

## 2.6 Unit A503/01: Maths Unit C (Foundation)

This unit assumes the use of a calculator

FC1 General problem solving skills	Examples
<p>These skills should underpin and influence the learning experiences of all candidates in mathematics. They will be assessed within this paper.</p>	
<p>1.1 - Solve problems using mathematical skills</p>	<p>Candidates should be able to:</p> <ol style="list-style-type: none"> <li>select and use suitable problem solving strategies and efficient techniques to solve numerical problems;</li> <li>identify what further information may be required in order to pursue a particular line of enquiry and give reasons for following or rejecting particular approaches;</li> <li>break down a complex calculation into simpler steps before attempting to solve it and justify their choice of methods;</li> <li>use notation and symbols correctly and consistently within a problem;</li> <li>use a range of strategies to create numerical representations of a problem and its solution; move from one form of representation to another in order to get different perspectives on the problem;</li> <li>interpret and discuss numerical information presented in a variety of forms;</li> <li>present and interpret solutions in the context of the original problem;</li> <li>review and justify their choice of mathematical presentation;</li> <li>understand the importance of counter-example and identify exceptional cases when solving problems;</li> <li>show step-by-step deduction in solving a problem;</li> <li>recognise the importance of assumptions when deducing results; recognise the limitations of any assumptions that are made and the effect that varying those assumptions may have on the solution to a problem;</li> <li>draw on their knowledge of operations and inverse operations (including powers and roots), and of methods of simplification (including factorisation and the use of the commutative, associative and distributive laws of addition, multiplication and factorisation) in order to select and use suitable strategies and techniques to solve problems and word problems, including those involving ratio and proportion; fractions, percentages, measures and conversion between measures, and compound measures defined within a particular situation.</li> </ol>
	<p>Statements a to k are repeated across all Units</p>

**FC2 Number**

2.1 - Add, subtract, multiply and divide any number	Candidates should be able to: a. derive integer complements to 100; b. recall all multiplication facts to $10 \times 10$ , and use them to derive quickly the corresponding division facts; c. understand and use positive and negative numbers both as positions and translations on a number line; d. calculate a given fraction of a given quantity, expressing the answer as a fraction; e. express a given number as a fraction of another; f. add and subtract fractions by writing them with a common denominator; g. multiply and divide a fraction by an integer and by a unit fraction; h. understand and use unit fractions as multiplicative inverses.	Statements a and b are repeated from Unit A502 Statement c is repeated from Unit A501 Statements d, e, f, g and h are repeated from Unit A502
2.2 - Approximate to a specified or appropriate degree of accuracy	Candidates should be able to: a. round to the nearest integer, to any number of decimal places, specified or appropriate, and to any number of significant figures; b. understand the calculator display, knowing when to interpret the display, when the display has been rounded by the calculator, and not to round during the intermediate steps of a calculation; c. give solutions in the context of the problem to an appropriate degree of accuracy, interpreting the solution shown on a calculator display, and recognising limitations on the accuracy of data and measurements.	These statements build on the work in Unit A501
2.3 - Use calculators effectively and efficiently	Candidates should be able to: a. use calculators effectively and efficiently; b. know how to enter complex calculations and use function keys for reciprocals, squares and powers c. enter a range of calculations, including measures; d. understand the calculator display, knowing when to interpret the display, when the display has been rounded by the calculator, and not to round during the intermediate steps of a calculation.	Statements a, b and d are repeated from Unit A501
2.4 - Substitute numbers into expressions involving indices	Candidates should be able to: a. substitute positive and negative numbers into expressions such as $3x^2 + 4$ and $2x^3$ and evaluate the outcome.	

**FC3 Use upper and lower bounds**

3.1 - Inaccuracy in measurement

Candidates should be able to:

- a. recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction.

This statement is repeated in the General measures section

**FC4 Social arithmetic**

4.1 - Apply problem solving skills

Candidates should be able to:

- a. analyse real life problems using mathematical skills;
- b. apply mathematical skills when solving real life problems;
- c. communicate findings from solutions to real life problems;
- d. interpret solutions to real life problems.

4.2 - Use percentage and repeated percentage change

Candidates should be able to:

- a. solve simple percentage problems in real life situations, including increase and decrease.

4.3 - Understand and use direct and indirect proportion

Candidates should be able to:

- a. solve word problems about proportion, including using informal strategies and the unitary method of solution.

4.4 - Solve real life problems involving measures

Candidates should be able to:

- a. explore and solve problems in real life contexts that use common measures (including time, money, mass, length, area and volume);
- b. explore and solve problems in real life contexts that use common compound measures such as speed and density;
- c. use checking procedures, including inverse operations; work to stated levels of accuracy.

**FC5 General algebra and coordinates**

5.1 - Symbols and notation

Candidates should be able to:

- a. distinguish the different roles played by letter symbols in algebra, using the correct notational conventions for multiplying or dividing by a given number;
- b. know that letter symbols represent definite unknown numbers in equations<sup>(1)</sup>, defined quantities or variables in formulae<sup>(2)</sup> and general, unspecified independent numbers in identities<sup>(3)</sup>;
- c. know that in functions, letter symbols define new expressions or quantities by referring to known quantities<sup>(4)</sup>.

These statements are repeated across all Units

(1)  $5x + 1 = 16$

(2)  $V = IR$

(3)  $3x + 2x = 5x$  for all values of  $x$

(4)  $y = 2x$

5.2 - Algebraic terminology	Candidates should be able to: a. distinguish in meaning between the words 'equation', 'formula' and 'expression'.	This statement is repeated across all Foundation Units
5.3 - Use the conventions for coordinates in the plane	Candidates should be able to: a. use the conventions for coordinates in the plane; plot points in all four quadrants; b. understand that one coordinate identifies a point on a number line, two coordinates identify a point in a plane and three coordinates identify a point in space, using the terms '1D', '2D' and '3D'; c. use axes and coordinates to specify points in all four quadrants; d. locate points with given coordinates.	Statements a, b, c and d occur across all three Units, where an understanding of coordinates is needed to complete other sections of the work  Statement b occurs across all three Units but without the inclusion of 3D coordinates, which only appear in this Unit
<b>FC6 Algebraic manipulation</b>		
6.1 - Manipulate algebraic expressions	Candidates should be able to: a. understand that the transformation of algebraic expressions obeys and generalises the rules of general arithmetic <sup>(1)</sup> , b. manipulate algebraic expressions by collecting like terms <sup>(2)</sup> , by multiplying a single term over a bracket, and by taking out common factors <sup>(3)</sup> .	(1) $a(b + c) = ab + ac$ (2) $x + 5 - 2x - 1 = 4 - x$ (3) $9x - 3 = 3(3x - 1)$ or $x^2 - 3x = x(x - 3)$
6.2 - Use trial and improvement to solve equations	Candidates should be able to: a. use systematic trial and improvement to find approximate solutions of equations where there is no simple analytical method of solving them.	$x^3 = x - 900$ ; $\frac{1}{x} = x^2 - 5$
<b>FC7 Real life and non-linear functions</b>		
7.1 - Functions from real life	Candidates should be able to: a. discuss and interpret graphs modelling real situations.	Distance time graphs, mobile phone charges, electricity bills  Graphs may not be linear. Purely linear cases are dealt with in Unit A502
7.2 - Plot graphs of simple quadratic functions	Candidates should be able to: a. generate points and plot graphs of simple quadratic functions; b. find approximate solutions of a quadratic equation from the graph of the corresponding quadratic function.	$y = x^2$ ; $y = 3x^2 + 4$

## FC8 General measures

8.1 - Interpret scales and use measurements

Candidates should be able to:

- a. interpret scales on a range of measuring instruments, including those for time and mass;
- b. know that measurements using real numbers depend on the choice of unit;
- c. understand angle measure using the associated language<sup>(1)</sup>;
- d. convert measurements from one unit to another;
- e. know approximate metric equivalents of pounds, feet, miles, pints and gallons;
- f. recognise that measurements given to the nearest whole unit may be inaccurate by up to one half in either direction;
- g. convert between area measures (including square centimetres and square metres), and volume measures (including cubic centimetres and cubic metres);
- h. understand and use compound measures (including speed<sup>(2)</sup> and density).

Statements a to e are repeated from Unit A501

- (1) use bearings to specify direction  
(2) how far do you go travelling at 40 mph for 3 hours?

## FC9 Area and volume

9.1 - Perimeter, area (including circles), and volume

Candidates should be able to:

- a. find areas of rectangles, recalling the formula, understanding the connection to counting squares;
- b. recall and use the formulae for the area of a parallelogram and a triangle;
- c. work out the surface area of simple shapes using the area formulae for triangles and rectangles;
- d. calculate perimeters and areas of shapes made from triangles and rectangles;
- e. find circumferences of circles and areas enclosed by circles, recalling relevant formulae;
- f. find volumes of cuboids, recalling the formula and understanding the connection to counting cubes;
- g. calculate volumes of right prisms and of shapes made from cubes and cuboids;
- h. use  $\pi$  in exact calculations.

9.2 - Use 2D representations of 3D shapes	<p>Candidates should be able to:</p> <ol style="list-style-type: none"> <li>explore the geometry of cuboids (including cubes) and objects made from cuboids;</li> <li>use 2D representations of 3D objects; analyse 3D objects through 2D projections (including plan and elevation) and cross-sections;</li> <li>draw nets of 3D objects<sup>(1)</sup>;</li> <li>solve problems involving the surface area and volume of prisms;</li> <li>construct nets of cubes, regular tetrahedra, square-based pyramids and other 3D shapes from given information.</li> </ol>	(1) Cube, cuboid and simple pyramids
9.3 - Enlargement	<p>Candidates should be able to:</p> <ol style="list-style-type: none"> <li>identify the scale factor of an enlargement as the ratio of the lengths of any two corresponding line segments and apply this to triangles;</li> <li>understand that enlargement preserves angle but not length;</li> <li>understand the implications of enlargement for perimeter;</li> <li>understand the implications of enlargement for area and volume<sup>(1)</sup>.</li> </ol>	<p>Statements a and b are repeated from Unit A502</p> <p>(1) That sf 2 does not double area</p> <p>Formal treatment not required</p>
<b>FC10 The study of chance</b>		
10.1 - Probability	<p>Candidates should be able to:</p> <ol style="list-style-type: none"> <li>use the vocabulary of probability to interpret results involving uncertainty and prediction;</li> <li>understand and use the probability scale;</li> <li>understand and use estimates or measures of probability from theoretical models (including equally-likely outcomes), or from relative frequency;</li> <li>list all outcomes for single events, and for two successive events, in a systematic way;</li> <li>identify different mutually-exclusive outcomes;</li> <li>know that the sum of the probabilities of all the possible mutually exclusive outcomes is 1;</li> <li>understand that if they repeat an experiment, they may (and usually will) get different outcomes, and that increasing sample size generally leads to better estimates of probability;</li> <li>compare experimental data to theoretical probabilities.</li> </ol>	