



Victorian Essential Learning Standards

CAS Technology Mathematics at Level 6

Part 1: Technology in the Mathematics domain of the VELS



Published by

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1. Technology in the Mathematics domain of the VELS

The role of technology in the Mathematics domain of the VELS is clearly outlined in the overview of each of its five dimensions, and is highlighted in the following excerpts:

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 two, $\sqrt{2}$, the golden ratio *phi*, φ , and fractions or multiples of *pi*, π .

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.

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 **data-loggers 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 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.