



# Victorian Essential Learning Standards

CAS Technology Mathematics at Level 6

## Resources

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## Disclaimer

*At the time of publication, the URLs (website addresses) cited were checked for accuracy and appropriateness of content. However, due to the transient nature of material placed on the Internet, their continuing accuracy cannot be guaranteed by the Victorian Curriculum and Assessment Authority. Teachers are strongly advised to prepare their own indexes of sites that are suitable and applicable to this resource and to check these addresses prior to allowing student access.*

## Part 2: CAS technology – a brief background

### **CAS technology in the broad historical context of the use of technology for computation**

School of Mathematics and Statistics, University of St Andrews, Scotland. Viewed April 2007:

[www-gap.dcs.sde.htmlt-and.ac.uk/~history/Mathematicians/Recor](http://www-gap.dcs.sde.htmlt-and.ac.uk/~history/Mathematicians/Recor)

Keith Wong and Dr Len Berggren, Simon Fraser University, Canada. Viewed April 2007:

[www.math.sfu.ca/histmath/China/1stCenturyAD/NineChapIntro.html](http://www.math.sfu.ca/histmath/China/1stCenturyAD/NineChapIntro.html)

School of Mathematics and Statistics, University of St Andrews, Scotland. Viewed April 2007:

[www-groups.dcs.st-and.ac.uk/~history/Indexes/Chinese.html](http://www-groups.dcs.st-and.ac.uk/~history/Indexes/Chinese.html)

Redin, J. Viewed April 2007:

[www.xnumber.com/xnumber/mechanical1.htm](http://www.xnumber.com/xnumber/mechanical1.htm)

Tout, N. Viewed April 2007:

[www.vintagecalculators.com/html/history\\_of\\_electronic\\_calculat.html](http://www.vintagecalculators.com/html/history_of_electronic_calculat.html)

From Éric Lévénéz's Computer Languages History site. Viewed April 2007:

[www.levenez.com/lang/history.html](http://www.levenez.com/lang/history.html)

Ticalc.org website. Viewed April 2007:

[www.ticalc.org/pub/83plus/basic/math/](http://www.ticalc.org/pub/83plus/basic/math/)

## Part 3: CAS-related activities for dimensions

### CAS and Number

#### **A comprehensive introduction to Egyptian fractions, including geometry**

Dr. Knott, R. 'Egyptian Mathematics' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007:

[www.mcs.surrey.ac.uk/Personal/R.Knott/Fractions/egyptian.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fractions/egyptian.html)

#### **A comprehensive introduction to continued fractions, including their connection to the Euclidean division algorithm for finding the greatest common divisor of two integers, with an online continued fraction calculator.**

Dr. Knott, R. 'An Introduction to the Continued Fraction' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007:

[www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/cfINTRO.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/cfINTRO.html)

#### **A discussion on the relationship between continued fractions and the Euclidean division algorithm**

Bogomolny, A. 'Did you know that...The word 'fraction' derives from the Latin *fractio* – to break. However, there are continuous fractions' in Cut the Knot Exchange. Viewed April 2007:

[www.cut-the-knot.org/do\\_you\\_know/fraction.shtml](http://www.cut-the-knot.org/do_you_know/fraction.shtml)

**A discussion of the application of mathematics and continued fractions to musical scales**

Dunne, E. G. 2000, *Pianos and Continued Fractions*, American Mathematical Society. Viewed April 2007:

[www.research.att.com/~njas/sequences/DUNNE/TEMPERAMENT.HTML](http://www.research.att.com/~njas/sequences/DUNNE/TEMPERAMENT.HTML)

**A formal treatment of the mathematics of continued fractions**

Weisstein, E. W. 'Continued Fraction.' from *MathWorld* – A Wolfram Web Resource. Viewed April 2007:

<http://mathworld.wolfram.com/ContinuedFraction.html>

**Worked examples and a template for implementation of algorithms**

Taylor, Keith, Department of Mathematics and Statistics, University of Saskatchewan. Viewed April 2007:

<http://math.usask.ca/encryption/lessons/lesson02/page6.html>

**CAS and Space****A comprehensive coverage of basic and advanced constructions and theorems of Euclidean geometry**

Florida Atlantic University. Viewed April 2007:

[www.math.fau.edu/~yiu/EuclideanGeometryNotes.pdf](http://www.math.fau.edu/~yiu/EuclideanGeometryNotes.pdf)

**CAS and Measurement, chance and data****A dictionary of units**

Tapson, F. Centre for Innovation in Mathematics Teaching, University of Plymouth server. Viewed April 2007:

[www.ex.ac.uk/cimt/dictunit/dictunit.htm](http://www.ex.ac.uk/cimt/dictunit/dictunit.htm)

**An extended discussion with an on-line triple calculator of Pythagoras triples**

Bogomolny, A. 'Pythagorean Triples' Cut the Knot Exchange. Viewed April 2007:

[www.cut-the-knot.org/pythagoras/pythTriple.shtml](http://www.cut-the-knot.org/pythagoras/pythTriple.shtml)

**Right-angled triangles and Pythagoras' Theorem**

Dr Knott, R. 'Right-angled Triangles and Pythagoras' Theorem' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007:

[www.mcs.surrey.ac.uk/Personal/R.Knott/Pythag/pythag.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Pythag/pythag.html)

**History of trigonometry outline**

Joyce, D.E. 'History of Trigonometry Outline' Mathematics and Computer Science, Clark University. Viewed April 2007:

<http://aleph0.clarku.edu/~djoyce/ma105/trighist.html>

**CAS and Structure****Harmonic series**

Bain, R. 'The Harmonic Series' School of Music, University of South Carolina. Viewed April 2007:

[www.music.sc.edu/fs/bain/atmi02/hs/index-audio.html](http://www.music.sc.edu/fs/bain/atmi02/hs/index-audio.html)

Webb, J, 'In perfect harmony' viewed April 2007:

<http://plus.maths.org/issue12/features/harmonic/index-gifd.html>

**Fibonacci numbers and the continued fraction**

Dr. Knott, R. 'Fibonacci Numbers and Nature' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007.  
[www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fibnat.html)

Dr. Knott, R. 'An Introduction to the Continued Fraction' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007:  
[www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/cfINTRO.html#sqrtcf](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/cfINTRO.html#sqrtcf)

Weisstein, E. 'Continued Fraction' From MathWorld – A Wolfram Web Resource. Viewed April 2007:  
<http://mathworld.wolfram.com/ContinuedFraction.html>

**CAS and Working mathematically****Prime numbers**

Caldwell, C. K. 'The Largest Known Primes – A Summary' The Prime Pages. Viewed April 2007:  
<http://primes.utm.edu/largest.html>

Heinz, H. D. 'Patterns in Primes'. Viewed April 2007:  
[www.geocities.com/~harveyh/primes.htm](http://www.geocities.com/~harveyh/primes.htm)

Feicht, L. 'Matrix/Spreadsheet/Transformation Lesson' in World Web Dynamics. Viewed April 2007.  
[www.worldwebdynamics.com/lou/Matst.htm](http://www.worldwebdynamics.com/lou/Matst.htm)

**Part 4 – Sample course planner****General**

VCAA, Mathematics Victorian Essential Learning Standards  
<http://vels.vcaa.vic.edu.au/essential/discipline/mathematics/index.html>

VCAA, Mathematics assessment maps  
[http://vels.vcaa.vic.edu.au/assessment/maps/maps\\_domain/maths/index.html](http://vels.vcaa.vic.edu.au/assessment/maps/maps_domain/maths/index.html)

Annotated samples of student work linked to specific elements of the standards. The samples are designed to assist teachers with what student work looks like at a particular standard, and to illustrate typical features of the work of students progressing towards a standard.

VCAA, Mathematics progression points  
<http://vels.vcaa.vic.edu.au/assessment/ppoint/maths/index.html>

Developed to assist teachers in making on-balance judgments about student achievement with respect to the standards, and reporting on this achievement.

Department of Education, Mathematics Developmental Continuum P–10  
[www.education.vic.gov.au/studentlearning/teachingresources/maths/mathscontinuum/default.htm](http://www.education.vic.gov.au/studentlearning/teachingresources/maths/mathscontinuum/default.htm)  
Pedagogical advice on student learning related to various aspects of mathematics related to the standards.

**Geometry, similarity and scale, networks, polygons and polyhedra****Anamorphosis in art**

Kent, P. Art of Anamorphosis. Viewed April 2007:  
<http://myweb.tiscali.co.uk/artofanamorphosis/what-is.html>

**Mathematics in art and architecture**

Mathematics in Art and Architecture, Aslaksen, Helmer, Department of Mathematics, National University of Singapore. Viewed April 2007:  
[www.math.nus.edu.sg/aslaksen/teaching/math-art-arch.shtml](http://www.math.nus.edu.sg/aslaksen/teaching/math-art-arch.shtml)

**Investigation of packing shapes and three-dimensional shapes in nature**

Dr. Knott, R. 'Some Solid (Three-dimensional) Geometrical Facts about the Golden Section' from the Personal Pages in School of Electronic Engineering, Information Technology and Mathematics, University of Surrey. Viewed April 2007:

[www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/phi3DGeom.html](http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/phi3DGeom.html)

**Introduction to networks, mazes and the map-colouring problem**

Budd, C. & Sangwin, C. 'Maths aMazes' in Plus Magazine Millennium Mathematics Project, University of Cambridge, Issue 14, March 2001. Viewed April 2007:

<http://plus.maths.org/issue14/features/budd/index.html>

Keith, D. 'Colouring Maps' in Maths – Investigations. Viewed April 2007:

[www.subtangent.com/math/ig-mapcolouring.php](http://www.subtangent.com/math/ig-mapcolouring.php)

**Pythagoras' theorem**

Seth Yoshioka-Maxwell, presenting Pythagoras' theorem. Viewed April 2007:

[www.geocities.com/CapeCanaveral/Launchpad/3740/diagrams.html](http://www.geocities.com/CapeCanaveral/Launchpad/3740/diagrams.html)

Bogomolny, A. 'Pythagorean Theorem' in Cut the Knot Exchange. Viewed April 2007:

[www.cut-the-knot.org/pythagoras/index.shtml](http://www.cut-the-knot.org/pythagoras/index.shtml)

**Coordinate and deductive geometry**

Savard, J. 'Map Projections' in Hypermaths. Viewed April 2007:

[www.hypermaths.org/quadibloc/maps/mapint.htm](http://www.hypermaths.org/quadibloc/maps/mapint.htm)

GIS Development 'Projection System' In Geospatial Resource Portal. Viewed April 2007:

[www.gisdevelopment.net/tutorials/tuman007.htm](http://www.gisdevelopment.net/tutorials/tuman007.htm)

Dana, P. 'Map Projection Overview' Geographer's Craft, Department of Geography, University of Colorado at Boulder. Viewed April 2007:

[www.colorado.edu/geography/gcraft/notes/mapproj/mapproj\\_f.html](http://www.colorado.edu/geography/gcraft/notes/mapproj/mapproj_f.html)

**Sets and probability**

Duke University Libraries 'Electronic Searching'. Viewed April 2007:

[www.lib.duke.edu/libguide/adv\\_searching.htm](http://www.lib.duke.edu/libguide/adv_searching.htm)

Massachusetts Institute of Technology 'The Information Navigator'. Viewed April 2007:

<http://libraries.mit.edu/tutorials/general/boolean.html>

**An online simulation for the conditional probability called Monty's dilemma**

Cryptography, Department of Mathematics, University of California, Monty Hall Page. Viewed April 2007:

<http://math.ucsd.edu/~crypto/Monty/monty.html>

Institute for Advanced Study/Park City Mathematics Institute 'The WWW Tackles The Monty Hall Problem' in Department of Mathematics, Rice University maths links section. Viewed April 2007:

<http://math.rice.edu/~pcmi/mathlinks/montyurl.html>

**Quadratic functions, graphs, algebra and models**

West Michigan University, unit samples. Viewed April 2007:

[www.wmich.edu/cmp/unitamples/c2u4/C2U4\\_265-273.pdf](http://www.wmich.edu/cmp/unitamples/c2u4/C2U4_265-273.pdf)

History of John Napier, University of St Andrews, Scotland. Viewed April 2007:

[www-groups.dcs.st-and.ac.uk/~history/Biographies/Napier.html](http://www-groups.dcs.st-and.ac.uk/~history/Biographies/Napier.html)

O'Connor, J. J. & Robertson, E. F. 'John Napier' MacTutor History of Mathematics, April 1998. Viewed April 2007.

[www-history.mcs.st-andrews.ac.uk/Biographies/Napier.html](http://www-history.mcs.st-andrews.ac.uk/Biographies/Napier.html)

## Sample lessons

Onlinemathslearning.com 'Triangle Inequality'. Viewed April 2007.

[www.onlinemathslearning.com/triangle-inequality.html](http://www.onlinemathslearning.com/triangle-inequality.html)

Mathcentre 'Pythagoras' theorem'. Viewed April 2007.

[www.mathcentre.ac.uk/resources/workbooks/mathcentre/web-pythagoras.pdf](http://www.mathcentre.ac.uk/resources/workbooks/mathcentre/web-pythagoras.pdf)

## Mathematical subject areas

Wikimedia Foundation, Inc. The following Wikipedia links present the subject areas covered in the support material. Viewed April 2007:

[http://en.wikipedia.org/wiki/Computer\\_algebra\\_system](http://en.wikipedia.org/wiki/Computer_algebra_system)

[http://en.wikipedia.org/wiki/The\\_Nine\\_Chapters\\_on\\_the\\_Mathematical\\_Art](http://en.wikipedia.org/wiki/The_Nine_Chapters_on_the_Mathematical_Art)

[http://en.wikipedia.org/wiki/Recurring\\_decimal](http://en.wikipedia.org/wiki/Recurring_decimal)

[http://en.wikipedia.org/wiki/Square\\_root\\_of\\_2](http://en.wikipedia.org/wiki/Square_root_of_2)

[http://en.wikipedia.org/wiki/Golden\\_ratio](http://en.wikipedia.org/wiki/Golden_ratio)

[http://en.wikipedia.org/wiki/Euclidean\\_algorithm](http://en.wikipedia.org/wiki/Euclidean_algorithm)

<http://en.wikipedia.org/wiki/Measurement>

[http://en.wikipedia.org/wiki/Pythagorean\\_triple](http://en.wikipedia.org/wiki/Pythagorean_triple)

<http://en.wikipedia.org/wiki/Trigonometry>

[http://en.wikipedia.org/wiki/Harmonic\\_series](http://en.wikipedia.org/wiki/Harmonic_series)

[http://en.wikipedia.org/wiki/Fibonacci\\_sequence](http://en.wikipedia.org/wiki/Fibonacci_sequence)

[http://en.wikipedia.org/wiki/Prime\\_number](http://en.wikipedia.org/wiki/Prime_number)

[http://en.wikipedia.org/wiki/Absolute\\_deviation](http://en.wikipedia.org/wiki/Absolute_deviation)

[http://en.wikipedia.org/wiki/Golden\\_ratio](http://en.wikipedia.org/wiki/Golden_ratio)