepts, issues, relationships and processes related to all areas of the curriculum
- manage their files to secure their contents and enable efficient retrieval
- plan and monitor the progress of extended tasks.

Students learn to use ICT efficiently to capture, validate and manipulate data for required purposes. In order to improve the appearance and functionality of information products and solutions, they apply commonly accepted conventions. They examine the ethical and legal implications of using ICT in a range of settings such as the home, school and the workplace. Students evaluate the usefulness of ICT for solving different types of problems and reflect on the effectiveness of their own use of ICT.

### ICT for communicating

The *ICT for communicating* dimension focuses on students using ICT to:

- present ideas and understandings to audiences
- communicate with known and unknown audiences
- support knowledge-building among teams.

Students use ICT to support oral presentations to live local audiences and to present ideas and understandings to unknown, remote audiences. They use ICT to communicate with others, both known and unknown, with the purpose



Definitions of underlined terms are provided in the Glossary (page 121)

of seeking and discussing alternative views, acquiring expert opinions, sharing knowledge and expressing ideas. Students also locate information from a range of online and multimedia resources to support their own learning.

ICT supports knowledge-building among teams and enables team members to collaborate, enquire, interact and integrate prior knowledge with new understanding.

Protocols for receiving, transferring and publishing ideas and information are needed to promote communication that respects intended audiences.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

The Statements of Learning were developed as a means of achieving greater national consistency in curriculum outcomes across the eight Australian states and territories. It was proposed that they be used by state and territory departments or curriculum authorities (their primary audience) to guide the future development of relevant curriculum documents. They were agreed to by all states and territories in August 2006.

During 2007, the VCAA prepared a detailed map to show how the Statements of Learning are addressed and incorporated in the VELS. In the majority of cases, the VELS learning focus statements incorporate the Statements of Learning. Some Statements of Learning are covered in more than one domain. In some cases, VELS learning focus statements have been elaborated to address elements of the Statements of Learning not previously specified. These elaborations are noted at the end of each learning focus statement.

# Level 6

## Learning focus

As students work towards the achievement of Level 6 standards in Information and Communications Technology, they use complex ICT tools and techniques to visually represent, model, reframe and refine their thinking to assist in developing new understanding. For example, they can represent causal reasoning by using graphic organisers such as cause-and-effect diagrams, influence diagrams and explore and represent the interdependence between

LEVEL 6

Definitions of underlined terms are provided in the Glossary (page 121)

different components of a situation by using expert systems, spreadsheets and microworlds. By changing the values of some variable components, students can visualise the effect of these on the constant components to assist their understanding.

In addition to recording and evaluating the decisions and actions taken when developing new understanding and solving problems, students learn to assess their suitability for new situations and make adaptations where necessary.

Working in real and virtual teams, students collaboratively develop conventions for storing and presenting information (such as style guides, filenames, file structure, file access rights) to create information products and solve problems set in real-world contexts in all areas of the curriculum. They investigate threats to data security, such as accidental loss (failure to follow file management procedures), stealing (files from a network), and data corruption by viruses and hackers. This investigation could focus on the preventative actions taken by businesses within the local community to protect their data and information. They apply ICT techniques and privacy law principles to protect individual and team files from unauthorised access and accidental damage.

Students, individually and in teams, use ICT to make detailed project plans that sequence tasks to be done, resources needed and timelines for completion. They annotate these plans to explain changes made during the execution of tasks. When selecting hardware and software for each task, students consider the capabilities and limitations of these tools and recognise that their choice is influenced by the characteristics of the data to be manipulated. Students consider new or emerging ICT used in workplaces, and how their new capabilities would change the way students process data and information when developing information products.

Students consistently apply commonly accepted ICT presentation conventions and use efficient procedures and techniques to solve problems, and create quality information products that fulfil their purpose. For example, templates, macros and keyboard shortcuts reduce the time taken to process data and increase the accuracy of creating solutions and products. Also, using checklists helps confirm the completeness of products and proofreading assists in detecting typographical and readability errors.

Students accept and respect differences in others' approaches to using ICT for solving problems and designing products, and respect cultural diversity among users of ICT; for example, using icons on a website to indicate functions such as print and mail, which are universally recognised, and using symbols that are not offensive to different cultures. Students use ICT techniques to make their information products accessible to a wide audience, taking into account special needs. For example, providing options to view a website in different font sizes assists visually impaired people, and transcripts of audio material assist the hearing impaired.



Definitions of underlined terms are provided in the Glossary (page 121)

Students develop criteria to evaluate their own and others' work and use them to assess quality and the extent to which the purpose is fulfilled. For example, students compare the quality of their website with a commercial one, taking into account the knowledge and skills typical of professional website designers.

Students build on skills developed in previous levels to share ideas with the teacher and others through a range of electronic communication means such as email, contributing to forums, SMS messaging, and interacting with websites such as Wikipedia (http://en.wikipedia.org/wiki/Main_Page), which allow viewers to make modifications to the content. Students expand their skills in locating information on websites by using general and specialised directories. They refine their searching techniques to get more precise results by using within suitable search engines, proximity operators, which specify where one term in a document must appear in relation to another term. They develop knowledge and understanding about the ethical use of ICT through practical experience, observation of their own and others' behaviour, and by researching strategies for protecting vulnerable users from accessing or receiving unwanted information from the Internet.

### National Statements of Learning

This learning focus statement incorporates the Year 9 National Statement of Learning for ICT.

## Standards

### ICT for visualising thinking

At Level 6, students use a range of ICT tools and data types to visualise their thinking strategies when solving problems and developing new understanding. They use visualising thinking tools and apply ICT techniques to support causal reasoning and to model and describe the dynamic relationship between variable and constant data values to test hypotheses.

Students are efficient and effective in their use of appropriate ICT tools and editing techniques for assisting in visualising thinking. When solving problems, students discriminate between such tools and strategies based on their suitability for problem solving in new situations.

### ICT for creating

At Level 6, students appraise different strategies for organising and managing resources involved in problem solving and creating information products. They use ICT to devise detailed plans that sequence tasks to be done, resources needed, and timelines for completion. They annotate their plans to explain changes made during the project.

Individually, and as team members, students apply a range of techniques, equipment and procedures that minimise the cost, effort and time of processing ICT solutions and maximise the accuracy, clarity and completeness



Definitions of underlined terms are provided in the Glossary (page 121)

of the information. They apply strategies that protect their files from being corrupted, stolen or accidentally lost. Their products demonstrate a clear sense of purpose and respect for the audience. Students apply processing practices that take into account their legal obligations and ethical considerations. They compare their own solutions with others and justify suggestions to improve quality.

### ICT for communicating

At Level 6, students exchange ideas and considered opinions with others through online forums and websites. Students apply techniques to locate more precise information from websites, including searching general and specialised directories, and applying proximity operators. They use accepted protocols to communicate regularly online with peers, experts, and others, expressing their messages in language appropriate to the selected form of communication, and demonstrating respect for cultural differences.

# Thinking Processes

## Introduction

Our world and the world of the future demand that all students are supported to become effective and skilful thinkers. Thinking validates existing knowledge and enables individuals to create new knowledge and to build ideas and make connections between them. It entails reasoning and inquiry together with processing and evaluating information. It enables the exploration of perceptions and possibilities. It also involves the capacity to plan, monitor and evaluate one's own thinking, and refine and transform ideas and beliefs.

The Thinking Processes domain encompasses a range of cognitive, affective and metacognitive knowledge, skills and behaviours which are essential for students to function effectively in society, both within and beyond school.

An explicit focus on thinking and the teaching of thinking skills aims to develop students' thinking to a qualitatively higher level. Students need to be supported to move beyond the lower-order cognitive skills of recall and comprehension to the development of higher-order processes required for creative problem solving, decision making and conceptualising. In addition, they need to develop the capacity for metacognition – the capacity to reflect on and manage their own thinking. This can only happen if the school and classroom culture values and promotes thinking and if students are provided with sufficient time to think, reflect, and engage in sustained discussion, deliberation and inquiry. Students need challenging tasks which stimulate, encourage and support skilful and effective thinking.

A focus on the development of thinking competencies within specific areas of the curriculum and across it not only serves as a core integrative function, it also has the potential to provide continuity in approaches to learning from Prep to Year 10 and to emphasise the view that such knowledge, skills and behaviours are important to lifelong learning. To emphasise this, teachers model skilful and effective thinking and make their own thinking explicit as part of their everyday practice.

Thinking skills can be defined in a variety of ways. Many different taxonomies and models for teaching thinking have been developed. Each classification scheme has its strengths and weaknesses. However, whatever the system or systems being used, all seek to improve the quality of student thinking.

## Structure of the domain

The Thinking Processes domain is organised into six sections, one for each level of achievement from Level 1 to Level 6. Each level includes a learning focus statement and, from Level 3, a set of standards organised by dimension.

## Learning focus

Learning focus statements are written for each level. These outline the learning that students need to focus on if they are to progress in the domain and achieve the standards at the levels where they apply. They suggest appropriate learning experiences from which teachers can draw to develop relevant teaching and learning activities.

## Standards

Standards define what students should know and be able to do at different levels and are written for each dimension. In Thinking Processes, standards for assessing and reporting on student achievement apply from Level 3.

## Dimensions

Standards in the Thinking Processes domain are organised in three dimensions:

- Reasoning, processing and inquiry
- Creativity
- Reflection, evaluation and metacognition.

### Reasoning, processing and inquiry

The *Reasoning, processing and inquiry* dimension encompasses the knowledge, skills and behaviours required to enable students to inquire into the world around them, and to use critical thinking to analyse and evaluate information they encounter. Students learn to assemble and question information and develop opinions based on informed judgments. They also develop the capacity to transform information into coherent knowledge structures.

### Creativity

The capacity to think creatively is a central component of being able to solve problems and be innovative. In the *Creativity* dimension, students learn to seek innovative alternatives and use their imagination to generate possibilities. They learn to take risks with their thinking and make new connections.

### Reflection, evaluation and metacognition

Learning is enhanced when individuals develop the capacity to reflect on, and refine their existing ideas and beliefs. In the *Reflection, evaluation and metacognition* dimension, students learn to reflect on what they know and develop awareness that there is more to know. They learn to question their perspectives and those of others. They evaluate the validity of their own and others' ideas. They also develop their metacognitive skills in planning, monitoring and evaluating their own thinking processes and strategies.

## National Statements of Learning

The Victorian Essential Learning Standards (VELS) incorporate the opportunities to learn covered in the national Statements of Learning (www.curriculum.edu.au/mceetya/the_statements_of_learning,11893.html). The Statements of Learning describe essential skills, knowledge, understandings and capacities that all young Australians should have the opportunity to learn by the end of Years 3, 5, 7 and 9 in English, Mathematics, Science, Civics and Citizenship and Information and Communication Technologies (ICT).

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# Level 6

### Learning focus

As students work towards the achievement of Level 6 standards in Thinking Processes, they become discriminating thinkers, capable of making informed decisions about controversial and complex issues. They are supported to put effort into sustained thinking in order to construct deep understanding of key concepts across the curriculum. They continually reflect on their own thinking and identify assumptions that may influence their ideas. They seek to develop coherent knowledge structures and recognise gaps in their understanding. They are challenged to identify, use, reflect on, evaluate and modify a variety of effective thinking strategies to inform future choices.

Students begin to formulate and test hypotheses, contentions and conjectures and to collect evidence to support or reject them. They develop their skills in synthesising complex information and solving problems that include a wide range of variables. Students develop questioning techniques appropriate to the complexity of ideas they investigate, to probe into and elicit information from varying sources. They work with others to modify their initial questions and to develop further their understanding that sources of information may vary in their validity.

Students explore differing perspectives and issues in depth and identify a range of creative possibilities. They are encouraged to examine and acknowledge a range of perspectives on an issue and to accommodate diversity. They engage positively with novelty and difference and are innovative in the ways they define and work through tasks, and find solutions. They practise creative thinking behaviours and strategies to find solutions, synthesise information and understand complex ideas.

In inquiry projects, students select appropriate strategies and connect existing knowledge and new knowledge to process and organise information. They begin to analyse the relationships between ideas, and synthesise these to form coherent knowledge.

Students recognise that different disciplines use different methodologies to create and verify knowledge. They investigate a variety of discipline-based methodologies and reflect on their usefulness in different contexts; for example, the application of the scientific methodology of hypothesis, observation, data collection and conclusion in contexts other than science. They continue to evaluate their solutions using appropriate criteria and identify assumptions that may underpin a particular line of reasoning.

## Standards

### Reasoning, processing and inquiry

At Level 6, students discriminate in the way they use a variety of sources. They generate questions that explore perspectives. They process and synthesise complex information and complete activities focusing on problem solving and decision making which involve a wide range and complexity of variables and solutions. They employ appropriate methodologies for creating and verifying knowledge in different disciplines. They make informed decisions based on their analysis of various perspectives and, sometimes contradictory, information.

### Creativity

At Level 6, students experiment with innovative possibilities within the parameters of a task. They take calculated risks when defining tasks and generating solutions. They apply selectively a range of creative thinking strategies to broaden their knowledge and engage with contentious, ambiguous, novel and complex ideas.

### Reflection, evaluation and metacognition

At Level 6, when reviewing information and refining ideas and beliefs, students explain conscious changes that may occur in their own and others' thinking and analyse alternative perspectives and perceptions. They explain the different methodologies used by different disciplines to create and verify knowledge. They use specific terms to discuss their thinking, select and use thinking processes and tools appropriate to particular tasks, and evaluate their effectiveness.

# Glossary

**aesthetics**

The appreciation of, and sensitivity towards, works of art, designs, products, objects or artefacts.

**algebra**

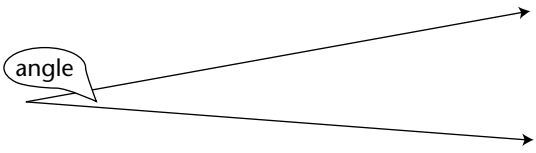
Refers to both the process of *manipulating* variables and constants in a mathematical expression according to fixed laws, properties or rules; for example, simplifying an expression or solving an equation; and alternatively to a *mathematical structure* whose elements and operations satisfy a given *collection of laws*. The word algebra comes from the work of the Arabic scholar *Abu Abd-Allah ibn Musa al'Khwarizmi*, who was born about 790 AD near Baghdad, and died about 850 AD. Khwarizmi wrote one of the first books *Hisab al-jabr w'al-muqabala* on what is now called algebra in 830 AD. *Al-jabr* refers to the process of moving a subtracted quantity to the other side of an equation while *al-muqabala* involves subtracting equal quantities from both sides of an equation. In 1140 AD this text was translated into Latin as *Liber algebrae et almucabala*, from which the word algebra has become part of mathematical language.

**algorithm**

A process for computation that can be carried out mechanically; for example, the algorithm for subtraction of many-digit decimal numbers, or the algorithm for factorisation of a linear expression using the distributive rule. The word *algorithm* comes from the old English *algorisme*, from a Latin translation of the name of the ninth century AD Arabic scholar *al-Khwarizmi*, who investigated computation using the Hindu numeration system (leading to the Hindu-Arabic number system of today).

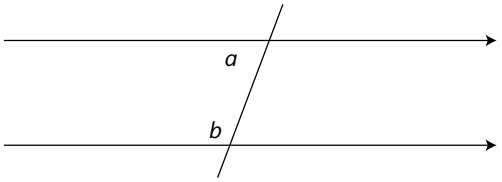
**angle**

An angle is formed at the point of intersection of two rays:

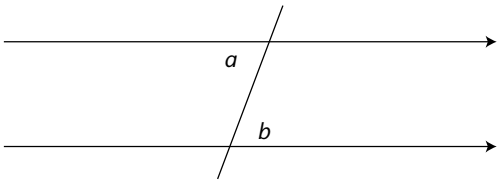



Angle *measure* is commonly based on the amount of turn between two rays with a common point. There are three common measures of angle: *fraction of a full turn*, *degree* and *radian*.
A full turn = 360 degrees = $2\pi$ radian.
A half turn = 180 degrees = $\pi$ radian.

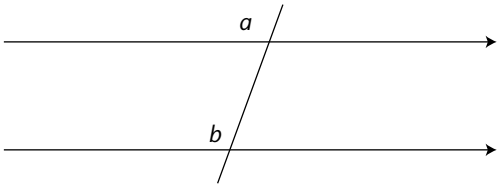
- **allied or co-interior (angles)**: Angles which are between two parallel lines, adjacent to a transversal cutting that pair of parallel lines and sum to 180 degrees are said to be *allied* or *co-interior* angles, for example angles *a* and *b* in the following diagram:



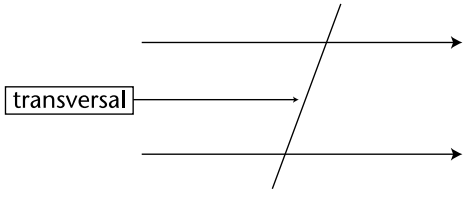

- **alternate (angles)**: Angles which are symmetrically located under a half turn with respect to the midpoint of a transversal cutting a pair of parallel lines are said to be *alternate* angles, for example angles *a* and *b* in the following diagram:




- **corresponding (angles)**: Angles which are in the same relative position with respect to a transversal cutting a pair of parallel lines are said to be corresponding angles, for example angles *a* and *b* in the following diagram:




- **supplementary (angles)**: Angles at a point on a line that sum to 180 degrees are said to be supplementary angles.
- **transversal**: A line that cuts a pair of parallel line obliquely




**approximate**

To obtain a value to a particular accuracy. For example, the fraction $\frac{22}{7}$ provides an approximate value for the irrational real number $\pi$. Rounded correct to 4 decimal places, $\frac{22}{7}$ has the value 3.1429

while π has the value 3.1416. These values are themselves decimal approximations to $\frac{22}{7}$ and $\pi$ respectively. While it is not possible to trisect any angle *exactly* using only a compass and rules, it is possible to approximate such a trisection with reasonable accuracy.

### arts disciplines

Arts disciplines encompass distinct bodies of knowledge each with its own conventions, skills, expressive forms and language involving creation and performance, aesthetics, traditions, contexts and analysis. Schools use the six disciplines of Art, Dance, Drama, Media, Music and from Level 5, Visual Communication as the starting points for delivery of student learning programs in the Arts.

### arts elements, principles and/or conventions

#### arts elements

The visual, tactile, sonic and spatial qualities and sensory components used to create and talk about two-dimensional, three-dimensional and time-based arts works. Arts elements traditionally associated with particular arts disciplines and forms include:

- *Art*: line, shape, space, texture, colour, form, tone, movement, surface, composition, sound
- *Dance*: space, time, energy, the body. Dance also uses production elements including music, sound, projected image, costume, make-up, properties, lighting and set-design
- *Drama*: voice, movement, gesture, focus, language, sound, silence, tension, conflict, climax, contrast, mood, symbol. Drama also uses stagecraft elements including acting, direction, dramaturgy, stage management, sound effects and/or accompaniment, properties, lighting, costume, make-up and set design
- *Media*: sound, colour, movement, light, images, pattern
- *Music*: pitch (melody and harmony), duration (rhythm, time and metre), dynamics and volume, tempo, tone colour, texture/timbre, instrumentation, tonality, articulation
- *Visual communication*: point, line, shape, tone, colour, texture, colour, letterform, sound.

Contemporary arts works often combine elements from a range of traditional arts disciplines and forms.

#### arts principles and/or conventions

Ways arts elements are used, arranged, manipulated and/or organised to create arts works. Arts principles are sometimes referred to as design principles and may also be referred to as compositional or structural devices or conventions; for example, theatrical conventions.

Arts principles and/or conventions include: unity, balance, harmony, distortion, abstraction, juxtaposition, contrast, space, hierarchy, level, scale, symmetry/asymmetry, proportion, cropping, repetition, relationships, pattern, sequence, emphasis, movement, rhythm, augmentation, diminution, variation, tension and release.

### arts forms

Arts works can be categorised as forms representative of particular formal and informal fields, genres, products and/or structures. This categorisation is generally determined by characteristics of the work such as the organisation of and relationships between arts elements in the work and/or specific technical, aesthetic and/or expressive qualities evident in the work. Some arts forms are traditionally associated with particular arts disciplines although these distinctions are less influential in the categorisation of contemporary arts works which are frequently described as being for example, 'multi-disciplinary' and/or in a 'hybrid form'.

Arts forms associated with specific disciplines include:

- *Art*: two-dimensional, three-dimensional, digital, collage, drawing, painting, photography, print-making, sculpture, textile/fibre (for example, tapestry, weaving, costume), installation, performance art, mask-making, mixed-media, ceramics, conceptual
- *Dance*: improvisation, learnt movement material, self- or group-devised, set movement material, solo, duet/partner dance, ensemble/group. Dance includes many genres which in turn each encompass a range of styles: for example, the genre of Classical Ballet includes styles such as Romanticism and Neo-Classicism; Contemporary Dance includes styles such as Graham, Cunningham, Limon and Horton; folk and ethnic genres include traditional dance forms of countries, cultures and indigenous societies, Musical Theatre and Commercial dance genres include jazz dance, funk, hip hop and tap
- *Drama*: story-telling, mime, puppetry, improvisation, spontaneous dramatic play, role-play, movement, process drama, enactment, devised drama, scripted drama, monologue, ensemble work, physical theatre, dance drama, theatrical forms such as poor theatre, or commedia dell'arte

- *Media*: television programs, film, video, photography, interactive CD-ROMs/DVDs, computer/electronic games, radio, print layout (for example, magazine, newspaper), sequence, collage, role-play, animation, claymation
- *Music*: instrumental, vocal, soundscape, composition, improvisation. Other music forms are based on compositional structures; for example, symphony, raga, blues, and song-form
- *Visual communication*: map, graph, symbol, diagram, chart, illustration, instrumental drawing, architectural drawing, three-dimensional model/form, poster, flyer/brochure, package, logo/corporate identity, two-dimensional layout, multimedia.

**arts language**

Arts language is used throughout the Arts domain as an umbrella term for 'arts language, arts terminology and arts expressions'. Each of these facilitates the range of learning required in the Arts domain. Students can learn to speak/write about their works, about other people's works, they can learn to use symbol systems as appropriate and they can develop skills in speaking about arts in terms of content and use of technique, process, elements, principles and/or conventions, media, materials, equipment and technologies. Arts language includes:

- Arts language – aesthetic, oral, visual, symbolic including notation, gestural, physical, kinaesthetic and/or written language used in an agreed way to portray, communicate, describe, discuss, analyse, evaluate, and/or comment on arts works, events, ideas and/or concepts; for example, the symbol system that is Western music notation, or the symbols used by Cecchetti to document choreography and techniques.
- Arts terminology – formal learned terms used in particular ways to define, explain, and show recognition of and/or understandings specific to each arts discipline. Arts specific terms are associated with specific arts disciplines; for example, in Art, formal elements such as line, shape and/or texture. Many of these terms are used in more than one arts discipline and the meaning across disciplines can have strong connections (for example, sequence in Music and Media). More generally, however, the meaning is different between disciplines; for example, tone in Drama and Visual Arts.
- Arts expressions – words and phrases often associated with particular aesthetic perspectives and/or the vernacular of cultural artistic communications and aesthetic interpretations that are subject to change over time. For example, arts expressions such as 'primitive understanding' or 'soulless expression' can be used in arts works and commentaries/analyses etc. to communicate ideas, meanings, messages, observations, perceptions and/or concepts. Often these expressions combine formal terms and more colloquial language; for example, 'mise en scene' or 'structured improvisation'. Arts expressions are also used to communicate affective understandings; for example, a description of a movement phrase from a dance work such as 'crumpled up like a dried leaf'. Arts expressions vary according to the perceptions and understandings of the user and the audience and are dependent on cultural and experiential contexts.

**associative**

An operation is *associative* if the result of applying the operation to any three elements of an expression is the same regardless of which pair of elements (without changing their order) is combined first.

Addition and multiplication *are* associative on the set of natural numbers, for example:

$4 + (7 + 5) = 4 + 12 = 16$ and $(4 + 7) + 5 = 11 + 5 = 16$

$2 \times (3 \times 4) = 2 \times 12 = 24$ and $(2 \times 3) \times 4 = 6 \times 4 = 24$

Subtraction and division are *not* associative on the set of natural numbers, for example:

$10 - (4 - 2) = 10 - 2 = 8$ but
$(10 - 4) - 2 = 6 - 2 = 4$

$24 \div (12 \div 2) = 24 \div 6 = 4$ but
$(24 \div 12) \div 2 = 2 \div 2 = 1$

In general the *associative* laws (properties) for addition and multiplication of real numbers state respectively that *for all* real numbers $a$, $b$ and $c$:

$a + (b + c) = (a + b) + c$ and $a \times (b \times c) = (a \times b) \times c$

**assumption**

A proposition which is taken as being true with respect to a given context. For example, in a modelling problem to design a seating arrangement in a theatre, it may be assumed that the height of the people watching the movie is no greater than 200 cm.

**bi-variate (data)**

Data relating to the simultaneous measurement of two variables; for example, age and income.

**cause-and-effect diagrams**

Graphic organisers that enable the visual representations of possible causes of problems or events, and the effects of those causes.

**chance and likelihood**

The relative frequency of an event, this may be expressed qualitatively using terms such as: impossible, no chance, not likely, an even change, odds-on, likely, a certainty, or quantitatively using numbers on a scale from 0 (impossible) to 1 (certain). These numerical values are often expressed as fractions such as $\frac{1}{2}$, ratios such as 2:3, decimals such as 0.87 or percentages such as 40%.

**closure**

The result of carrying out an operation on an element of a set, or elements of a set, is also an element of that set. For example, multiplication is closed on the set of natural numbers, because the result of multiplying any pair of natural numbers is also a natural number. Division is *not* closed on natural numbers, since 9 and 2 are both natural numbers, but the result of dividing 9 by 2 is not a natural number: $9 \div 2 = \frac{9}{2} = 4.5$, and 4.5 is a decimal fraction, not a natural number.

**commutative**

An operation is *commutative* if the result of applying the operation to any two elements of a set is the same, regardless of the order of the elements. Addition and multiplication *are* commutative on the set of natural numbers, for example:

$6 + 12 = 18 = 12 + 6$ and $6 \times 12 = 72 = 12 \times 6$

but subtraction and division are not commutative for example:

$6 - 12 = -6$ but $12 - 6 = 6$ and $6 \div 12 = \frac{1}{2}$ but $12 \div 6 = 2$.

In general the *commutative* laws (properties) for addition and multiplication of real numbers state that *for all* real numbers $a$ and $b$, $a + b = b + a$ and $ab = ba$, respectively.

**complement (set)**

The set of all elements *not* in a given set with respect to the universal set for a particular context or situation. For example, if the universal set in a particular situation is taken to be the letters of the alphabet, the complement to the set of vowels is the rest of the alphabet. If the universal set in a particular situation is taken to be the set of numbers {1, 2, 3, 4, 5, 6, 7, 8, 9, 10}, then the complement to $A = \{4, 5, 6\}$ is {1, 2, 3, 7, 8, 9, 10}. The complement of $A$ is written as $A'$ or $\overline{A}$.

**component**

A part that makes up a whole, particularly in reference to a system. Examples of mechanical components include gears and pulleys and electrical/electronic components include batteries, switches and diodes.

**congruence**

The property of being *identical* in shape and dimensions. Two shapes are congruent if one of them can be mapped onto the other by transformations that do not change the length of line segments or the angle between lines.

**conjecture**

A statement whose truth or otherwise is not yet determined, but is open to further investigation, for example, *Golbach's Conjecture: 'every even natural number greater than 2 can be expressed as a sum of two prime numbers'*. First stated in 1742, the Golbach conjecture has not yet been either proven to be true or shown to be false, although many mathematicians intuitively believe that it is true.

**connective**

A logical term that connects or qualifies other expressions, such as 'and', 'or', 'not', 'if ... then ...' and 'is equivalent to'. For example, given a set of attribute blocks, specifying the blocks that are red and square involves two attributes 'red', 'square' which apply to some blocks but not to others. The use of the connective *and* to specify 'red' *and* 'square' required both attributes to apply.

**constant**

A number that has a fixed value in a given context. For example, in the calculation of $n + 11$ for different natural numbers $n$, the number 11 is a *constant*. In formulas such as $P = 4 \times l$, 4 is a *constant* while $P$ and $l$ are *variables*.

**constraint**

A condition which is applied in a given context; for example, in solving the equation $3x + 2y = 24$ a *constraint* may be that only natural number solutions are required (there are an infinite number of integer solutions).

**continuous**

Can in principle assume all possible values in a given interval. For example, height is a continuous data measurement. While the actual height of a person can only be physically measured to a given accuracy, it is possible in principle for a for person's height to be any value within a typical range of heights for a human being.

**conventions**

Commonly understood or accepted ways of doing something (for example, including a postcode in an address; displaying file size and download time required for video links in a webpage).

**cost-benefit analysis**

A cost-benefit analysis provides an economic framework which can be used to evaluate the viability of proposed solutions to issues or problems, in terms of the associated costs and benefits. The information gathered through this analysis assists decision making about resource allocation and the likely consequences of proposed solutions.

**counting**

The process of listing a subset of the set of natural numbers $N = \{0, 1, 2, 3 \ldots\}$ in consecutive order; for example {0, 1, 2, ...} or {11, 12, 13, ...}.

**criteria**

For information products include suitability for audience, accuracy, readability, effective use of colour, functional navigation links, and communication of intended meaning.

**degree**

Measure of angle where a full rotation around a fixed point corresponds to 360 degrees.

**design**

A vital step in transforming ideas into creative, practical and commercial realities. Design optimises the value of products and systems and is therefore an important key to economic, social and cultural development.[1] Other definitions of design include to plan or fashion artistically or skilfully, usually in working detail; to form or conceive in the mind; a scheme of attack; to intend for a definite purpose; an adaptation of means to ends; an outline, sketch or plan. Design may also involve production, and evaluating products in a real context.

**design brief**

A statement that contains an outline of a situation, context, problem, need or opportunity, and specifications that apply to the problem. It is a means by which students can develop and apply knowledge and skills to solve problems. Design briefs can vary in the amount of information they provide and the way in which this information is presented. Both of these are usually determined by the level at which the students are working. Design briefs can be developed entirely by the teacher, or with varying degrees of student input.

**discrete**

Can only assume a countable number of data values. For example, shoe size is a discrete data measurement.

**distributive**

An operation is said to be *distributive* over another operation if it can take priority over the operation used for combination within brackets (that is, its application can be distributed over the brackets). *Multiplication* is distributive over *addition* for real numbers, for example:

$6 \times 17 = 6 \times (10 + 7) = (6 \times 10) + (6 \times 7) = 60 + 42 = 102$

The distributive property underpins algorithms for multiplication and division that involve natural numbers of several digits. In general the *distributive law* (property) for (multiplication over addition) for real numbers states that for *all* real numbers $a$, $b$ and $c$:

$a(b + c) = ab + ac$.

Addition is *not* distributive over multiplication, for example:

$3 + (2 \times 4) = 3 + 8 = 11$ but
$(3 + 2) \times (3 + 4) = 5 \times 7 = 35$

**division**

For a finite set this is the process of partitioning the set into subsets of equal size. For natural numbers division re-expresses a given natural number in terms of a multiple of a smaller natural number and a remainder. For example $68 = 7 \times 9 + 5$, so 68 *divided by* 9 is equal to 7 with 5 remainder. Using rational numbers in fraction form this is expressed exactly as:

$$68 \div 9 = \frac{68}{9} = 7\frac{5}{9}$$

In general, for real numbers, if $xy = z$ then

$z \div y = \frac{z}{y} = x$, unless $y = 0$ in which case the process is not defined.

- **partition**: To divide into separate parts which together constitute the whole. For example, the letters of the alphabet can be partitioned into vowels and consonants, the set of natural numbers can be partitioned into those with remainder 0, 1 or 2 on division by 3.

**ecological footprint**

An ecological footprint (or eco-footprint) is a measure of our ecological performance. It tracks the quantity of resources individuals (or organisations, cities, regions, nations or the global population) consume and compares this amount to the resources nature can provide. It indicates how much biologically productive land and water area a given population occupies in order to produce the resources it consumes and to absorb its waste, using prevailing technology.

**edge**

A straight line or curve that forms the boundary of a region in the plane (such as the side of a triangle, or an edge in a network) or a boundary between two surfaces (such as the rim of a can or the edge of a box).

- **adjacency**: Two edges in a shape are said to be adjacent if they meet at a common vertex; similarly, two faces in a shape are said to be adjacent if they meet at a common edge.

**efficiency**

Measured in terms of the effort, speed and cost of creating a solution or information product. For example, students explore techniques such as using short-cuts and macros to increase the speed of processing and reduce effort.

**emerging sciences**

Traditional science discipline boundaries are being revised as new knowledge in science creates broader and novel applications of science. The emerging sciences include:

- **Nanotechnology**
  Further information can be found at <www.nano.gov>
- **Biotechnology**
  Further information can be found at <www.gtac.edu.au> and <www.biotechnology.vic.gov.au>
- **Green chemistry**
  Further information can be found at <www.chem.monash.edu.au/green-chem>
- **Synchrotron science**
  Further information can be found at <www.synchrotron.vic.gov.au>

**empirical**

Derived from observation, measurement or experiment.

**energy**

Energy is defined as the amount of work required to change the state of a physical system. Energy may be classified as *potential* (stored) energy or *kinetic* (moving) energy. Forms of energy include thermal, mechanical, electrical, gravitational, elastic, chemical, heat, light and sound. Energy may be transformed from one form into another. The presence of energy is revealed only when a change takes place. Animals obtain their energy from food. Toasters and washing machines use electricity as their energy supply.

**equivalence**

Two statements or propositions are understood to be equivalent if they are *both* true or *both* false. That is, the conditions which make one true make the other true as well, and the conditions which make one false make the other false as well.

**error**

Is the difference between an actual value and its measured or estimated value and is defined as:

error = measured or estimated value – actual value

**estimate**

To form an approximate value for a quantity.

**everyday texts**

Everyday texts include spoken, print and non-print texts that are part of daily life. They include, for example, classified advertisements, personal letters, telephone conversations, messages, instructions, labels, electronic mail and web pages. Everyday texts also include newsletters, notices, signs and timetables associated with the specialised demands of schooling. In general terms, the English curriculum gradually shifts in emphasis from simple everyday texts used in the home and school for personal, informal purposes towards more formal and complex everyday texts used in the home and the wider community.

**expert system**

A computer program that uses a set of predetermined rules for providing answers to questions by drawing on a stored knowledge base developed from the knowledge of experts in a particular field such as medicine or automotive engineering. They simulate how human experts solve problems.

**factorial**

The number formed by the product of a given natural number with all the natural numbers less than it down to 1. For example 4 *factorial* is $4! = 4 \times 3 \times 2 \times 1 = 24$.

**financial literacy**

The ability to make informed judgments and to take effective decisions regarding the use and management of money.[2]

**finite**

The set {*a*, *b*, *c*, *d*, *e*} is an example of a finite set. The set of all people alive on a given day is a very large, but finite set. The cardinal number of a finite set is a natural number, that is, the elements of any finite set can be put in a one-to-one correspondence with the elements of a set of the form {0, 1, 2, 3, ... , *n*} where *n* is a natural number.

**formal unit**

A unit whose value is fixed by agreement; for example, litre is a formal unit of capacity for fluids and hour is a formal unit of time.

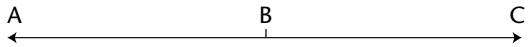
**function**

A correspondence (map or relation) between the elements of two sets where each element in the first set is mapped to exactly one corresponding element in the second set. A function is either a one-to-one correspondence or a many-to-one correspondence.

- **dependent variable**: The variable associated with the *range* of a relation. For a function $f$ with rule $y = f(x)$, $y$ is the dependent variable.
- **independent variable**: The variable associated with the *domain* of a relation. For a function $f$ with rule $y = f(x)$, $x$ is the *independent* variable.

**golden ratio (phi φ)**

Is the irrational number whose value is given by the proportion AC : AB = AB : BC where A and C are the endpoints of a line segment and B is the point on the line segment between A and C such that AC : AB = AB : BC




It is called the golden ratio as it is believed to represent a proportion of lengths that is aesthetically attractive to the human eye in art and design contexts. The exact value of φ is $^{(1+\sqrt{5})}/_{2}$ and its approximate value is 1.618 correct to 3 decimal places. The decimal expansion for *phi* to 100 significant figures is:

1.61803398874989484820458683436563811772030917980576286213544862270526046281890244970720720418939113 7.

The digits in this decimal expansion do not display any recurring pattern, a property which distinguishes irrational numbers from rational numbers.

**graph**

A visual representation of data or functions. Cartesian graphs of functions and relations are plots of ordered pairs of values $(x, y)$ that represent the function or relation relative to $x$ and $y$ coordinate axes and the fixed origin (0, 0). Statistical graphs include dot plots, box and whisker plots, bar graphs and histograms.

**graphic/visual organisers**

Frameworks that help students structure their thinking processes (including concept maps, time-sequence patterns, cause-and-effect patterns, flow charts). They are visual frameworks, which help students make connections between existing knowledge and new information, and make visible their thinking processes. Electronic templates can be created by teachers, or students can use available software for generating them.

**ICT-controlled models**

Tools used to control devices or actions in a pre-determined way; for example, controlling a robot.

**ICT presentation conventions**

Commonly accepted guidelines for layout and presentation of information.

**ICT tools**

The range of hardware and software available to perform particular functions. For example, software such as spreadsheets can perform mathematical calculations; a digital camera can capture images.

**identity**

An element of a set which when combined (using a given operation) with any other element of the set leaves that element unchanged. For example, 0 is the identity element for addition of natural numbers, since for any natural number n it is the case that $0 + n = n$ and $n + 0 = n$. Similarly, 1 is the identity element for multiplication of natural numbers, since for any natural number $n$ it is the case that $1 \times n = n$ and $n \times 1 = n$.

**implication**

A statement of the form *if ... then ...* An implication is understood to be *true* unless the *first* part of the statement is *true* but the second part of the statement is *false*.

**inclusion (subset)**

A set $A$ is a subset of another set $B$ if all of the elements of $A$ are also elements of $B$. For example, if $A$ = {vowels} and $B$ = {letters of the alphabet} then $A$ is a (proper) subset of $B$, written symbolically as $A \subset B$. In the case where $A$ is required to be a subset of $B$, but may include all of the elements of $B$ then this is represented symbolically by $A \subseteq B$.

**inference**

An assertion made on the basis of analysis from given data or propositions; for example, on the basis of the weather patterns observed over several years, a farmer might infer that it is likely to be a hot summer.

**influence diagram**

A graphic organiser that enables the visual representation of the relationship between the components of a system, or the elements in a process, that identifies the components/elements that will be affected by particular decisions.

**infinite**

The set of natural numbers $N = \{0, 1, 2, 3 \ldots\}$ is an example of an infinite set. There are many examples of infinite sets, the set of all prime numbers is an infinite set (there is no largest prime number). The set of natural numbers, $N$ , is an example of an infinite set which has a smallest element, 0, but no largest element. The set of integers $Z = \{\ldots -3, -2, -1, 0, 1, 2, 3 \ldots\}$ is an example of an infinite set which has no smallest or largest element. The set $\{0.9, 0.99, 0.999, 0.9999, \ldots , 1\}$ is an example of an infinite set which has both a smallest element, 0.9, and a largest element, 1. It is *not* possible for the elements of any infinite set to be put in a one-to-one correspondence with the elements of a set of the form $\{0, 1, 2, 3, \ldots , n\}$ where $n$ is a natural number.

**informal unit**

A unit whose value is decided on in a given context, for example, the use of a pace to measure distance or the use of a cupped hand to measure capacity of rice for a meal (irregular informal units). An informal unit may also be regular, such as the use of paperclips to measure length or a drinking glass to measure a small amount of a substance (capacity).

**information product**

Output created by students using ICT tools, functions and techniques to demonstrate their knowledge or understanding of ideas, concepts and processes from different areas of the curriculum. Typically printed or displayed on-screen; in some cases, output is an action as a result of students using an ICT-controlled model; examples include reports, slide shows, multimedia, cartoons, tables, websites and programs used to control robots.

**innovative/innovation**

To be innovative is to do something different, to explore new territory or to take a risk and is often seen as an outcome of the broad exploration of ideas, materials, and technical processes that can occur during the design and technology process.[3] Technology has also been defined as 'human innovation in action'.[4] Creativity, defined as 'the application of knowledge and skills in new ways to achieve a valued goal',[5] is frequently linked with innovation.

**integer**

An element of the infinite set of numbers $Z = \{\ldots -3, -2, -1, 0, 1, 2, 3 \ldots\}$, sometimes also referred to as a positive or negative whole number.

**intersection (set)**

Given two sets A and B, their intersection, written $A \cap B$, is the set of all elements common to both sets. If $A$ and $B$ have no elements in common then their intersection is the empty set $\{\ \}$. For example, if $A = \{ a, b, d, z \}$ and $B = \{ a, c, x, y, z \}$ then $A \cap B = \{ a, z \}$; however, if $C = \{ m, n \}$ then $A \cap C = \{\ \}$.

**invariance**

The property of not changing under a process such as transformation; for example, the points on a mirror line are invariant under the transformation of reflection in that mirror line. If a person touches a mirror with their finger, then the point of contact will be invariant under reflection in the mirror, all other points their image will have left- and right-hand senses reversed.

**inverse**

For each element of a set its inverse with respect to a given operation defined on the set is the element in the set which, when they are combined using the operation result in the identity element. For example, the inverse of the integer +4 with respect to the operation of addition is the integer –4 since $+4 + (-4) = 0$ and $-4 + (+4) = 0$. The inverse of the rational number $\frac{2}{3}$ with respect to the operation of multiplication is the rational number $\frac{3}{2}$ since $\frac{2}{3} \times \frac{3}{2} = \frac{1}{1} = 1$.

**investigation**

- In Mathematics, investigation is an exploration of a situation or context.
- In Science, investigations provide students with the opportunities to frame and pose questions which can be tested scientifically. Students work independently or in small groups or teams. They plan their work and select processes and equipment with attention to safety and draw conclusions from their data. They comment on the accuracy and reliability of the processes used and data collected, and complete a report of their investigation which can be presented in a range of formats.

**irrational number**

A number that cannot be expressed as a fraction in the form $\frac{m}{n}$ , where $m$ and $n$ are integers and $n$ is non-zero. The decimal form of such numbers does not terminate, and is non-recurring, that is, there is no finite sequence of digits that repeats itself. For example, $r = 0.12345678910111213$ is part of the decimal expansion of an irrational real number. Numbers such as $\sqrt{2}$, the golden ratio $\varphi$, and $\pi$ are examples of irrational numbers.



**literacies**

The term literacies encompasses the distinct language aspects of each subject such as the specialised language used to describe and analyse key concepts and the typical forms and conventions used to convey meaning. Through understanding of the literacies of the contexts in which they are working, students learn to make choices about the appropriate language to present ideas and information effectively for different purposes and audiences.

**literary texts**

Literature, which is fundamental to the English curriculum, uses language to represent, re-create, shape and explore human experience. Literary texts can be based on fiction or fact and includes written and spoken texts. Examples include picture storybooks, traditional stories, speeches, novels, short stories, plays, poetry, translated works, non-print texts and non-fiction works such as biographies. Through reading, writing, listening to and talking about literature, students extend their understanding of the world and of themselves, and they see how cultural beliefs and values are formed.

**location**

A description of position with respect to some fixed reference.

**logic**

Principles of reasoning where one proposition is deduced from other propositions.

**macroeconomic**

The study of economics concerned with the behaviour of the economy as a whole, focusing on the overall (aggregate) performance.

**magnitude**

The size, or absolute value of a number; for example, both +5 and -5 have magnitude 5. The magnitude of certain numbers can only be approximated to a given accuracy, for example the magnitude of the number *pi*, correct to two decimal places, is 3.14.

**mass**

Mass and weight are not the same. In science these words have special meanings. Mass is a measure of the amount of matter (material) in an object and is commonly measured in grams (g) or kilograms (kg).

**material/s**

A material is a natural or synthetic resource that can be processed into a product by the use of tools and equipment. Examples of materials that students learn about and manipulate are wood, fibres/fabrics/textiles, soils, metals, plastics, foods, plants and a variety of composites. The characteristics and properties of materials can influence the nature of products. In choosing materials, students need to think carefully about technical, social, cultural, economic, legal, environmental and ecological considerations. These considerations influence student decision making about the appropriateness of materials.

**Material Safety Data Sheets (MSDS)**

MSDS provide the information needed to allow the safe handling of hazardous substances used at the workplace. Schools are required to comply with these procedures for the management of hazardous substances. An MSDS should provide sufficient information to enable users of the hazardous substances to handle them safely, to understand their potential dangers and to take appropriate action in case of an emergency.

**measure**

A measure is a record of the magnitude of an attribute (such as weight, length, time, and likelihood) associated with an object or event.

**media, materials, equipment and technologies**

Two-dimensional, three-dimensional, time-based, sonic and physical objects and/or resources found in the natural and human environments and used to make and/or present arts works.

Media, materials, equipment and technologies often associated with traditional arts disciplines include:

- *Art and Visual communication*: two-dimensional and three-dimensional, hard, soft, wet, dry, papers, clays, videotape, pens, pencils, wire, crayons, washes, woods, metals, information and communications technology hardware and software, paints, dyes, cameras, natural (for example, shells, leaves, grasses, rice, sand, pasta), threads, plastics, film, canvas, fabric, moulds, glues, glass, light, cards, water, markers, chalks, plasticine, papier maché, straws, kiln, knives, sponge, ceramicists' tools (for example, clay-cutter, tools for creating decorative effects), silk-screen, balloons
- *Dance*: the body, whole or part body movements, locomotor and non-locomotor gestures and actions, dance studio/rehearsal room, music, technologies to support dance-making processes and presentation such as sound, lighting, make-up, properties, costume and information and communications technologies

- *Drama*: the body, voice, acting space, stimulus materials (for example, books, music, film/video, personal experience, pictures, myths, environments), technologies to support drama processes, production and presentation such as sound, lighting, properties, make-up, costume and information and communications technologies
- *Media*: images, sounds, objects, digital, recycled materials, technologies for making and recording and/or manipulating images and sounds (for example, film, camera, editing software), technologies for presenting media products
- *Music*: voice, instruments (acoustic, electronic, digital), objects (for example, washboard, gourd), body percussion, recorded sounds, technologies for recording, sequencing and manipulating sounds, technologies for presenting performances; for example, microphones, speakers.

**media texts**

Media texts include spoken, print, graphic and electronic communications with a public audience. They often involve numerous people in their construction and are usually shaped by the technology used in their production. The media texts studied in English are found in newspapers, magazines, and on television, video, film, radio, computer software and the Internet.

**metalanguage**

A metalanguage is a language used to discuss language conventions and use, for example, the terms and definitions used in the various grammars to describe the functions of words in sentences and the terms used to describe and categorise structural features of different kinds of texts.

**microeconomic**

The study of a small part of the economy such as businesses, industries or households.

**model/modelling**

- In Design Creativity and Technology, a standard or example for imitation or comparison; representation in miniature to show the construction of something; a typical or specific form or style; to form or plan according to a model.
- In Science, models are ways of representing complex structures and relationships. They are used to simplify a more complex arrangement; for example, the structure of matter represented through particle and atomic theory.
- In Mathematics, using mathematical concepts, structures and relationships to describe and characterise, or model, a situation in a way that captures its essential features.

**multimodal**

- In the Arts, multimodal forms combine; for example, visual images and sound in an installation work, or music, dramatic, kinaesthetic and visual elements in an opera, musical or shadow puppet play.
- In English, the modes of language are reading (including viewing), writing (including composing electronic texts), speaking and listening. Multimodal texts are those that combine, for example, print text, visual images and spoken word as in film or computer presentation media.

**natural number**

An element of the infinite set of numbers $N = \{0, 1, 2, 3 \ldots\}$, sometimes also referred to as a counting number. In some references the number 0 is not included in the set of natural numbers; however, it is useful to include as it corresponds to the number of elements in an empty set.

- **even natural number**
  An element of the set {0, 2, 4, 6, ...}
- **odd natural number**
  An element of the set {1, 3, 5, 7 ...}

**opportunity cost**

The next best use to which the limited productive resources could have been used in the production process.

**order**

Is a relation that describes the location of elements in a set with respect to each other. These elements may be totally ordered or partially ordered. For example, the set of natural numbers is totally ordered by the relation less than or equal to since for any two natural numbers $m$ and $n$ exactly one of the following is true: $m<n$ or $m = n$ or $m>n$. Similarly, the set of students in a class can be totally ordered with respect to their height using the relation less than or equal to. However, the set of people at a school fair is only partially ordered by the relation 'is a parent of' since there will likely be many pairs of people who are not each others parent, such as siblings.

**perimeter**

The boundary of a closed shape or curve, also the *length* of this boundary.

**periodic**

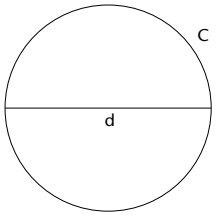
Repeats at regular intervals; for example, if the elements of the set of natural numbers are divided by 3, in order, and the remainder on division recorded, the following periodic pattern of remainders occurs:

0, 1, 2, 0, 1, 2, 0, 1, 2, 0, 1, 2 ...

The graph of a function that describes the rise and fall of tides in a given location from high tide to low tide over several days will also be periodic.

**pi**

Represented by the symbol $\pi$, is the irrational number defined by the ratio of the circumference $C$ of a circle to its diameter, $d$:




Its approximate value, correct to 2 decimal places is 3.14, and $\frac{22}{7}$ is a reasonably accurate fraction approximation to $\pi$. The decimal expansion for pi to 100 significant figures is:

3.14159265358979323846264338327950288419716939937510582097494459230781640628620899862803482534211706 8.

The digits in the continued decimal expansion of $\pi$ do not have any recurring pattern, a property which distinguishes irrational numbers from rational numbers.

**platonic solids**

The five platonic solids are the *tetrahedron* (4 equilateral triangles as faces), the *cube* (six squares as faces), the *octahedron* (8 equilateral triangles as faces), the *dodecahedron* (12 regular pentagons as faces), and the *icosahedron* (20 equilateral triangles as faces). They are solid shapes with faces that are made of regular polygons which tessellate with an equal number of faces at each vertex.

**polygon**

Literally 'many-sides'; a closed plane figure with sides formed by straight lines; for example, triangles, quadrilateral, pentagons, hexagons and the like. Polygons with all sides of equal length and all angles between adjacent sides equal are said to be *regular* polygons.

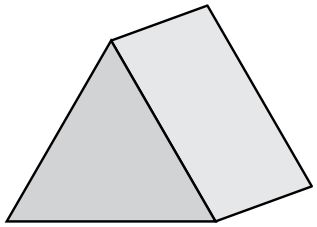
- **tangram**: A Chinese puzzle formed by a square cut into several pieces that are then rearranged to create other shapes.

**polyhedron**

A three-dimensional shape whose faces are adjacent polygons; for example, a pyramid is a polyhedron but a cone is not a polyhedron (part of a cone is a curved surface which is not a polygon).

**prism**

A three-dimensional shape that has a polygonal cross section, formed by having its edge points translated parallel to a given direction. For example, the following shape is a *triangular prism*:



**privacy law principles**

Any personal data held about a person must not be disclosed to others without the permission of the person.

**problem posing**

Formulating a problem in such a way that it is amenable to mathematical analysis.

**problem solving**

The application of mathematical reasoning to the development of a solution or solutions to a given problem.

**processes**

see (technological) technique/process

**product/s**

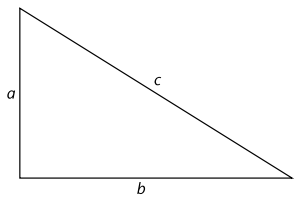
The output of human activity in the form of an artefact. A technological product is an artefact created to meet an identified need or want.

**prototype**

An original or model after which anything is formed.

**pythagorean relationship (pythagoras theorem)**

If $a$, $b$ and $c$ are the lengths of the sides of a right angled triangle, such that c is the length of the side opposite the right angle, then $a^2 + b^2 = c^2$ :



**radian**

Measure of angle where one cycle around the circumference of a unit circle from a fixed point corresponds to 2 π radians. Thus, as a measure of angle, 180 degrees is equivalent to π radian.

**rational number**

An element of the infinite set of numbers:

$Q = \{ \frac{m}{n}$, where $m$ and $n$ are integers and $n$ is not equal to zero}, sometimes also referred to as a fraction. Rational numbers can be expressed in fraction form, with corresponding terminating decimal expansion, for example, $\frac{1}{8} = 0.125$, or with infinite recurring decimal expansion, for example, $\frac{4}{9} = 0.444\ldots$

Rational numbers may be positive or negative; for example, $\frac{-17}{5}$ is also a rational number.

**recursion**

The process of carrying out the current step of a process using the results of the previous step (or steps) of the same process. For example, the sequence of numbers:
{3, 6, 12, 24 … } can be described using recursion as 'start at 3 and make the next term in the sequence twice the previous term in the sequence'. Students often intuitively define sequences using recursion. Skip-counting; for example, 'counting by fives starting from 12' is another example of a recursive process.

**reflection**

A transformation where each point in the plane is reflected in a given mirror line.

**risk assessment**

Process used to determine the likelihood that people may be exposed to injury, illness, or disease from any situation identified during the hazard identification process. A hazard is the potential to cause injury, illness or disease. Hazard identification is the process used to identify all possible situations where people may be exposed to injury, illness or disease.[6]

**rotation**

A transformation where each point in the plane is rotated through a given angle about a fixed point (the point of rotation).

**rounding**

The process for *approximating* a value that lies between two known values by one of these values. In particular, when a measure lies between two of the smallest marks on a scale it is rounded to the nearest value represented by either one of these marks. Rounding is used to specify a number correct to a given accuracy. With *measurements* this often means rounding a decimal number. For example, 16.29 rounded to the nearest *tenth* of a unit is 16.3, rounded to the nearest *unit* is 16, rounded to the nearest *five* is 15, and rounded to the nearest *ten* is 20. The decimal number 57.139 rounded to the nearest *hundredth* is 57.14 and rounded to the nearest *tenth* is 57.1. However, 57.199 rounded to the nearest *hundredth* is 57.20. Some general principles for rounding are:

- if the last digit is a 1, 2, 3 or 4 then the previous digit is left unchanged and the number is said to be *rounded down*; for example, 296.2 rounded to the nearest *whole number* is 296
- if the last digit is a 6, 7, 8 or 9 then the previous digit is increased by 1 and the number is said to be *rounded up*; for example, 296.8 rounded to the nearest *whole number* is 297
- if the last digit is a 5 then the previous digit can be *randomly* rounded up or down, especially where several measurements are taken. This avoids cumulative error that would arise from either *always* rounding up or *always* rounding down; for example, 296.5 would be randomly rounded to either 296 or 297
- if rounding to a given accuracy has a cumulative effect, zeroes should be used to indicate the accuracy; for example, 299.97 rounded to the nearest *tenth* is 300.0.

It should be noted that several different conventions for rounding a last digit of 5 can be found in the literature, and these relate to different contexts for number computation.

**sample**

A subset of a population; for example, a set of people used for a newspaper survey is a sample of the population. A *random* sample is one which is obtained by using a random process for selecting a sample.

**scale**

Scale specifies the proportion between two measures. For example, a model of a house may be made on a 1:10 *scale* of length. A measuring *scale* for weight could be based on the extension of a spring in proportion to the mass of an object (each 500 grams could cause an extension 5 cm). The tick marks on the axes of a graph are specified according to some scale, for example each mark along the horizontal axis might correspond to 5 units, while each mark along the vertical axis might correspond to 2 units. These are then referred to as axes *scales*.

**scientific notation (also standard form)**

A notation used in particular to express very small or very large numbers in the form of the product of a decimal number between 1 and 10 (not inclusive) with an integer power of 10 expressed in exponential form. For example, in scientific notation:

$1\ 567\ 000 = 1.567 \times 10^6$ and $0.000034 = 3.4 \times 10^{-5}$

**Scientific Procedures Premises License (SPPL)**

An SPPL is required when animals are used to teach science. For further information contact Schools Animal Welfare Project, Bureau of Animal Welfare, Department of Primary Industries (Victoria) at <www.dpi.vic.gov.au> and/or the Department of Education and Training (Victoria) at <www.sofweb.vic.edu.au>

**sensory perception**

Students' sense of the aesthetic is expressed through a heightened and increasingly focused awareness of the ways arts works and even environments and objects look, feel and sound, and the impact it has on them and other people. For example, in the early years of schooling, students might comment on the way that lines in a drawing represent the path flight of a bird they have seen flying or how the sounds they are making on a drum are like the sound of rain on a pavement.

**set**

'set' is an undefined term that informally corresponds to the notion of a collection of objects or elements. Sets are usually specified by listing their elements, for example: { a, e, i, o, u }, describing them in words; for example, 'the set of Australian citizens', by or using a mathematical rule:

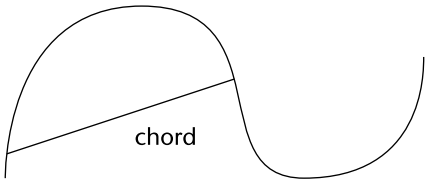
$\{(x, y): y = 2x + 1, x \in N\} = \{(0, 1), (1, 3), (2, 5), (3, 7) \ldots\}$.

- **element**: 'element' is an undefined term that informally corresponds to the notion of *belonging* or *membership* of a set. For example, 3 *is a member* of the set of natural numbers $N = \{0, 1, 2, 3, \ldots\}$. This relation can be written more concisely as $3 \in N$. The symbol '$\in$' is a shorthand for 'is an element of'. The number $\frac{1}{2}$ is not a natural number, and this can be written as $\frac{1}{2} \notin \mathrm{N}$, where $\notin$ is a shorthand for 'is **not** an element of'.
- **power set**: The power set of a given set is the set of all possible subsets of the given set, including the empty set and the given set itself. For example, if $A = \{a, b, c\}$ then the power set of $A$, written $P(A)$ is the set $\{\{\}, \{a\}, \{b\}, \{c\}, \{a, b\}, \{a, c\}, \{b, c\}, \{a, b, c\}\}$. If there are $n$ elements in the set $A$ then there are $2^n$ elements in its power set, in this example $A$ has 3 element and its power set has $2^3 = 8$ elements.
- **universal set**: In a given context, the *universal set* is the set of all objects under consideration. For example, the set of natural numbers is often the universal set for basic arithmetic computation in the early years of schooling. When students conduct a survey about students in their school, the set of all students in the school is the universal set (often called the population in this situation) for the survey.

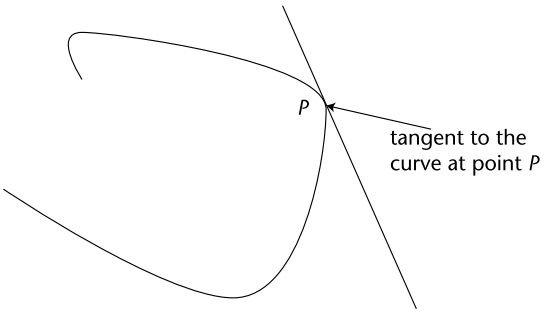
**shape**

A geometric object or representation of a common real-life object, in two-dimensional space, such as a free-hand closed curve, a triangle, circle, square; or in three-dimensional space (also called solids) such as a blob of play-dough, a cube, sphere or pyramid.

- **chord**: A line segment joining two points on a curve:




- **cross-section**: The shape produced by cutting a three-dimensional shape completely through by a plane.
- **shadow projection**: The two-dimensional image formed on a plane surface by the shadow of a three-dimensional object illuminated by a light source; for example, a person's shadow on the ground on a sunny day. In geometry this usually corresponds to the projections of a shape onto three plane surface at right angles to each other, such as front view, side view, top view.
- **tangent (local tangent)**: A line that touches but does not cut a curve at a point:




In the case of a circle, a tangent is always at right angles to the radius which meets the circumference of the circle at the point of contact.

**significant figure**

If a numerical value is expressed in scientific notation (standard form) a x $10^n$, where $1 < a < 10$ and $n$ is an integer, then all the digits in $a$ are *significant*. For example, 1567000 x $10^6$ has four significant figures and $0.000034 = 3.4 \times 10^{-5}$ has two significant figures.

**similarity**

The property of one shape being an exact enlargement or reduction of another shape.

**skills, techniques and processes**

Ways and methods of using and manipulating elements, principles, media, materials, equipment and technologies. Skills, techniques and processes can be used to realise ideas, achieve specific effects, investigate creative outcomes for expressive, aesthetic and/or technical tasks and/or to explore (practically, by observation and/or through discussion) aesthetic and communicative potential of media and materials. Skills and techniques can be practised in isolation but are generally used as part of an arts-making process.

Artists also use a range of processes to document (in verbal, written, physical and/or visual forms) working and/or thinking practices, and/or comment on/critique arts works.

**spatial concepts**

Spatial concepts are the organising concepts common to all branches of geography. From Level 1 through to Level 6, and beyond, spatial concepts can be used and applied according to the stages of learning – laying the foundations, building breadth and depth, and developing pathways. Although there are many organising concepts, there are nine commonly recognised concepts:

- **location**: Where natural and built phenomena are found on the surface of the Earth. A place has an absolute location measured accurately by co-ordinates, and a relative location measured by distance and direction from one place to another.
- **scale**: The term 'scale' includes two uses.
    - The map scale shows the relationship between measurements on a map and the actual measurements on the ground. Map scales are expressed in words, by a line scale, or as a representative fraction. A large scale map covers a small area with detail; a small scale map will cover a larger area with less detail.
    - The observational scale refers to the size of an area being studied. A range of scales includes the following:
        - **local scale**: Involves the smallest area and is immediate to wherever the study is taking place. Fieldwork is conducted at the local scale.
        - **regional scale**: Covers a larger area than the local scale. The study of the Murray–Darling Basin is at a regional scale.
        - **national scale**: Focuses study on a nation, for example, the Australian government's response to a global phenomenon.
        - **international scale**: Considers two or more nations. The combined efforts of several Asian nations would be an example.
        - **global scale**: Considers a significant proportion of the Earth, for example, the distribution of rainforests across the Earth.
- **distance**: The space between different locations on Earth. The absolute or linear distance is measured in units such as metres and kilometres. The relative distance is the length of time it takes to travel from one location to another, cost involved and the convenience of the journey.
- **distribution**: The arrangement of things at or near the Earth's surface viewed at a variety of scales.
- **region**: A definable area of the Earth's surface which contains one or more common characteristics that distinguish it from other areas. Regions are different for different groups of people. For example, Oakleigh South (local), Gippsland (regional), Australia (national), Sub Saharan Africa (international).
- **spatial change over time**: The degree to which an area has changed its geographic characteristics, features or patterns of use over a period of time. Change occurs at varying rates at different times and may be considered at different scales. For example, the redevelopment of the Melbourne Docklands since the 1990s would look at distribution, spatial association between things, movement and spatial interaction.
- **movement**: The change in location of one or more things across the Earth's surface. Movement includes direction, method, rate, nature and volume.



- **spatial association**: The degree to which things are similarly arranged over space. Spatial association compares distribution patterns. A strong spatial association occurs where two distributions are similar. Weak association describes little similarity. No association occurs when two distributions are dissimilar.
- **spatial interaction**: The strengths of the relationships between phenomena and places in the environment, and the degree to which they influence or interact with each other. Over time, the impact of people on the environment changes and the environment in turn changes people.

**specifications**

Outline of the constraints (aspects that are fixed) and considerations (aspects that are flexible) in a design brief. Specifications may include such things as the materials available to make a product, expected completion date, and maximum size of the product to be designed or cost restrictions, or the expected level of performance.

**square root of 2**

Is the irrational number, $\sqrt{2}$, whose value corresponds to the length of the diagonal of a unit square.

 1 unit

Its approximate value is 1.414 correct to 3 decimal places. The decimal expansion for the square root of two correct to 100 significant figures is:

1.41421356237309504880168872420969807856967187537694807317667973799073247846210703885038753432764157 3.

The digits in this decimal expansion do not display any recurring pattern, a property which distinguishes irrational numbers from rational numbers.

**standard unit**

A formal unit from a system of units which is comprehensive and is used to define other units or combinations of units. For example, in the metric system, the standard units for *length*, *mass* and *time* are respectively, *metre*, *kilogram* and *second*. The standard units are described in the International System of Units (SI). Related *formal*, units are:

*centimetre* = metre × $\frac{1}{100}$

*tonne* = kilogram × 1 000

*minute* = second × 60.

Other non-standard formal units are, for example, carat, gallon, hour and knot.

**strategies for reading**

Strategies for reading include:

- techniques such as reading the cover and contents page when selecting texts
- predicting, checking, confirming and self-correcting using knowledge of a topic
- browsing, skimming and scanning for key words and content
- using computer technology to locate and explore information.

**strategies for writing**

Strategies for writing include:

- planning, composing, recording, editing and publishing
- using word-processing and graphics programs to create, edit and publish texts
- phonic, visual and morphemic strategies for attempting to spell unfamiliar words
- consulting resources such as a dictionary and thesaurus.

**structures and features of language**

Structures of language refer to characteristics of the overall ordering and organisation of texts. Features of language refer to the grammar of speech and of writing. Throughout the years of schooling, students need to develop abilities to use the following structures and features of written and spoken language:

- print elements, such as letters, words, spelling, paragraphs, punctuation, layout and presentation
- textual and grammatical aspects of language, such as sentence structure and vocabulary
- patterns of text structure and organisation of various kinds of texts, including narrative, exposition, verse, narrative voice and point of view
- intonation, rhythm, pace, pitch, volume and pauses in spoken language
- non-verbal elements of communication, such as facial expression, body movement, proximity and gestures, and the graphic elements of texts, such as the impact of illustrations on the meaning of a text.

**surd (quadratic)**

An irrational number such as $\sqrt{2}$ or $\frac{(5+\sqrt{3})}{4}$. An older term of reference for a particular type of irrational number.

**surface area**

Area of the surfaces of a three-dimensional shape or object.

**sustainability**

Sustainability is an ecological, economic, social and political concept. A sustainable society is one that meets the needs of the present without compromising the ability of future generations to meet their own needs. In the Science domain, issues which need to be considered for sustainability include: the conservation of biodiversity and ecological integrity; dealing judiciously with risk, uncertainty and irreversibility; ensuring appropriate valuation of environmental assets; integration of environmental and economic goals in government and institutional policies and activities; social equity (both intragenerational and intergenerational); and community participation.

Resources:

- <www.earthcharter.org> for information about The Earth Charter (a United Nations initiative) and listing a number of teaching and learning resources
- <www.unesco.org/education/tlsf> provides access to *'Teaching and Learning for a Sustainable Future'*, a multimedia teacher education programme published by the United Nations Educational, Scientific and Cultural Organisation (UNESCO). It contains 25 professional development modules for teachers, teacher educators and student teachers, as well as curriculum developers, education policy makers and authors of educational materials. The program may be used in both pre- and in-service teacher education, by individuals or by groups.
- Australian Government Department of the Environment and Heritage, 'Educating for a Sustainable Future', A National Environmental Education Statement for Australian Schools, Curriculum Corporation, Carlton South, Victoria, 2005.

**symbolic**

Using marks or symbols that have a meaning particular to mathematical language, for example, the written statement 'two is less than 3' can be written symbolically as '$2 < 3$'.

**symmetry**

Property of regularity in shape by, for example, reflection or rotation. Thus the letter **T** is symmetrical by reflection, the letter **Z** is symmetrical by rotation, the letter **H** is symmetrical by both reflection and rotation, the letter **R** is *not* symmetrical.

- **asymmetry**: Irregular, does not display symmetry. The human body is asymmetrical with respect to an imaginary line down the middle.

**system**

- In Design Creativity and Technology, a system is a combination of elements that work together so that a specific outcome is achieved. Systems are used, applied and developed in all areas of human activity. Especially important are environmental, engineering, energy, manufacturing and information systems. Examples of technological systems are a television, a sewing machine, a bicycle, a conveyor belt, and an electronic alarm. All technological systems have specific inputs, processes and outputs that are controlled manually or automatically. Management and programming of systems are important in technology.

  Each system contains separate elements that are connected in a specific way so the system will work. In some systems; for example a door lock, the elements or components are within the one system. In others; for example a car, the elements are a series of subsystems and might, as in the thermostat control of a heating system, contain feedback components.

  Whether a system is appropriate depends on the technical, economic, environmental and social and cultural consequences of its application/s as well as on how well it meets human needs. Students have to consider these factors on both a local and global level and estimate their future impact on societies and environments.
- In Science, systems consist of inputs, processing and outputs for a group of organs (or cells) that work together to provide living things with advantages for survival. Systems can be found in plants and animals (including humans). Systems work alone and with other systems. The human body is an example of a complex system and illustrates the progression from *cells* to *tissues* to *organs* and then *systems*. Maintaining *homeostasis*, or a stable internal environment, enables humans to survive.

**(technological) technique/process**

Human activity (for example, cutting, shaping, soldering, blending, and digging) that brings about a change in a material or to a system; usually carried out using tools, equipment and machines when working with materials and components.

**tessellation**

A repeated pattern in the plane or on a surface where shapes completely fill all of the space around a given point where their boundaries meet. For example, a honeycomb is a tessellation using hexagons Tiling patterns are tessellations using



rectangular tiles or brick pavers in paths, mosaics in buildings, quilts and art.

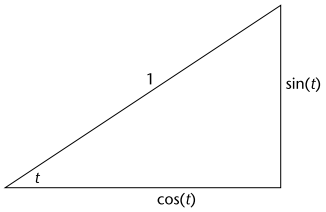
**transformation**

A one-to-one correspondence of points in the plane. *Reflections*, *rotations* and *dilations* are examples of transformations.

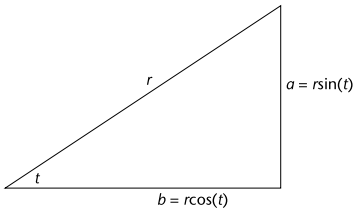
- **isometric**: Literally 'the same measure', an isometry is a transformation that leaves lengths, area and angles unchanged.

**trigonomentry (sine, cosine and tangent)**

In the following right angled triangle, with long side length 1 unit, the vertical side length is sin($t$) and the horizontal side length is cos($t$)




if the triangle is dilated by a factor $r$ from the point at which the angle t is formed, then, by similarity:




and $\sin(t) = \frac{a}{r}$ $\cos(t) = \frac{b}{r}$ $\tan(t) = \frac{ar}{br} = \frac{a}{b}$

**undefined term**

A term or expression taken as accepted without definition. These are the basic building blocks of mathematics; for example, element and set are undefined terms in the *Structure* dimension, while point and line are undefined terms in the *Space* dimension. Undefined terms may be characterised by informal description, or illustrated by examples. Other mathematical terms and expressions are defined using undefined terms and relations on them.

**union (set)**

Given two sets $A$ and $B$, their union, written $A \cup B$ is the set of all elements which occur in either set, listed without repetition. For example,
if $A = \{ a, b, d, z \}$ and $B = \{ a, c, x, y, z \}$ then
$A \cup B = \{ a, b, c, d, x, y, z \}$.

**unit**

A basic or fundamental construct for counting and/or measurement. For example, the number 1 is the unit for counting (from the Latin *unus* for one). The metre is the standard unit for measurement of length in the metric system.

**units of measurement**

A unit is a particular physical quantity, defined and adopted by convention, with which other particular quantities of the same kind are compared to express their value. The International System of Units (SI) is founded on seven base quantities, assumed to be mutually independent, as shown in the table below:

| BASE QUANTITY | SI BASE UNIT | |
|---|---|---|
| | NAME | SYMBOL |
| Amount of substance | mole | mol |
| electric current | ampere | A |
| length | metre | m |
| luminous intensity | candela | cd |
| mass | kilogram | kg |
| thermodynamic temperature | kelvin | K |
| time | second | s |

Further information about SI units can be found at the Bureau International des Poids et Mesures website at <www.bipm.org>

**uni-variate (data)**

Data relating to measurement of a single variable, for example, shoe size.

**virtual teams**

Those in which people work together via the Internet, meeting and working electronically; can comprise people from intrastate, interstate and overseas.

**workplace texts**

Workplace texts include spoken, print and electronic forms of communication commonly encountered in enterprises across a wide range of industries, including business letters, resumes, memoranda, short reports, formal and informal minutes. Practice in interpreting and producing such texts is a valuable part of students' preparation for the world of work and further training.

## Web references for Mathematics

**School of Mathematics and Statistics at the University of St Andrew's, Scotland**
<www-history.mcs.st-and.ac.uk/history/>

This website provides topic, context, chronology and biographical historical references, and links to other history of mathematics sites.

**Cut The Knot, Alex Bogomolny**
<www.cut-the-knot.org/glossary/atop.shtml>

This website contains an extensive mathematical glossary, items of interest, mathematical games and puzzles and is a mathematics forum.

**A Dictionary of Units, Frank Tapson**
<www.ex.ac.uk/cimt/dictunit/dictunit.htm>

This website provides a comprehensive summary of many of the units of measurement in use around the world today, some units of historical interest and conversions into standard SI units. It also contains links to other sites related to units and measurement.

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