

UNIT A6

Recommended Prior Knowledge Units A1 to A5

Context Work on quadratic functions is expanded, leading to solving a quadratic equation by factorisation. Graphical work is extended to graphing linear inequalities.

Outline Having factorised simple quadratics in unit A5, students learn to factorise the remaining range of quadratic functions, where possible, and then apply their knowledge to the solution of quadratic equations. Work done in unit A3 on drawing and interpreting straight line graphs is now applied to representing linear inequalities graphically.

	Learning Outcomes	Suggested Teaching Activities	Resources
23	Factorise expressions of the form $ax + bx + kay + kby$; $a^2x^2 - b^2y^2$; $a^2 + 2ab + b^2$; $ax^2 + bx + c$	First revise the work done in A5 on factorising quadratic expressions with 1 as the coefficient of x^2 . Then in a similar way to the work that was done there in introducing factorisation, first expand and simplify some quadratic expressions such as $(3x - 1)(2x + 5)$ before establishing the method for factorising such quadratics.	sections 10.10 and 10.11 of http://www.ex.ac.uk/cimt/mepres/allgcse/bkb10.pdf
25	Solve quadratic equations by factorisation.	You may wish to combine drawing the graph of a function such as $y = x^2 - 4x + 3$ with solving $x^2 - 4x + 3 = 0$ graphically and factorising $x^2 - 4x + 3$ as a way in to the case of solving the equation algebraically compared with drawing the graph. Show the students also that the product of two factors being zero means that one of the factors must be zero so that they see the reasoning behind the method of solution by factorisation. Give the students practice so that they become proficient in the algebraic manipulation required.	http://www.ilovemaths.com/3quadfactor.htm has some suitable examples
26	Represent linear inequalities in one or	Show how a number line may be used to	section 16.1 of

	<p>two variables graphically. (Linear Programming problems are not included.)</p>	<p>represent in 1-D the solution of an inequality such as $x > 6$ or $0 \leq x < 3$, using an unfilled circle to represent a boundary which is not included and a filled-in circle to represent a boundary which is included.</p> <p>Start representing inequalities in 2-D by drawing a line such as $x = 3$. Identify the line as the boundary between the regions $x > 3$ and $x < 3$. Similarly for lines such as $y = 6$, $y = 4x - 1$, $x + 2y = 6$. In particular identify to the students the possible methods for determining which region is which, in the case of sloping lines – for instance seeing which inequality is satisfied by the origin or another point not on the line.</p> <p>Give the students practice in drawing the graphs of inequalities and in identifying the inequalities represented on a given graph [for which they may have to determine the equation of a straight line, studied in unit A3].</p>	<p>http://www.ex.ac.uk/cimt/mepres/allgcse/bkc16.pdf</p> <p>section 16.4 of http://www.ex.ac.uk/cimt/mepres/allgcse/bkc16.pdf</p>
--	---	---	---

UNIT D6

Recommended Prior Knowledge Units D1 to D3

Context Work on grouped data studied in D3 is developed further to include the use and interpretation of cumulative frequency diagrams.

Outline The concept of cumulative frequency is introduced, leading on to representing this information in a diagram. The information given by this diagram is then discussed and used, leading on to comparing distributions.

	Learning Outcomes	Suggested Teaching Activities	Resources
35	Construct and use cumulative frequency diagrams; estimate the median, percentiles, quartiles and interquartile range.	<p>Start with a frequency table for a grouped distribution and take the opportunity to revise how to find the mean of such a distribution, using the mid-points of the intervals, and how to draw a frequency polygon to represent the distribution.</p> <p>Then combine the frequencies for the first two classes and ask what information is given by this etc, so helping students to see that cumulative frequency gives information about values less than the upper bound of each class and so the diagram must be plotted using upper bounds.</p> <p>Draw cumulative frequency diagrams and read information from them, showing how the median can be obtained directly and how to interpret the varying steepness of the graph. Introduce the concepts of percentiles, quartiles and inter-quartile range. Give students practice in obtaining and using these to compare distributions.</p>	<p>http://www.ex.ac.uk/cimt/mepres/allgcse/bkb9.pdf has cumulative frequency etc at section 9.5</p>

UNIT N6

Recommended Prior Knowledge Units N1, N5

Context Knowledge about indices is applied to using standard form.

Outline The use of standard form to write very large and very small numbers is taught. Students learn to convert numbers to and from this form and to use it in calculations, both with and without a calculator.

	Learning Outcomes	Suggested Teaching Activities	Resources
8	Use the standard form $A \times 10^n$ where n is a positive or negative integer and $1 \leq A < 10$	Ask students to multiply two large numbers together, such as 2 million and 3.6 million. Ask them to do this mentally and to write the result as an ordinary number, then to do the same calculation on their calculator and compare the results; similarly for a division such as $3.6 \div 2$ million. Use this opportunity to define standard form and discuss the correct notation. Practice conversion to and from standard form. Show the students how to use their calculators to calculate with standard form and how to use the laws of indices to simplify standard form calculations without a calculator.	Astronomy uses large distances and data using stars is a good source of large numbers. See websites such as http://www.essex1.com/people/speer/stars.html Nanotechnology is a good source of data on very small distances. See websites such as http://www.sciam.com/article.cfm?chanID=sa002&articleID=000CE8C4-DC31-1055-973683414B7F0000&catID=7 Section 1.7 of http://www.ex.ac.uk/cimt/mepres/allgcse/bka1.pdf is about standard form.

UNIT S6

Recommended Prior Knowledge Units S1 to S5, A1, A5, N4

Context Work on triangles is developed to include similar and congruent triangles and an introduction to trigonometry. Concepts of enlargement and ratios already met assist in understanding the use of both trigonometrical and similarity ratios.

Outline First, trigonometrical ratios are introduced, leading on to solving right-angled triangle problems including trigonometry and / or Pythagoras' theorem. The focus then moves to similarity, developing an understanding of the ratios there and applying them. Finally, the conditions for congruence for triangles are established.

	Learning Outcomes	Suggested Teaching Activities	Resources
34	<p>Apply the sine, cosine and tangent ratios for acute angles to the calculation of a side or an angle of a right-angled triangle [angles will be quoted in, and answers required in, degrees and decimals of a degree to one decimal place.]</p> <p>Solve trigonometrical problems in two dimensions including those involving angles of elevation and depression and bearings.</p>	<p>Ask students to draw a right-angled triangle with an angle of 40° and adjacent side of 2, 4 or 5 cm and to measure the opposite side and compare the results, (revising their knowledge of enlargement from unit S5 in the process), hence finding the opposite side when the adjacent is 1 cm and defining this length in cm as $\tan 40^\circ$ and show the length they have drawn is consistent with this value on the calculator. Use enlargement to show this is opposite \div adjacent for all their triangles drawn. Repeat the process with one or two other angles, then show how tangent ratios can be used to find unknown sides and then angles in right-angled triangles.</p> <p>Similarly define cosine and sine ratios and use all three ratios. Include solving problems, where the students need to interpret the situation, sketching a diagram to show the right-angled triangle needed.</p> <p>Include also problems requiring the use of Pythagoras' theorem as well as</p>	<p>http://www.catcode.com/trig/index.html has interactive pages on basic trigonometry</p> <p>http://www.ex.ac.uk/cimt/mepres/allgcse/bka4.pdf is a chapter about trigonometry and sections 4.4 to 4.7 are suitable for this unit, together with work on Pythagoras, theorem from section 4.3.</p>

		trigonometry [studied in unit S3].	
27	Solve problems and give simple explanations involving similarity and congruence.	<p>Use the work on enlargements in unit S5, to find unknown sides in similar triangles, via using the scale factor of enlargement. Derive the ratios for similar triangles, relating them to the scale factor and showing how other ratios can be obtained.</p> <p>Ask students what information they need to be given in order to draw a triangle, leading on to a discussion of the conditions for congruence. Give students practice in setting out explanations showing congruency.</p>	<p>http://www.gcseguide.co.uk/similar_triangles.htm</p> <p>http://regentsprep.org/Regents/math/similar/Lstrategy.htm</p> <p>http://regentsprep.org/Regents/math/congruen/Ttriangles.htm</p>