

UNIT A7

Recommended Prior Knowledge Units A1 to A6, N1, N5

Context Work on solving quadratic equations studied in unit A6 is extended to include equations which do not factorise. Work on indices is extended to include fractional indices.

Outline Revision of solving quadratic equations which factorise leads on to the new methods required to solve those which do not factorise. In the other section of this unit, the laws of indices are applied to find the meaning of fractional indices and these are then used.

	Learning Outcomes	Suggested Teaching Activities	Resources
25	Solve quadratic equations either by use of the formula or by completing the square.	Remind students how to solve quadratic equations which factorise, by giving them a few to solve, including as the last one an equation which does not factorise. Use this to discuss the methods available for solving such an equation, reminding them of the graphical methods used in unit A5 to obtain approximate solutions. Then introduce the methods of using the formula or completing the square, as methods which give the exact solution of a quadratic equation.	sections 10.12 and 10.14 of http://www.ex.ac.uk/cimt/mepres/allgcse/bkb10.pdf
24	Use and interpret fractional indices	Remind students of the work done on other indices in unit N5. Use the laws of indices to discuss the meaning of an index such as $\frac{1}{2}$ by considering $a^{1/2} \times a^{1/2} = a^1$ etc. Progress to simplifying algebraic expressions containing roots and indices.	section 1.6 of http://www.ex.ac.uk/cimt/mepres/allgcse/bka1.pdf has work on indices, including fractional indices

UNIT D7

Recommended Prior Knowledge Units N2, D4

Context Elementary ideas of probability were studied in unit D4. This unit moves on to considering the probabilities of combined events.

Outline

	Learning Outcomes	Suggested Teaching Activities	Resources
36	Calculate the probability of simple combined events using possibility diagrams and tree diagrams where appropriate. (In possibility diagrams outcomes will be represented by points on a grid and in tree diagrams outcomes will be written at the end of branches and probabilities by the side of the branches.)	<p>Build on the work of D4 and start with a simple event such as the score on a spinner; ask for the probability of the total score being a certain number when the spinner is spun twice. Discuss with the students strategies such as listing outcomes and show them how to represent the outcomes on a possibility diagram.</p> <p>To introduce tree diagrams use an example such as choosing balls at random from a bag, when there are different numbers of balls of different colours. First do examples where the first ball is replaced and a second ball chosen. Later, to introduce conditional probability, do an example where the first ball is not replaced and so the probabilities on the second branches are changed.</p> <p>Use reasoning such as finding a fraction of a fraction to help students see when to multiply and when to add combined probabilities – this can be accompanied by listing outcomes using suffix notation where appropriate (such as R_1, R_2, R_3 where there are three red balls) to obtain a list of</p>	<p>section 5.3 onwards of http://www.ex.ac.uk/cimt/mepres/allgcse/bka5.pdf</p>

		<p>equally likely outcomes.</p> <p>At first, give students examples which require them to complete drawn tree diagrams and calculate probabilities. Then progress to students drawing their own tree diagrams to represent situations. Finally, include examples where a tree diagram is not required [though students may wish to draw it] but where students can solve the problem using logic and addition / multiplication of probabilities as appropriate</p>	
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UNIT N7

Recommended Prior Knowledge Units N1, A1 to A4.

Context The topic of sequences involves both number and algebra, as number patterns are explored and generalised. The work on linear sequences could be studied earlier, after unit A3.

Outline Linear number sequences are studied first, progressing to explore other sequences.

	Learning Outcomes	Suggested Teaching Activities	Resources
1	Continue given number sequences, recognise patterns within and across different sequences and generalise to simple algebraic statements (including expressions for the n th term) relating to such sequences.	<p>Start with some simple linear sequences, expressed in numbers or in patterns using matchsticks etc. Ask students to explain the patterns and how to find the next term, the 10th term etc, leading on to finding the nth term. Make comparisons with gradient and the equation for a straight line.</p> <p>Lead on to other basic number patterns such as squares, cubes, powers of 2 and triangle numbers before other quadratic sequences. Look at second differences for quadratic sequences etc and how these or simultaneous equations can be used to find the nth term.</p> <p>For an activity using sequences, students could explore the number of games, rounds etc needed for any number of competitors for a knockout tournament such as the Wimbledon tennis tournament.</p>	<p>http://www.ex.ac.uk/cimt/mepres/allgcse/bkb12.pdf is a chapter about number patterns</p> <p>A fascinating site about the Fibonacci sequence and the Golden section is at http://www.mcs.surrey.ac.uk/Personal/R.Knott/Fibonacci/fib.html</p> <p>The NRich site has many puzzles about sequences, such as this one about triangle numbers http://nrich.maths.org/public/viewer.php?obj_id=2274&part=index&refpage=monthindex.php</p>

UNIT S7

Recommended Prior Knowledge Units N2, S2, S4, S5.

Context The remaining work in the syllabus about circles is covered in this unit.

Outline From knowing how to find the circumference and area of whole circles, studied in S4, students move on to calculating for sectors, where the angle is given in degrees. Angle properties involving symmetry were also met in S4 and students now meet the remaining angle properties of the circle and use the whole range of these angle properties.

	Learning Outcomes	Suggested Teaching Activities	Resources
33	Solve problems involving arc length and sector area as fractions of the circumference and area of a circle.	Ask students to find the area of a whole circle and then a fraction of it, progressing quickly on to find the area of a sector of any angle; similarly for calculating arc-length. Include also some problems using fractions of cylinders, such as finding the volume of a piece of cheese whose cross-section is a sector.	http://www.bbc.co.uk/schools/gcsebitesize/maths/shapeih/circlesanglesarcsandsectorsrev3.shtml is the revision site for arcs and sectors. There is also a test page at http://www.bbc.co.uk/schools/gcsebitesize/gigaflat/maths/circlesanglesarcsandsectors/circlesanglesarcsandsectors_quiz.shtml
31	Calculate unknown angles and give simple explanations using the following geometrical properties: (g) angle in a semi-circle (i) angle at the centre of a circle is twice the angle at the circumference (j) angles in the same segment are equal (k) angles in opposite segments are supplementary	If a dynamic geometry computer package such as Geometer's Sketchpad or Cabri-géomètre is available, this may be used to demonstrate these angle properties, such as varying the angle at the centre and showing that the angle at the circumference is always half its value. If it is not available, students can draw and measure angles to see the relationships. Proofs are not required of these angle properties, but it is worthwhile to show students how they can be obtained, using the properties of isosceles triangles and the exterior angle to a triangle etc. Give	sections 3.8 and 3.9 of http://www.ex.ac.uk/cimt/mepres/allgcse/bka3.pdf there are interactive investigations about the angle properties at http://teachers.henrico.k12.va.us/math/rd03/GeometryActs/CircleAngle01.html

		students practice at calculating unknown angles in circle diagrams [using also the work done in unit S4] and in giving reasons for how they obtained their answers.	
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