International General Certificate
of Secondary Education

Syl

CAMBRIDGE INTERNATIONAL MATHEMATICS 0607

For examination in June and November 2010

Cambridge International Mathematic
Syllabus

Syllabus code 0607

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INTRODUCTION

Cambridge International Mathematics (IGCSE) syllabus is designed as a two-year course f examination at age 16-plus.

The main sections are:

Aims
Assessment Objectives
Assessment
Curriculum Content.

AIMS

The Aims of this syllabus should enable students to:

1. acquire a foundation of mathematical skills appropriate to further study and continued learning in mathematics;
2. develop a foundation of mathematical skills and apply them to other subjects and to the real world;
3. develop methods of problem solving;
4. interpret mathematical results and understand their significance;
5. develop patience and persistence in solving problems;
6. develop a positive attitude towards mathematics which encourages enjoyment, fosters confidence and promotes enquiry and further learning;
7. appreciate the beauty and power of mathematics;
8. appreciate the difference between mathematical proof and pattern spotting;
9. appreciate the interdependence of different branches of mathematics and the links with other disciplines;
10. appreciate the international aspect of mathematics, its cultural and historical significance and its role in the real world;
11. read mathematics and communicate the subject in a variety of ways.

ASSESSMENT OBJECTIVES

The examination will test the ability of candidates to:

1. know and apply concepts from all the aspects of mathematics listed in the specification;
2. apply combinations of mathematical skills and techniques to solve a problem;
3. solve a problem by investigation, analysis, the use of deductive skills and the application of an appropriate strategy;
4. recognise patterns and structures and so form generalisations;
5. draw logical conclusions from information and understand the significance of mathematical or statistical results;
6. use spatial relationships in solving problems;
7. use the concepts of mathematical modelling to describe a real-life situation and draw conclusions;
8. organise, interpret and present information in written, tabular, graphical and diagrammatic forms;
9. use statistical techniques to explore relationships in the real world;
10. communicate mathematical work using the correct mathematical notation and terminology, logical argument, diagrams and graphs;
11. make effective use of technology;
12. estimate and work to appropriate degrees of accuracy.

GRAPHICS CALCULATOR REQUIREMENTS

Students should be able to do the following using a graphics calculator.

1. Sketch a graph.
2. Produce a table of values for a function.
3. Find zeros and local maxima or minima of a function.
4. Find the intersection point of two graphs.
5. Find mean, median, quartiles.
6. Find the linear regression equation.

Other existing in-built applications should not be used and will gain no credit.
Calculators with symbolic algebraic logic are not permitted.
Any other applications and programs from external sources are not permitted.

FORMULA LIST

There will be a list of formulae appropriate to the Core tier at the start of Papers 1 and 3. There will be a corresponding list of formulae appropriate to the Extended tier at the start of Papers 2 and 4. The Papers may require the use of none, some or all of the formulae listed. The formula lists are given in the Appendix of this booklet.

ASSESSMENT

Core

There are three written papers with a total of 3½ hours.
Candidates should attempt to answer all the questions on each paper.

Paper 1 **Time 45 minutes** **40 marks** **25%**
10-12 short response questions.
No calculators are permitted on this paper.
This paper is designed to assess knowledge and use of basic skills and methods. While any part of the syllabus content may be assessed in this paper, questions will focus on concepts which can be assessed without access to a calculator.

Paper 3 **Time 1 hour 45 minutes** **96 marks** **60%**
11-15 medium to extended response questions.
A graphics calculator is required for this paper.
Any area of the syllabus may be assessed.
Some of the questions will particularly assess the use of the graphics calculator functions described on page 2.

Paper 5 **Time 1 hour** **24 marks** **15%**
One investigation question.
A graphics calculator is required for this paper.
Candidates will be assessed on their ability to investigate and solve a more open-ended problem. Clear communication and full reasoning will be especially important and mark schemes will reflect this.
An extended time allowance is given for this paper to allow students to explore and communicate their ideas fully.

Extended

There are three written papers with a total of 4½ hours.
Candidates should attempt to answer all the questions on each paper.

Paper 2 **Time 45 minutes** **40 marks** **20%**
10-12 short response questions.
No calculators are permitted on this paper.
This paper is designed to assess knowledge and use of basic skills and methods. While any part of the syllabus content may be assessed in this paper, questions will focus on concepts which can be assessed without access to a calculator.

Paper 4 **Time 2 hours 15 minutes** **120 marks** **60%**
11-15 medium to extended response questions.
A graphics calculator is required for this paper.
Any area of the syllabus may be assessed.
Some of the questions will particularly assess the use of the graphics calculator functions described on page 2.

Paper 6 **Time 1 hour 30 minutes** **40 marks** **20%**
One investigation and one modelling question.
A graphics calculator is required for this paper.
Candidates will be assessed on their ability to investigate, model, and solve more open-ended problems. Clear communication and full reasoning will be especially important and mark schemes will reflect this.
An extended time allowance is given for this paper to allow students to explore and communicate their ideas fully.

CURRICULUM CONTENT (Core)

	ITEM	Notes	Link within syllabus
1	**NUMBER**		
1.1	Vocabulary and notation for different sets of numbers: natural numbers $\mathbb{N}$, primes, squares, cubes, integers $\mathbb{Z}$, rational numbers $\mathbb{Q}$, irrational numbers, real numbers $\mathbb{R}$	$\mathbb{N} = \{0, 1, 2, \ldots\}$	
1.2	Use of the four operations and brackets		
1.3	Highest common factor, lowest common multiple		
1.4	Calculation of powers and roots		
1.5	Ratio and proportion		4.5
1.6			
1.7	Equivalences between decimals, fractions, ratios and percentages		
1.8	Percentages including applications such as interest and profit	Excluding reverse percentages	
1.9	Meaning of exponents (powers, indices) in $\mathbb{Z}$ Standard Form $a \times 10^n$ where $1 \leqslant a < 10$ and $n \in \mathbb{Z}$ Rules for exponents		
1.10			
1.11	Estimating, rounding, decimal places and significant figures		
1.12	Calculations involving time: second (s), minutes (min), hours (h), days, months, years including the relation between consecutive units	1 year = 365 days	
1.13	Speed, distance, time problems		

CURRICULUM CONTENT (Extended)

(A denotes 'Assumed Knowledge' and will not be assessed directly at the Extended Level.)

	ITEM	Notes	Link within syllabus	
1	**NUMBER**			
1.1	Vocabulary and notation for different sets of numbers: natural numbers $\mathbb{N}$, primes, squares, cubes, integers $\mathbb{Z}$, rational numbers $\mathbb{Q}$, irrational numbers, real numbers $\mathbb{R}$	$\mathbb{N} = \{0, 1, 2, \ldots\}$		A
1.2	Use of the four operations and brackets			A
1.3	Highest common factor, lowest common multiple			A
1.4	Calculation of powers and roots			A
1.5	Ratio and proportion		4.5	A
1.6	Absolute value $\lvert x \rvert$			
1.7	Equivalences between decimals, fractions, ratios and percentages			A
1.8	Percentages including applications such as interest and profit		11.7	
1.9	Meaning of exponents (powers, indices) in $\mathbb{Q}$ Standard Form $a \times 10^n$ where $1 \leqslant a < 10$ and $n \in \mathbb{Z}$ Rules for exponents			
1.10	Surds (radicals), simplification of square root expressions Rationalisation of the denominator	e.g. $\frac{1}{\sqrt{3}-1}$		
1.11	Estimating, rounding, decimal places and significant figures			A
1.12	Calculations involving time: second (s), minutes (min), hours (h), days, months, years including the relation between consecutive units	1 year = 365 days		A
1.13	Speed, distance, time problems			

CURRICULUM CONTENT (Core) continued

2	**ALGEBRA**		
2.1	Writing, showing and interpretation of inequalities, including those on the real number line		9.2
2.2	Solution of simple linear inequalities		
2.3	Solution of linear equations		
2.4	Simple indices – multiplying and dividing	e.g. $8x^5 \div 2x^3$	
2.5	Derivation, rearrangement and evaluation of simple formulae		
2.6	Solution of simultaneous linear equations in two variables		
2.7	Expansion of brackets		
2.8	Factorisation: common factor only	e.g. $6x^2 + 9x = 3x(2x + 3)$	
2.9	Algebraic fractions: simplification addition or subtraction of fractions with integer denominators multiplication or division of two simple fractions	e.g. $\frac{2x^2}{6x}$ e.g. $\frac{2x}{3} - \frac{y}{5}$ e.g. $\frac{p}{q} \div \frac{2t}{3q}$	
2.10			
2.11	Use of a graphics calculator to solve equations, including those which may be unfamiliar	e.g. $2^x = x^2$	3.6
2.12	Continuation of a sequence of numbers or patterns Determination of the *n*th term Use of a difference method to find the formula for a linear sequence or a simple quadratic sequence		
2.13			

CURRICULUM CONTENT (Extended) continued

2	**ALGEBRA**			
2.1	Writing, showing and interpretation of inequalities, including those on the real number line		9.2	
2.2	Solution of linear inequalities Solution of inequalities using a graphics calculator			
2.3	Solution of linear equations including those with fractional expressions			
2.4	Indices			
2.5	Derivation, rearrangement and evaluation of formulae			
2.6	Solution of simultaneous linear equations in two variables			
2.7	Expansion of brackets, including the square of a binomial			
2.8	Factorisation: common factor difference of squares trinomial four term	$6x^2 + 9x = 3x(2x + 3)$ $9x^2 - 16y^2 = (3x - 4y)(3x + 4y)$ $6x^2 + 11x - 10 = (3x - 2)(2x + 5)$ $xy - 3x + 2y - 6 = (x + 2)(y - 3)$		
2.9	Algebraic fractions: simplification, including use of factorisation addition or subtraction of fractions with linear denominators multiplication or division and simplification of two fractions			
2.10	Solution of quadratic equations: by factorisation using a graphics calculator using the quadratic formula	 formula given	3.6	
2.11	Use of a graphics calculator to solve equations, including those which may be unfamiliar	e.g. $2^x - 1 = 1/x^3$	3.6	
2.12	Continuation of a sequence of numbers or patterns Determination of the *n*th term Use of a difference method to find the formula for a linear sequence, a quadratic sequence or a cubic sequence Identification of a simple geometric sequence and determination of its formula			
2.13	Direct variation $y \propto x$, $y \propto x^2$, $y \propto x^3$, $y \propto \sqrt{x}$ Inverse variation $y \propto 1/x$, $y \propto 1/x^2$, $y \propto 1/\sqrt{x}$ Best variation model for given data		modelling	

CURRICULUM CONTENT (Core) continued

3	**FUNCTIONS**		
3.1	Domain and range Mapping diagrams	domain is $\mathbb{R}$ unless stated otherwise	
3.2			
3.3			
3.4			
3.5	Understanding of the concept of asymptotes and identification of simple examples parallel to the axes		
3.6	Use of a graphics calculator to: sketch the graph of a function produce a table of values find zeros, local maxima or minima find the intersection of the graphs of functions	 including unfamiliar functions vertex of quadratic	2.11
3.7			
3.8	Description and identification, using the language of transformations, of the changes to the graph of $y = f(x)$ when $y = f(x) + k$, $y = f(x + k)$	 k an integer	5.4
3.9			
3.10			

CURRICULUM CONTENT (Extended) continued

3	**FUNCTIONS**			
3.1	Domain and range Mapping diagrams	domain is $\mathbb{R}$ unless stated otherwise		
3.2	Recognition of the following function types from the shape of their graphs: linear $f(x) = ax + b$ quadratic $f(x) = ax^2 + bx + c$ cubic $f(x) = ax^3 + bx^2 + cx + d$ reciprocal $f(x) = a/x$ exponential $f(x) = a^x$ with $0 < a < 1$ or $a > 1$ absolute value $f(x) = \lvert ax + b \rvert$ trigonometric $f(x) = a\sin(bx)$; $a\cos(bx)$; $\tan x$	some of a, b, c or d may be 0 compound interest including period and amplitude	modelling 7.6 7.8 7.8 8.8	
3.3	Determination of at most two of a, b, c or d in simple cases of 3.2		modelling	
3.4	Finding the quadratic function given vertex and another point, x-intercepts and a point, vertex or x-intercepts with a=1.			
3.5	Understanding of the concept of asymptotes and identification of examples Simple tangent			
3.6	Use of a graphics calculator to: sketch the graph of a function produce a table of values find zeros, local maxima or minima find the intersection of the graphs of functions	including unfamiliar functions vertex of quadratic	 2.10 2.11	
3.7	Simplified formulae for expressions such as $f(g(x))$ where $g(x)$ is a linear expression			
3.8	Description and identification, using the language of transformations, of the changes to the graph of $y = f(x)$ when $y = f(x) + k$, $y = k\,f(x)$, $y = f(x+k)$	 k an integer	5.4 3.4	
3.9	Inverse function f^{-1}		5.5	
3.10	Logarithmic function as the inverse of the exponential function $y = a^x$ equivalent to $x = \log_a y$ Rules for logarithms corresponding to rules for exponents Solution to $a^x = b$ as $x = \log b / \log a$.			

CURRICULUM CONTENT (Core) continued

4	**GEOMETRY**		
4.1	Vocabulary: acute, obtuse, right angle, reflex, parallel, perpendicular, equilateral, isosceles, congruent, similar, regular, pentagon, hexagon, octagon, rectangle, square, kite, rhombus, parallelogram, trapezium		
4.2	Line and rotational symmetry		7.8
4.3	Angle measurement in degrees		
4.4	Angles round a point Angles on a straight line and intersecting straight lines Vertically opposite angles Alternate and corresponding angles on parallel lines Angle sum of a triangle, quadrilateral and polygons Angles of regular polygons		
4.5	Similarity Calculation of lengths of similar figures		1.5
4.6	Theorem of Pythagoras in two dimensions Including: chord length and its distance of a chord from the centre of a circle distances on a grid		7.2
4.7	Properties of circles tangent perpendicular to radius at the point of contact tangents from a point angle in a semicircle		

CURRICULUM CONTENT (Extended) continued

4	**GEOMETRY**			
4.1	Vocabulary: acute, obtuse, right angle, reflex, parallel, perpendicular, equilateral, isosceles, congruent, similar, regular, pentagon, hexagon, octagon, rectangle, square, kite, rhombus, parallelogram, trapezium			
4.2	Line and rotational symmetry		7.8	A
4.3	Angle measurement in degrees			A
4.4	Angles round a point Angles on a straight line and intersecting straight lines Vertically opposite angles Alternate and corresponding angles on parallel lines Angle sum of a triangle, quadrilateral and polygons Angles of regular polygons			
4.5	Similarity Calculation of lengths of similar figures Area and volume scale factors		1.5	
4.6	Theorem of Pythagoras and its converse in two and three dimensions Including: chord length and its distance of a chord from the centre of a circle distances on a grid		5.3 7.2	
4.7	Properties of circles: tangent perpendicular to radius at the point of contact tangents from a point angle in a semicircle angles at the centre and at the circumference on the same arc cyclic quadrilateral			

CURRICULUM CONTENT (Core) continued

5	**TRANSFORMATIONS IN TWO DIMENSIONS**		
5.1	Notation: Directed line segment $\overrightarrow{AB}$; component form $\begin{pmatrix} x \\ y \end{pmatrix}$		
5.2			
5.3			
5.4	Transformations on the cartesian plane translation, reflection, rotation, enlargement (reduction) Description of a translation using the Notation in 5.1		3.8
5.5			
5.6			

6	**MENSURATION**		
6.1	Units: mm, cm, m, km mm^2, cm^2, m^2, ha, km^2 mm^3, cm^3, ml, cl, l, m^3 g, kg, t	convert between units	
6.2	Perimeter and area of rectangle, triangle and compound shapes derived from these.	formula given for area of triangle	4.1
6.3	Circumference and area of a circle Arc length and area of sector	formulae given	
6.4	Surface area and volume of prism and pyramid (in particular, cuboid, cylinder and cone) Surface area and volume of sphere	formulae given for curved areas of cylinder, cone and sphere; volume of pyramid, cone, cylinder, prism and sphere	
6.5	Areas of compound shapes		

CURRICULUM CONTENT (Extended) continued

5	**TRANSFORMATIONS & VECTORS IN TWO DIMENSIONS**			
5.1	Notation: Vector **a**; directed line segment $\overrightarrow{AB}$; component form $\begin{pmatrix} x \\ y \end{pmatrix}$			
5.2	Addition of vectors using directed line segments or number pairs Negative of a vector, subtraction of vectors Multiplication of a vector by a scalar			
5.3	Magnitude $\lvert \mathbf{a} \rvert$		4.6 7.2	
5.4	Transformations on the cartesian plane: translation, reflection, rotation, enlargement (reduction), stretch Description of a translation using the Notation in 5.1		3.8	
5.5	Inverse of a transformation		3.9	
5.6	Combined transformations			

6	**MENSURATION**			
6.1	Units: mm, cm, m, km mm^2, cm^2, m^2, ha, km^2 mm^3, cm^3, ml, cl, l, m^3 g, kg, t	convert between units		A
6.2	Perimeter and area of rectangle, triangle and compound shapes derived from these		4.1	A
6.3	Circumference and area of a circle Arc length and area of sector			
6.4	Surface area and volume of prism and pyramid (in particular, cuboid, cylinder and cone) Surface area and volume of sphere	formulae given for curved areas of cylinder, cone and sphere; volume of pyramid, cone, cylinder, and sphere		
6.5	Areas and volumes of compound shapes			

CURRICULUM CONTENT (Core) continued

7	**CO-ORDINATE GEOMETRY**		
7.1	Plotting of points and reading from a graph in the cartesian plane		11.1
7.2	Distance between two points		4.6
7.3	Midpoint of a line segment		
7.4	Gradient of a line segment		
7.5	Gradient of parallel lines		
7.6	Equation of a straight line as $y = mx + c$ or $x = k$		
7.7			
7.8	Symmetry of diagrams or graphs in the cartesian plane		4.2

8	**TRIGONOMETRY**		
8.1	Right-angled triangle trigonometry		
8.2			
8.3			
8.4			
8.5			
8.6			
8.7	Applications: three-figure bearings and North, East, South, West problems in two dimensions compound shapes		
8.8			

CURRICULUM CONTENT (Extended) continued

7	**CO-ORDINATE GEOMETRY**			
7.1	Plotting of points and reading from a graph in the cartesian plane		11.1	
7.2	Distance between two points		4.6 5.3	
7.3	Midpoint of a line segment			
7.4	Gradient of a line segment			
7.5	Gradient of parallel and perpendicular lines			
7.6	Equation of a straight line as $y = mx + c$ and $ax + by = d$ (a, b and d integer)		3.2	
7.7	Linear inequalities on the cartesian plane	shade unwanted regions		
7.8	Symmetry of diagrams or graphs in the cartesian plane		3.2 4.2	

8	**TRIGONOMETRY**			
8.1	Right-angled triangle trigonometry			
8.2	Exact values for the trig ratios of 0°, 30°, 45°, 60°, 90°			
8.3	Extension to the four quadrants i.e. 0-360°			
8.4	Sine Rule	formula given, ASA SSA (ambiguous case)		
8.5	Cosine Rule	formula given, SAS, SSS		
8.6	Area of triangle	formula given		
8.7	Applications: three-figure bearings and North, East, South, West problems in two and three dimensions compound shapes			
8.8	Properties of the graphs of $y = \sin x$, $y = \cos x$, $y = \tan x$	x in degrees	3.2	

CURRICULUM CONTENT (Core) continued

9	**SETS**		
9.1	Notation and meaning for: is an element of ($\in$); is not an element of ($\notin$); is a subset of ($\subseteq$); is a proper subset of ($\subset$); universal set U, empty set $\varnothing$ or { }; complement of A, (A'); number of elements in A, n(A).		
9.2	Sets in descriptive form { x | } or as a list		2.1
9.3	Venn diagrams with at most two sets		
9.4	Intersection and union of sets		10.6

10	**PROBABILITY**		
10.1	Probability P(A) as a fraction, decimal or percentage Significance of its value		
10.2	Relative frequency as an estimate of probability		
10.3	Expected number of occurrences		
10.4	Combining events: the addition rule P(A or B) = P(A) + P(B) the multiplication rule P(A and B) = P(A) x P(B)	mutually exclusive independent simple cases only	
10.5	Tree diagrams including successive selection with or without replacement	simple cases only	
10.6	Probabilities from Venn diagrams and tables		9.3

CURRICULUM CONTENT (Extended) continued

9	**SETS**			
9.1	Notation and meaning for: is an element of ($\in$); is not an element of ($\notin$); is a subset of ($\subseteq$); is a proper subset of ($\subset$); universal set U, empty set $\varnothing$ or { }; complement of A, (A'); number of elements in A, n(A)			
9.2	Sets in descriptive form { x | } or as a list		2.1	
9.3	Venn diagrams with at most three sets			
9.4	Intersection and union of sets		10.6	

10	**PROBABILITY**			
10.1	Probability P(A) as a fraction, decimal or percentage Significance of its value			
10.2	Relative frequency as an estimate of probability			
10.3	Expected number of occurrences			
10.4	Combining events: the addition rule P(A or B) = P(A) + P(B) the multiplication rule P(A and B) = P(A) x P(B)	mutually exclusive independent		
10.5	Tree diagrams including successive selection with or without replacement			
10.6	Probabilities from Venn diagrams and tables		9.3	

CURRICULUM CONTENT (Core) continued

11	**STATISTICS**		
11.1	Reading and interpretation of graphs or tables of data		7.1
11.2	Discrete and continuous data		
11.3	(Compound) bar chart, line graph, pie chart, stem-and-leaf plot, scatter diagram		
11.4	Mean, mode, median, quartiles and range from lists of discrete data Mean, mode, median and range from grouped discrete data		
11.5	Mean from continuous data		
11.6			
11.7	Cumulative frequency table and curve Median, quartiles and inter-quartile range	 read from curve	
11.8	Use of a graphics calculator to calculate mean, median and quartiles for discrete data and mean for grouped data		
11.9	Understanding and description of correlation with reference to a scatter diagram Straight line of best fit (by eye) through the mean on a scatter diagram	the coefficient of correlation is not required	

CURRICULUM CONTENT (Extended) continued

11	**STATISTICS**			
11.1	Reading and interpretation of graphs or tables of data		7.1	
11.2	Discrete and continuous data			
11.3	(Compound) bar chart, line graph, pie chart, stem-and-leaf plot, scatter diagram			
11.4	Mean, mode, median, quartiles, range from lists of discrete data Mean, mode, median and range from grouped discrete data			
11.5	Mean from continuous data			
11.6	Histograms with frequency density on the vertical axis			
11.7	Cumulative frequency table and curve Median, quartiles, percentiles and inter-quartile range	read from curve	1.8	
11.8	Use of a graphics calculator to calculate mean, median, and quartiles for discrete data and mean for grouped data			
11.9	Understanding and description of correlation with reference to a scatter diagram Straight line of best fit (by eye) through the mean on a scatter diagram Equation of the linear regression line from a graphics calculator	the coefficient of correlation is not required		

APPENDIX

LIST OF FORMULAE FOR CORE TIER

Area, A, of triangle, base b, height h.	$A = \frac{1}{2}bh$
Area, A, of circle, radius r.	$A = \pi r^2$
Circumference, C, of circle, radius r.	$C = 2\pi r$
Curved surface area, A, of cylinder of radius r, height h.	$A = 2\pi rh$
Curved surface area, A, of cone of radius r, sloping edge l.	$A = \pi rl$
Curved surface area, A, of sphere of radius r.	$A = 4\pi r^2$
Volume, V, of prism, cross-sectional area A, length l.	$V = Al$
Volume, V, of pyramid, base area A, height h.	$V = \frac{1}{3}Ah$
Volume, V, of cylinder of radius r, height h.	$V = \pi r^2 h$
Volume, V, of cone of radius r, height h.	$V = \frac{1}{3}\pi r^2 h$
Volume, V, of sphere of radius r.	$V = \frac{4}{3}\pi r^3$

LIST OF FORMULAE FOR EXTENDED TIER

Curved surface area, A, of cylinder of radius r, height h. $A = 2\pi rh$

Curved surface area, A, of cone of radius r, sloping edge l. $A = \pi rl$

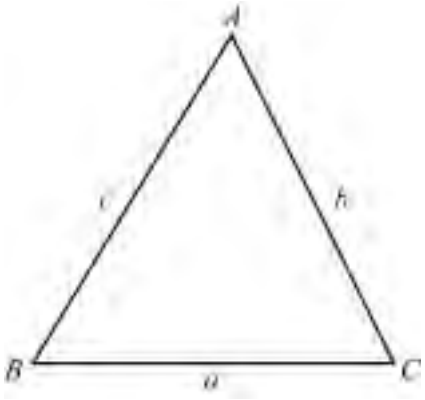
Curved surface area, A, of sphere of radius r. $A = 4\pi r^2$

Volume, V, of pyramid, base area A, height h. $V = \frac{1}{3}Ah$

Volume, V, of cylinder of radius r, height h. $V = \pi r^2 h$

Volume, V, of cone of radius r, height h. $V = \frac{1}{3}\pi r^2 h$

Volume, V, of sphere of radius r. $V = \frac{4}{3}\pi r^3$



$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$\text{Area} = \frac{1}{2}bc\sin A$$

For the equation $ax^2 + bx + c = 0$ $$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$