

NEW GRADING SYSTEM (1-9)

9 = A* +	8 = A* -	7 = A	6 = B+	5 = B-
4 = C	3 = D	2 = E	1 = F	U = G

EDEXCEL GCSE Mathematics (9-1) Route Map – Foundation Tier (Start September 2015)

Year 10

Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9	Wk10
1. Symmetry, Shapes and Angles (5)	2. Multiples, Factors and Primes (3)	3. Expressions and Equations (5)	4. Accuracy and using calculator (4)	5. Negative numbers (2)	6. Fractions (5)	7. Real life graphs (2)	8. Decimals and rounding (5)	Holiday	8. Decimals and rounding (5)
Wk11	Wk12	Wk13	Wk14	Wk15	Wk16	Wk17	Wk18	Wk19	Wk20
9. Metric and imperial units (2)	10. Area (4)	11. 3D solids (3)	12. Formulae (3)	13. Powers and Roots (zero and negative indices) (4)	14. Straight line graphs (3)	15. Scatter Graphs (2)	Holiday	16. FDP (4)	17. Probability (sets and venn diagrams) (6)
Wk21	Wk22	Wk23	Wk24	Wk25	Wk26	Wk27	Wk28	Wk29	Wk30
17. Probability (6)	18. Percentages (Reverse percentages) (5)	19. Collecting and interpreting data. Averages. (3)	20. Graphical representations (Time series) (6)	Holiday	20. Graphical representations (Time series) (6)	21. Ratio and proportion (3)	22. Algebraic Manipulation (Factorising quadratics, DOTS) (6)		23. Navigation and Travel (4)
Wk31	Wk32	Wk33	Wk34	Wk35	Wk36	Wk37	Wk38	Wk39	Wk40
Holiday	Holiday	24. Sequences (4)	25. Constructions (4)	26. Transformations (4)	27. Angles (Triangles, parallel lines, polygons) (Congruency) (5)	28. Fractions (4)		Holiday	29. Circles and related shapes (Pi) (Arcs / sectors) (4)
Wk41	Wk42	Wk43	Wk44	Wk45	Wk46				
REVISION	June Examinations	30. Probability (inc. Tree diagrams) (5)	31. Transformations (Enlargements fractional scale (5) factors)						

EDEXCEL GCSE Mathematics (9-1) Route Map – Foundation Tier (Start September 2015)

Year 11

Wk1	Wk2	Wk3	Wk4	Wk5	Wk6	Wk7	Wk8	Wk9 Holiday	Wk10
32. Using percentages (Compound interest) (5)		33. Expressions, brackets and formulae (Change the subject) (6)	34. Linear equations (simultaneous equations) (6)		35. Drawing and using quadratic graphs (3)	36. Quadratic equations (Factorising & DOTS) (5)			37. Indices (Standard form) (4)
Wk11	November Examinations		Wk14	Wk15	Wk16	Wk17 Holiday	Wk18 Holiday	Wk19	Wk20
REVISION			38. Fractions and decimals (4)	39. Compound measures (Density and pressure) (4)	40. Inequalities (3)			41. Using ratio (Direct and inverse proportion) (6)	42. Sequences (4)
Wk21	Wk22	Wk23	Wk24	Wk25 Holiday	Wk26	Wk27	Wk28	Wk29	Wk30
42. Sequences (Quadratic and geometric) (4)	43. Graphs (Gradients and other graphs) (5)	44. Area, SA and Volume (6)			45. Construction and Loci (4)	47. Congruence and similarity (4)	46. Pythagoras' Theorem (4)	48. Trigonometry (6)	
Wk31 Holiday	Wk32 Holiday	Wk33	Wk34	Wk35	Wk36	Wk37	Wk38	Wk39 Holiday	Wk40
		49. Vectors (4)	REVISION			May / June Examinations	May / June Examinations		May / June Examinations
Wk41	Wk42	Wk43	Wk44	Wk45	Wk46				
May / June Examinations	May / June Examinations								

1. Symmetry, shapes and angles (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Recognise and draw on lines of symmetry.
- Draw the reflection of a shape about a mirror line, on cm grid by counting squares.
- Draw all lines of symmetry for simple shapes & polygons and know the order of rotational symmetry
- Complete shapes with one line and/or rotational symmetry of order 2.
- Reflect shapes in either axis using coordinates (Diagonal Line of symmetry)
- Complete a pattern with rotational symmetry 4.
- Measure and draw lines, to the nearest mm;
- Measure and draw angles, to the nearest degree using a protractor;
- Estimate sizes of angles;
- Use geometric language appropriately;
- Use letters to identify points, lines and angles;
- Use two-letter notation for a line and three-letter notation for an angle;
- Describe angles as turns and in degrees and understand clockwise and anticlockwise;
- Know that there are 360° in a full turn, 180° in a half turn and 90° in a quarter turn;
- Recall and use properties of angles at a point, angles at a point on a straight line, right angles, and vertically opposite angles;
- Distinguish between scalene, equilateral, isosceles and right-angled triangles;
- Derive and use the sum of angles in a triangle;
- Find a missing angle in a triangle, using the angle sum of a triangle is 180° ;
- Understand and use the angle properties of triangles, use the symmetry property of isosceles triangle to show that base angles are equal;
- Use the side/angle properties of isosceles and equilateral triangles;
- Understand and use the angle properties of intersecting lines;
- Use the fact that angle sum of a quadrilateral is 360° ;
- Identify a line perpendicular to a given line on a diagram and use their properties;
- Identify parallel lines on a diagram and use their properties;

1. Symmetry, shapes and angles (5 hours)

Continued
on next
page

PEARSON

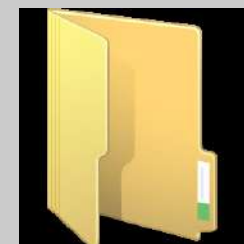
edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use a ruler and protractor. ➤ Students should have an understanding of angles as a measure of turning. ➤ Students should be able to name angles and distinguish between acute, obtuse, reflex and right angles. ➤ Students should recognise reflection symmetry, be able to identify and draw lines of symmetry, and complete diagrams with given number of lines of symmetry. ➤ Students should recognise rotation symmetry and be able to identify orders of rotational symmetry, and complete diagrams with given order of rotational symmetry.	➤ Pupils may believe, incorrectly, that perpendicular lines have to be horizontal/vertical or all triangles have rotational symmetry of order 3. ➤ Some students will think that all trapezia are isosceles, or a square is only square if 'horizontal', or a 'non-horizontal' square is called a diamond. ➤ Some students may think that the equal angles in an isosceles triangle are the 'base angles'. ➤ Incorrectly identifying the 'base angles' (i.e. the equal angles) of an isosceles triangle when not drawn horizontally.
Problem solving	Keywords
➤ Multi-step "angle chasing" style problems that involve justifying how students have found a specific angle. ➤ Geometrical problems involving algebra whereby equations can be formed and solved allow students the opportunity to make and use connections with different parts of mathematics.	Quadrilateral, angle, polygon, proof, tessellation, rotational symmetry, parallel, edge, face, sides, triangle, perpendicular, isosceles, scalene, clockwise, anticlockwise, hexagons, heptagons, octagons, decagons, obtuse, acute, reflex, quadrilateral, triangle, regular, irregular, two-dimensional, three-dimensional, measure, line, angle, order, intersecting

1. Symmetry, shapes and angles (5 hours)

Resources

- Rangoli Patterns.
- Practical proof of 'sum of the angles in a triangle adding up to 180° '.



Teacher notes

- Emphasise that diagrams in examinations are seldom drawn accurately.
- Make sure drawings are neat, labelled and accurate.
- Give students lots of practice.
- Angles should be accurate to within 2° .
- Investigate Rangoli patterns.
- Use tracing paper to assist with symmetry questions.
- Ask students to find their own examples of symmetry in real life.
- Emphasise that diagrams in examinations are seldom drawn accurately.
- Make sure drawings are neat, labelled and accurate.
- Students should have plenty of practice drawing examples to illustrate the properties and encourage them to check their drawings.
- Emphasise the need to give geometric reasons when required.

2. Multiples, Factors and Primes (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- List all three-digit numbers that can be made from three given integers;
- Recognise odd, even and prime (two digit) numbers;
- Identify factors and multiples and list all factors and multiples of a number systematically;
- Find the prime factor decomposition of positive integers and write as a product using index notation;
- Find common factors and common multiples of two numbers;
- Find the LCM and HCF of two numbers, by listing, Venn diagrams and using prime factors: include finding LCM and HCF given the prime factorisation of two numbers;
- Understand that the prime factor decomposition of a positive integer is unique – whichever factor pair you start with – and that every number can be written as a product of two factors;
- Solve simple problems using HCF, LCM and prime numbers.

2. Multiples, Factors and Primes (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students will have an appreciation of place value, and recognise even and odd numbers. ➤ Students will have knowledge of using the four operations with whole numbers. ➤ Students should have knowledge of integer complements to 10 and to 100.	➤ 1 is a prime number. ➤ Particular emphasis should be made on the definition of 'product' as multiplication as many students get confused and think it relates to addition.
Problem solving	Keywords
➤ Students should be able to provide convincing counter-arguments to statements concerning properties of stated numbers, i.e. Sharon says 108 is a prime number. Is she correct? ➤ Questions that require multiple layers of operations such as: ➤ Pam writes down one multiple of 9 and two different factors of 40. She then adds together her three numbers. Her answer is greater than 20 but less than 30. Find three numbers that Jan could have written down.	Integer, number, digit, negative, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate, power, roots, factor, multiple, primes, square, cube, even, odd

2. Multiples, Factors and Primes (3 hours)

Resources



Teacher notes

- Use a number square to find primes (Eratosthenes sieve).
- Using a calculator to check factors of large numbers can be useful.
- Students need to be encouraged to learn squares from 2×2 to 15×15 and cubes of 2, 3, 4, 5 and 10 and corresponding square and cube roots.

3. Expressions and Equations (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use notation and symbols correctly;
- Write an expression;
- Select an expression/equation/formula/identity from a list;
- Manipulate and simplify algebraic expressions by collecting 'like' terms;
- Multiply together two simple algebraic expressions, e.g. $2a \times 3b$;
- Simplify expressions by cancelling, e.g. $\frac{4x}{2} = 2x$;
- Use index notation and the index laws when multiplying or dividing algebraic terms;
- Understand the $\neq$ symbol and introduce the identity $\equiv$ sign;
- Write expressions and set up simple equations including forming an equation from a word problem;
- Use function machines;
- Solve simple equations including those:
 - with integer coefficients, in which the unknown appears on either side or on both sides of the equation;
 - which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;
 - with one unknown, with integer or fractional coefficients;
- Solve angle or perimeter problems using algebra.

3. Expressions and Equations (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ The ability to use negative numbers with the four operations and recall and use hierarchy of operations and understand inverse operations; ➤ Dealing with decimals and negatives on a calculator; ➤ Using index laws numerically. ➤ Experience of finding missing numbers in calculations ➤ The idea that some operations are 'opposite' to each other	➤ Any poor number skills involving negatives and times tables will become evident. ➤ Rules of adding and subtracting negatives. ➤ Inverse operations can be misapplied.
Problem solving	Keywords
➤ Forming expressions and equations using area and perimeter of 2D shapes. ➤ could be solved by forming equations such as: Pat and Paul have a combined salary of £800 per week. Pat earns £200 per week more than Paul. How much does Paul earn?	Expression, identity, equation, formula, substitute, term, 'like' terms, index, power, collect, substitute, expand, bracket, factor, factorise, linear, simplify, Equation, balance

3. Expressions and Equations (5 hours)

Resources

ICT:

www.bbc.co.uk/education/mathsfile

Equation Match

www.mymaths.co.uk

Matching game – Equation pairs

www.mathematics.hellam.net

Think of a number, Function machine



Teacher notes

- Some of this will be a reminder from Key Stage 3.
- Emphasise correct use of symbolic notation, i.e. $3 \times y = 3y$ and not $y3$ and $a \times b = ab$.
- Use lots of concrete examples when writing expressions, e.g. 'B' boys + 'G' girls.
- Plenty of practice should be given and reinforce the message that making mistakes with negatives and times tables is a different skill to that being developed.
- Students need to realise that not all linear equations can be solved by observation or trial and improvement, and hence the use of a formal method is important.
- Students can leave their answer in fraction form where appropriate.

4. Accuracy and using a calculator (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Recall all multiplication facts to 10×10 , and use them to derive quickly the corresponding division facts;
- Multiply or divide any number by powers of 10;
- Use brackets and the hierarchy of operations (not including powers);
- Round numbers to a given power of 10;
- Rounding to a sensible degree of accuracy
- Check answers by rounding and using inverse operations
- Using BIDMAS to establish a correct Order of Operations with/without a calculator
- Calculating with Negative Numbers (with/without a calculator)
- Use the terms square, positive square root, negative square root, cube and cube root.
- Using a calculator to accurately work out values of expressions with squares, cubes, powers and roots
- Estimate answers to calculations such as $\frac{22.6 \times 18.7}{5.2}$
- Find min. and max. values.
- Estimate answers to calculations such as $\frac{22.6 \times 18.7}{0.52}$

4. Accuracy and using a calculator (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Round numbers to the nearest 1000, nearest 100, nearest 10, nearest integer, decimal places, common everyday Units, ➤ Knowledge of square numbers and basic some simple roots.	➤ Stress the importance of knowing the multiplication tables to aid fluency. ➤ Students may write statements such as $150 - 210 = 60$.
Problem solving	Keywords
	Round, significant figures, decimals places, upper bound, lower bound, degree of accuracy, estimate, positive number, negative number, BIDMAS. Square number, cube number, square root, cube root, index, power,

4. Accuracy and using a calculator (4 hours)

Resources



Teacher notes

Encourage the exploration of different calculation methods.
Students should be able to write numbers in words and from words as a real-life skill.

5. Negative numbers (2 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use and order positive and negative numbers (integers) and decimals; use the symbols $<$, $>$ and understand the $\neq$ symbol;
- Add, subtract, multiply and divide positive and negative numbers (integers);

5. Negative numbers (2 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Understand the four rules of number ➤ Understand place value ➤ Know the meaning of sum and product ➤ Times Tables (up to 12) ➤	➤ Stress the importance of knowing the multiplication tables to aid fluency. ➤ Students may write statements such as $150 - 210 = 60$.
Problem solving	Keywords
	Counting number, positive number, negative number, Integer, directed number, less than, greater than, sum, product,

5. Negative numbers (2 hours)

Resources



Teacher notes

- Particular emphasis should be given to the importance of students presenting their work clearly.
- Formal written methods of addition, subtraction and multiplication work from right to left, whilst formal division works from left to right.
- Any correct method of multiplication will still gain full marks, for example, the grid method, the traditional method, Napier's bones.
- Negative numbers in real life can be modelled by interpreting scales on thermometers using F and C.

6. Fractions (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use diagrams to find equivalent fractions or compare fractions;
- Write fractions to describe shaded parts of diagrams;
- Express a given number as a fraction of another, using very simple numbers, some cancelling, and where the fraction is both < 1 and > 1 ;
- Write a fraction in its simplest form and find equivalent fractions;
- Order fractions, by using a common denominator;
- Compare fractions, use inequality signs, compare unit fractions;
- Convert between mixed numbers and improper fractions;
- Add and subtract fractions;
- Add fractions and write the answer as a mixed number;
- Multiply and divide an integer by a fraction;
- Multiply and divide a fraction by an integer, including finding fractions of quantities or measurements, and apply this by finding the size of each category from a pie chart using fractions;
- Understand and use unit fractions as multiplicative inverses;
- Multiply fractions: simplify calculations by cancelling first;
- Divide a fraction by a whole number and another fraction;

6. Fractions (5 hours)

Continued
on next
page

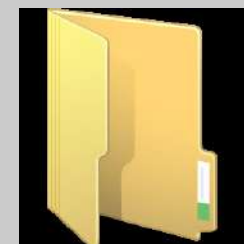
PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to find common factors. ➤ Students have a basic understanding of fractions as being 'parts of a whole'.	➤ The larger the denominator the larger the fraction.
Problem solving	Keywords
➤ Questions that involve rates of overtime pay including simple calculations involving fractional (>1, e.g. 1.5) and hourly pay. These can be extended into calculating rates of pay given the final payment and number of hours worked.	addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, integer,

6. Fractions (5 hours)

Resources



Teacher notes

When expressing a given number as a fraction of another, start with very simple numbers < 1 , and include some cancelling before fractions using numbers > 1 .

When adding and subtracting fractions, start with same denominator, then where one denominator is a multiple of the other (answers ≤ 1), and finally where both denominators have to be changed (answers ≤ 1).

Regular revision of fractions is essential.

Demonstrate how to use the fraction button on the calculator.

Use real-life examples where possible.

7. Real life graphs (2 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Draw, label and scale axes;
- Draw straight line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit;
- Draw distance–time graphs and velocity–time graphs;
- Work out time intervals for graph scales;
- Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time;

7. Real life graphs (2 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Know how to read scales, including whole numbers & negatives ➤ Some knowledge of some common Units. (e.g. Kg)	➤ With distance–time graphs, students struggle to understand that the perpendicular distance from the x-axis represents distance.
Problem solving	Keywords
➤ Students should be able to decide what the scales on any axis should be to be able to draw a correct graph. ➤ Conversion graphs can be used to provide opportunities for students to justify which distance is further, or whether or not certain items can be purchase in different currencies.	Linear, graph, distance, time, coordinate, quadrant, real-life graph,

7. Real life graphs (2 hours)

Resources



Teacher notes

- Clear presentation of axes is important.
- Ensure that you include questions that include axes with negative values to represent, for example, time before present time, temperature or depth below sea level.
- Careful annotation should be encouraged: it is good practice to get the students to check that they understand the increments on the axes.
- Use standard units of measurement to draw conversion graphs.
- Use various measures in distance–time and velocity–time graphs, including miles, kilometres, seconds, and hours.

8. Decimals and Rounding (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use decimal notation and place value;
- Identify the value of digits in a decimal or whole number;
- Compare and order decimal numbers using the symbols $<$, $>$;
- Understand the $\neq$ symbol (not equal);
- Write decimal numbers of millions, e.g. 2 300 000 = 2.3 million;
- Add, subtract, multiply and divide decimals;
- Multiply or divide by any number between 0 and 1;
- Round to the nearest integer;
- Round to a given number of decimal places and significant figures;
- Estimate answers to calculations by rounding numbers to 1 significant figure;
- Use one calculation to find the answer to another.

8. Decimals and Rounding (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students will have an appreciation of place value, and recognise even and odd numbers. ➤ Students will have knowledge of using the four operations with whole numbers. ➤ Students should have knowledge of integer complements to 10 and to 100. ➤ Students should have knowledge of strategies for multiplying and dividing whole numbers by 2, 4, 5, and 10. ➤ Students should be able to read and write decimals in figures and words.	➤ Significant figures and decimal place rounding are often confused. ➤ Some students may think $35\,877 = 36$ to two significant figures.
Problem solving	Keywords
➤ Problems involving shopping for multiple items, such as: Rob purchases a magazine costing £2.10, a newspaper costing 82p and two bars of chocolate. He pays with a £10 note and gets £5.40 change. Work out the cost of one bar of chocolate. ➤ When estimating, students should be able to justify whether the answer will be an overestimate or underestimate.	Integer, number, digit, decimal, addition, subtraction, multiplication, division, remainder, operation, estimate,

8. Decimals and Rounding (5 hours)

Resources



Teacher notes

- Practise long multiplication and division, use mental maths problems with decimals such as 0.1, 0.001.
- Amounts of money should always be rounded to the nearest penny.

9. Metric and Imperial units (2 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Know what metric units are used for length, mass and capacity.
- To interpret a range of measuring instruments including time and mass.
- To convert metric to metric units.
- Estimate length, mass and capacity of a variety of objects.
- Convert between units of measure within one system, including time and metric units to metric units of length, area and volume and capacity e.g. $1\text{ml} = 1\text{cm}^3$
- To convert more complex metric to imperial measures e.g. 70mph to km/h.
- Convert area measures including square centimetres to square metres etc.
- Convert volume measures including cubic centimetres to cubic metres etc.

9. Metric and Imperial units (2 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Multiply and divide by 10, 100 and 1000. ➤ Multiply and divide by numbers with and without a calculator. ➤ Clocks and dials.	For example: as there are 100 cm in a metre, to go from cm to m multiplying by 100 instead of $\div 100$
Problem solving	Keywords
	Measure, Length, Millimetre, Centimetre, Metre, Kilometre, Inch, Foot, Yard, Mile, Mass, Milligram, gram, Kilogram, Ounce, Pound, Ton, Tonne, Capacity, Millilitre, Litre, Pint, Gallon

9. Metric and Imperial units (2 hours)

Resources

Use of measuring equipment.



Teacher notes

- No more metric to imperial conversions

10. Area (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Measure shapes to find perimeters and areas using a range of scales;
- Find the perimeter of
 - rectangles and triangles;
 - parallelograms and trapezia;
 - compound shapes;
- Recall and use the formulae for the area of a triangle and rectangle;
- Find the area of a trapezium and recall the formula;
- Find the area of a parallelogram;
- Calculate areas and perimeters of compound shapes made from triangles and rectangles;
- Estimate surface areas by rounding measurements to 1 significant figure;
- Find the surface area of a prism;
- Find surface area using rectangles and triangles;

10. Area (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to measure lines and recall the names of 2D shapes. ➤ Students should be able to use strategies for multiplying and dividing by powers of 10. ➤ Students should be able to find areas by counting squares and volumes by counting cubes. ➤ Students should be able to interpret scales on a range of measuring instruments.	➤ Shapes involving missing lengths of sides often result in incorrect answers. ➤ Students often confuse perimeter and area. ➤ Volume often gets confused with surface area.
Problem solving	Keywords
➤ Given two 2D that shapes have equal areas, work out all the dimensions of the sides of the shapes. ➤ Problems involving straight-forward and compound shapes in a real-life context should be explored to reinforce the concept of area. For example, the floor plan of a garden linked to the purchase of grass seed.	Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion

10. Area (4 hours)

Resources



Teacher notes

- Use questions that involve different metric measures that need converting.
- Measurement is essentially a practical activity: use a range of everyday shapes to bring reality to lessons.
- Ensure that students are clear about the difference between perimeter and area.
- Practical examples help to clarify the concepts, i.e. floor tiles, skirting board, etc.
- Discuss the correct use of units.
- Drawings should be done in pencil.

11. 3D Solids (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Identify and name common solids: cube, cuboid, cylinder, prism, pyramid, sphere and cone;
- Sketch nets of cuboids and prisms;
- Recall and use the formula for the volume of a cuboid;
- Find the volume of a prism, including a triangular prism, cube and cuboid;
- Calculate volumes of right prisms and shapes made from cubes and cuboids;
- Estimate volumes etc by rounding measurements to 1 significant figure;
- Draw sketches of 3D solids;
- Know the terms face, edge and vertex;
- Identify and sketch planes of symmetry of 3D solids;
- Use isometric grids to draw 2D representations of 3D solids;
- Understand and draw front and side elevations and plans of shapes made from simple solids;
- Given the front and side elevations and the plan of a solid, draw a sketch of the 3D solid.

11. 3D Solids (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to measure lines and recall the names of 2D shapes. ➤ Students should be able to use strategies for multiplying and dividing by powers of 10. ➤ Students should be able to find areas by counting squares and volumes by counting cubes. ➤ Students should be able to interpret scales on a range of measuring instruments. ➤ Students should be able to measure and draw lines.	➤ Shapes involving missing lengths of sides often result in incorrect answers. ➤ Students often confuse perimeter and area. ➤ Volume often gets confused with surface area. ➤ Often 5 sides only are drawn for a cuboid.
Problem solving	Keywords
	Triangle, rectangle, parallelogram, trapezium, area, perimeter, formula, length, width, prism, compound, measurement, polygon, cuboid, volume, symmetry, vertices, edge, face, units, conversion, Construct, two-dimensional, three-dimensional, solid, elevations, congruent, scale, plan,

11. 3D Solids (3 hours)

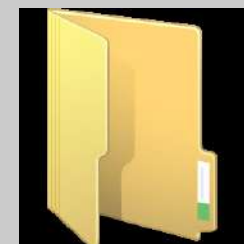
Resources

Activities: Use of Multi-link Cubes.

ICT:

- The Geometer's Sketchpad.
- www.mymaths.co.uk (Nets of Solids)

Excellent animations of various solids' Plans & Elevations.



Teacher notes

- Consider 'how many small boxes fit in a larger box' -type questions.
- Practical examples should be used to enable students to understand the difference between perimeter, area and volume.
- This is a very practical topic, and provides opportunities for some hands-on activities.
- Whilst not an explicit objective, it is useful for students to draw and construct nets and show how they fold to make 3D solids, allowing students to make the link between 3D shapes and their nets. This will enable students to understand that there is often more than one net that can form a 3D shape.

12. Formulae (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Substitute numbers into simple algebraic expressions;
- Substitute numbers into expressions involving brackets and powers;
- Substitute positive and negative numbers into expressions;
- Derive a simple formula, including those with squares, cubes and roots;
- Substitute numbers into a (word) formula;

12. Formulae (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ the ability to use negative numbers with the four operations and recall and use hierarchy of operations and understand inverse operations; ➤ dealing with decimals and negatives on a calculator;	➤ The convention of not writing a coefficient with a single value, i.e. x instead of $1x$, may cause confusion. ➤ Some students may think that it is always true that $a = 1$, $b = 2$, $c = 3$. ➤ If $a = 2$ sometimes students interpret $3a$ as 32. ➤ Making mistakes with negatives, including the squaring of negative numbers.
Problem solving	Keywords
➤ Forming and solving equations involving algebra and other areas of mathematics such as area and perimeter.	Expression, identity, equation, formula, substitute, term, 'like' terms, collect, substitute, linear, simplify

12. Formulae (3 hours)

Resources



Teacher notes

- Provide students with lots of practice.
- This topic lends itself to regular reinforcement through starters in lessons.
- Use formulae from mathematics and other subjects, expressed initially in words and then using letters and symbols.
- Include substitution into the kinematics formulae given on the formula sheet, i.e. $v = u + at$, $v^2 - u^2 = 2as$, and $s = ut + at^2$.

13. Powers and roots (Zero and negative indices)(4 hours)

Candidates should be able to:

- Find squares and cubes:
- recall integer squares up to 10×10 and the corresponding square roots;
- understand the difference between positive and negative square roots;
- recall the cubes of 1, 2, 3, 4, 5 and 10;
- Use index notation for squares and cubes;
- Recognise powers of 2, 3, 4, 5;
- Evaluate expressions involving squares, cubes and roots:
- add, subtract, multiply and divide numbers in index form;
- cancel to simplify a calculation;
- Use index notation for powers of 10, including negative powers;
- Use the laws of indices to multiply and divide numbers written in index notation;
- Use brackets and the hierarchy of operations with powers inside the brackets, or raising brackets to powers;
- Use calculators for all calculations: positive and negative numbers, brackets, square, cube, powers and roots, and all four operations.
- Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractions and powers of a power;
- Use numbers raised to the power zero, including the zero power of 10;

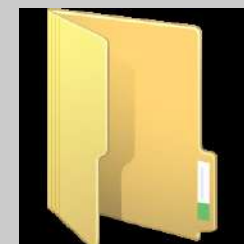
13. Powers and roots (Zero and negative indices)(4 hours)

Prior Knowledge	Common misconceptions
➤ Students will have an appreciation of place value, and recognise even and odd numbers. ➤ Students will have knowledge of using the four operations with whole numbers. ➤ Students should have knowledge of integer complements to 10 and to 100. ➤ Students should have knowledge of strategies for multiplying and dividing whole numbers by 2, 4, 5, and 10.	➤ The order of operations is often not applied correctly when squaring negative numbers, and many calculators will reinforce this misconception. ➤ 10^3, for example, is interpreted as 10×3.
Problem solving	Keywords
➤ Problems such as: What two digit number is special because adding the sum of its digits to the product of its digits gives me my original number?	Integer, number, digit, negative, addition, subtraction, multiplication, division, operation, power, roots, square, cube, even, odd

13. Powers and roots (Zero and negative indices)(4 hours)

Resources

ACTIVITIES: Show the square numbers as a number pattern.
Link cube numbers with volume of a series of cubes (Multi-Link)



Teacher notes

- Pupils need to know how to enter negative numbers into their calculator.
- Use the language of 'negative' number and not minus number to avoid confusion with calculations.
- Note that the students need to understand the term 'surd' as there will be occasions when their calculator displays an answer in surd form, for example, $4\sqrt{2}$.
- Negative fractional indices are not included at Foundation tier, but you may wish to extend the work to include these.

14. Straight line graphs (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use input/output diagrams;
- Draw, label and scale axes;
- Use axes and coordinates to specify points in all four quadrants in 2D;
- Identify points with given coordinates and coordinates of a given point in all four quadrants;
- Find the coordinates of points identified by geometrical information in 2D (all four quadrants);
- Find the coordinates of the midpoint of a line segment; Read values from straight-line graphs for real-life situations;
- Use function machines to find coordinates (i.e. given the input x , find the output y);
- Plot and draw graphs of $y = a$, $x = a$, $y = x$ and $y = -x$;

14. Straight line graphs (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to plot coordinates and read scales ➤ Students should be able to substitute into a formula.	➤ When not given a table of values, students rarely see the relationship between the coordinate axes.
Problem solving	Keywords
➤ Students should be able to decide what the scales on any axis should in order to draw a correct graph.	Linear, graph, coordinate, quadrant, real-life graph, gradient, intercept, function, solution, parallel

14. Straight line graphs (3 hours)

Resources

ICT:

Use Omnigraph understanding of $y=mx+c$



Teacher notes

- Emphasise the importance of drawing a table of values when not given one.
- Values for a table should be taken from the x -axis.

15. Scatter Graphs (2 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Draw scatter graphs;
- Interpret points on a scatter graph;
- Identify outliers and ignore them on scatter graphs;
- Draw the line of best fit on a scatter diagram by eye, and understand what it represents;
- Use the line of best fit make predictions; interpolate and extrapolate apparent trends whilst knowing the dangers of so doing;
- Distinguish between positive, negative and no correlation using lines of best fit;
- Use a line of best fit to predict values of a variable given values of the other variable;
- Interpret scatter graphs in terms of the relationship between two variables;
- Interpret correlation in terms of the problem;
- Understand that correlation does not imply causality;
- State how reliable their predictions are, i.e. not reliable if extrapolated.

15. Scatter Graphs (2 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to read scales on graphs and plot coordinates in the first quadrant	➤ Lines of best fit are often forgotten, but correct answers still obtained by sight. ➤ Interpreting scales of different measurements and confusion between x and y axes when plotting points.
Problem solving	Keywords
➤ Many real-life situations that give rise to two variables provide opportunities for students to extrapolate and interpret the resulting relationship (if any) between the variables.	data, scatter graph, line of best fit, correlation, positive, negative, estimate

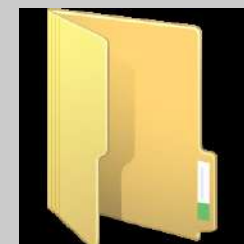
15. Scatter Graphs (2 hours)

Resources

ICT:

www.mymaths.co.uk

Section on Scatter Diagrams (Maths v Art Scores)



Teacher notes

Students need to be constantly reminded of the importance of drawing a line of best fit.
Support with copy and complete statements, e.g. as the ___ increases, the ___ decreases.
Statistically the line of best fit should pass through the coordinate representing the mean of the data.
Students should label the axes clearly, and use a ruler for all straight lines and a pencil for all drawing.
Remind students that the line of best fit does not necessarily go through the origin of the graph.

16. FDP (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Recall the fraction-to-decimal conversion and convert fractions to decimals;
- Convert a fraction to a decimal to make a calculation easier,
e.g. $0.25 \times 8 = \frac{1}{4} \times 8$, or $\frac{3}{8} \times 10 = 0.375 \times 10$;
- Recognise recurring decimals and convert fractions such as $\frac{3}{7}$, $\frac{1}{3}$ and $\frac{2}{3}$ into recurring decimals;
- Compare and order fractions, decimals and integers, using inequality signs;
- Understand that a percentage is a fraction in hundredths;
- Express a given number as a percentage of another number;
- Convert between fractions, decimals and percentages;
- Order fractions, decimals and percentages, including use of inequality signs.

16. FDP (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to find common factors. ➤ Students have a basic understanding of fractions as being 'parts of a whole'. ➤ Students should be able to define percentage as 'number of parts per hundred'. ➤ Students should know number complements to 10 and multiplication tables.	➤ Incorrect links between fractions and decimals, such as thinking that $\frac{1}{5} = 0.15$, $5\% = 0.5$, $4\% = 0.4$, etc. ➤ It is not possible to have a percentage greater than 100%.
Problem solving	Keywords
➤ Working out the number of people/things where the number of people/things in different categories is given as a fraction, decimal or percentage.	Decimal, percentage, inverse, addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, integer, decimal, terminating, percentage,

16. FDP (4 hours)

Resources

Activities:

Use spider diagrams to list equivalent fractions. Use fraction walls, pupils can make their own.

ICT:

www.mymaths.co.uk

Game – Fraction Golf



Teacher notes

- Emphasise the importance of being able to convert between fractions, decimals and percentages to make calculations easier.
- When expressing a given number as a fraction of another, start with very simple numbers < 1 , and include some cancelling before fractions using numbers > 1 .
- Students should be reminded of basic percentages and fraction conversions.
- Use long division to illustrate recurring decimals.

17. Probability (Sets and Venn diagrams) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur;
- Mark events and/or probabilities on a probability scale of 0 to 1;
- Write probabilities in words or fractions, decimals and percentages;
- Find the probability of an event happening using theoretical probability;
- Use theoretical models to include outcomes using dice, spinners, coins;
- List all outcomes for single events systematically;
- Work out probabilities from frequency tables, frequency trees, and two way tables;
- Record outcomes of probability experiments in tables;
- Add simple probabilities;
- Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;
- Using $1 - p$ as the probability of an event not occurring where p is the probability of the event occurring;
- Find a missing probability from a list or table including algebraic terms;
- Find the probability of an event happening using relative frequency;
- Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities;
- List all outcomes for combined events systematically;
- Use and draw sample space diagrams;
- Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values;
- Use union and intersection notation;
- Compare experimental data and theoretical probabilities;
- Compare relative frequencies from samples of different sizes;

17. Probability (Sets and Venn diagrams) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should know how to add and multiply fractions and decimals. ➤ Students should have experience of expressing one number as a fraction of another number.	
Problem solving	Keywords
➤ Lotteries provides a real life link to probability. Work out the probabilities of winning on different lotteries. ➤ Students should be given the opportunity to justify the probability of events happening or not happening.	Probability, dependent, independent, conditional, sample space, outcomes, theoretical, relative frequency, fairness, experimental

17. Probability (Sets and Venn diagrams) (6 hours)

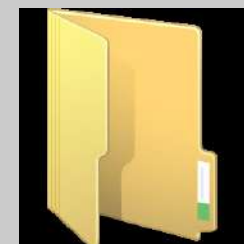
Resources

Activities:

Play your cards right.

ICT:

www.mymaths.co.uk Probability section



Teacher notes

Use this as an opportunity for practical work.

Probabilities written in fraction form should be cancelled to their simplest form.

Probability without replacement is best illustrated visually and by initially working out probability 'with' replacement.

Emphasise that were an experiment repeated it will usually lead to different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics.

18. Percentages (Reverse) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Express a given number as a percentage of another number;
- Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%;
- Find a percentage of a quantity or measurement (use measurements they should know from Key Stage 3 only);
- Calculate amount of increase/decrease;
- Use percentages to solve problems, including comparisons of two quantities using percentages;
- Percentages over 100%;
- Use percentages in real-life situations, including percentages greater than 100%:
- Price after VAT (not price before VAT);
- Value of profit or loss;
- Simple interest;
- Income tax calculations;
- Use decimals to find quantities;
- Find a percentage of a quantity, including using a multiplier;
- Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used;
- Understand the multiplicative nature of percentages as operators.

18. Percentages (Reverse) (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to define percentage as 'number of parts per hundred'. ➤ Students should know number complements to 10 and multiplication tables.	➤ It is not possible to have a percentage greater than 100%. ➤
Problem solving	Keywords
➤ Sale prices offer an ideal opportunity for solving problems allowing students the opportunity to investigate the most effective way to work out the "sale" price. ➤ Problems that involve consecutive reductions such as: Sale Prices are 10% off the previous day's price. If a jacket is £90 on Monday, what is the price on Wednesday?	Decimal, percentage, inverse, addition, subtraction, multiplication, division, percentage, VAT, increase, decrease, multiplier, profit, loss

18. Percentages (Reverse) (5 hours)

Resources



Teacher notes

- When finding a percentage of a quantity or measurement, use only measurements they should know from Key Stage 3.
- Amounts of money should always be rounded to the nearest penny.
- Use real-life examples where possible.
- Emphasise the importance of being able to convert between decimals and percentages and the use of decimal multipliers to make calculations easier.

19. Collecting and interpreting data. Averages. (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Design and use data-collection sheets for grouped, discrete and continuous data, use inequalities for grouped data, and introduce $\leq$ and $\geq$ signs; Sort, classify and tabulate data, both discrete and continuous quantitative data, and qualitative data; Extract data from lists and tables;
- Specify the problem and:
 - plan an investigation;
 - decide what data to collect and what statistical analysis is needed;
 - consider fairness;
- Recognise types of data: primary secondary, quantitative and qualitative;
- Use suitable data collection techniques (data to be integer and decimal values);
- Identify which primary data they need to collect and in what format, including grouped data;
- Collect data from a variety of suitable primary and secondary sources;
- Understand how sources of data may be biased and explain why a sample may not be representative of a whole population;
- Understand sample and population.
- Calculate the mean, mode, median and range for discrete data;
- Interpret and find a range of averages as follows:
 - median, mean and range from a (discrete) frequency table;
 - range, modal class, interval containing the median, and estimate of the mean from a grouped data frequency table;

19. Collecting and interpreting data. Averages. (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use correct notation for time, 12- and 24-hour clock and work out time taken for a journey from a timetable;
- Construct tables for time-series data;
- Design, complete and use two-way tables for discrete and grouped data;
- Calculate the total frequency from a frequency table;
- Read off frequency values from a table;
- Read off frequency values from a frequency table;
- Find greatest and least values from a frequency table;
- Identify the mode from a frequency table;
- Identify the modal class from a grouped frequency table;
- Understand that the expression 'estimate' will be used where appropriate, when finding the mean of grouped data using mid-interval values;
- Recognise the advantages and disadvantages between measures of average

19. Collecting and interpreting data. Averages. (3 hours)

Continued
on next
page

PEARSON

edexcel

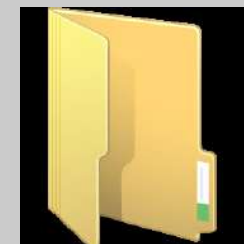
Prior Knowledge	Common misconceptions
➤ Students should have experience of tally charts.	➤ Students struggle to make the link between what the data in a frequency table represents, so for example may state the 'frequency' rather than the interval when asked for the modal group. ➤ The concept of an unbiased sample is difficult for some students to understand. ➤ Often the $\sum(m \times f)$ is divided by the number of classes rather than $\sum f$ when estimating the mean.
Problem solving	Keywords
When using a sample of a population to solve contextual problem, students should be able to justify why the sample may not be representative of the whole population. Students should be able to provide a correct solution as a counter-argument to statements involving the "averages", e.g. Susan states that the median is 15, she is wrong. Explain why. Given the mean, median and mode of five positive whole numbers, can you find the numbers?	Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data, sample, population, frequency, table, sort, estimate, survey

19. Collecting and interpreting data. Averages. (3 hours)

Resources

ICT:

- Excel.
- Random numbers on a calculator.



Teacher notes

- Ensure that students are given the opportunity to draw and complete two-way tables from words.
- Emphasise the difference between primary and secondary sources and remind students about the difference between discrete and continuous data.
- Discuss sample size and mention that a census is the whole population (the UK census takes place every 10 years in a year ending with a 1 – the next one is due in 2021).
- Specify the problem and planning for data collection is not included in the programme of study but is a prerequisite to understand the context of the topic.
- Writing a questionnaire is not part of the new specification, but is a good topic to demonstrate bias and ways to reduce bias in terms of timing, location and question types that can introduce bias.
- Encourage students to cross out the midpoints of each group once they have used these numbers to in $m \times f$. This helps students to avoid summing m instead of f .
- Remind students how to find the midpoint of two numbers.
- Emphasise that continuous data is measured, i.e. length, weight, and discrete data can be counted, i.e. number of shoes.
- When comparing the mean and range of two distributions support with 'copy and complete' sentences, or suggested wording.

20. Graphical representations (Time series) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Plotting coordinates in first quadrant and read graph scales in multiples;
- Produce and interpret:
 - pictograms;
 - composite bar charts;
 - dual/comparative bar charts for categorical and ungrouped discrete data;
 - bar-line charts;
 - vertical line charts;
 - line graphs;
 - **line graphs for time-series data;**
 - histograms with equal class intervals;
 - stem and leaf (including back-to-back);
- Calculate total population from a bar chart or table;
- Find greatest and least values from a bar chart or table;
- Recognise simple patterns, characteristic and relationships in bar charts and line graphs;
- Interpret and discuss any data.
- Interpret tables; represent data in tables and charts;
- Know which charts to use for different types of data sets;
- Interpret and find a range of averages as follows:
 - mode and range from a bar chart;
 - median, mode and range from stem and leaf diagrams;
 - mean from a bar chart;
- Compare the mean, median, mode and range (as appropriate) of two distributions using bar charts, dual bar charts, pictograms and back-to-back stem and leaf;

20. Graphical representations (Time series) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Draw circles and arcs to a given radius;
- Know there are 360 degrees in a full turn, 180 degrees in a half turn, and 90 degrees in a quarter turn;
- Measure and draw angles, to the nearest degree; Construct pie charts for categorical data and discrete/continuous numerical data;
- Interpret simple pie charts using simple fractions and percentages; , and multiples of 10% sections;
- From a pie chart:
 - find the mode;
 - find the total frequency;
- Understand that the frequency represented by corresponding sectors in two pie charts is dependent upon the total populations represented by each of the pie charts.

20. Graphical representations (Time series) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to read scales on graphs, draw circles, measure angles and plot coordinates in the first quadrant, and know that there are 360 degrees in a full turn and 180 degrees at a point on a straight line. ➤ Students should have experience of tally charts. ➤ Students will have used inequality notation. ➤ Students must be able to find the midpoint of two numbers. ➤ Students should be able to use the correct notation for time using 12- and 24-hour clocks	➤ Same size sectors for different sized data sets represent the same number rather than the same proportion.
Problem solving	Keywords
➤ Misleading graphs, charts or tables can provide an opportunity for students to critically evaluate the way information is presented. ➤ Students should be able to decide what the scales on any axis should be to be able to present information. ➤ From inspection of a pie chart, students should be able to identify the fraction of the total represented and know when that total can be calculated and compared with another pie chart. ➤	Mean, median, mode, range, average, discrete, continuous, qualitative, quantitative, data, scatter graph, line of best fit, correlation, positive, negative, sample, population, stem and leaf, frequency, table, sort, pie chart, estimate

20. Graphical representations (Time series) (6 hours)

Resources

Activities:

- Comparing distributions/information from different graphs and charts.



Teacher notes

- Ensure that you include a variety of scales, including decimal numbers of millions and thousands, time scales in hours, minutes, seconds.
- Misleading graphs are a useful life skill.
- Practise dividing by 20, 30, 40, 60, etc.
- Compare pie charts to identify similarities and differences.
- Angles when drawing pie charts should be accurate to 2° .

21. Ratio and proportion (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand and express the division of a quantity into a of number parts as a ratio;
- Write ratios in their simplest form;
- Write/interpret a ratio to describe a situation;
- Share a quantity in a given ratio including three-part ratios;
- Solve a ratio problem in context:
 - use a ratio to find one quantity when the other is known;
 - use a ratio to compare a scale model to a real-life object;
 - use a ratio to convert between measures and currencies;
- problems involving mixing, e.g. paint colours, cement and drawn conclusions;
- Compare ratios;
- Write ratios in form $1 : m$ or $m : 1$;
- Write a ratio as a fraction;
- Write a ratio as a linear function;
- Write lengths, areas and volumes of two shapes as ratios in simplest form;
- Express a multiplicative relationship between two quantities as a ratio or a fraction.
- Understand and use proportion as equality of ratios;
- Solve word problems involving direct and indirect proportion;
- Work out which product is the better buy;
- Scale up recipes;
- Convert between currencies;
- Find amounts for 3 people when amount for 1 given;
- Solve proportion problems using the unitary method;

21. Ratio and proportion (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should know the four operations of number. ➤ Students should have a basic understanding of fractions as being 'parts of a whole'.	➤ Students find three-part ratios difficult. ➤ Using a ratio to find one quantity when the other is known often results in students 'sharing' the known amount.
Problem solving	Keywords
➤ Problems involving sharing in a ratio that include percentages rather than specific numbers, such as: In a youth club the ratio of the number of boys to the number of girls is 3 : 2. 30% of the boys are under the age of 14, and 60% of the girls are under the age of 14. What percentage of the youth club is under the age of 14? ➤ Problems in context, such as scaling a recipe, or diluting lemonade or chemical solutions, will show how proportional reasoning is used in real-life contexts.	Ratio, proportion, share, parts, fraction, function, direct proportion, inverse proportion, graphical, linear, compare

21. Ratio and proportion (3 hours)

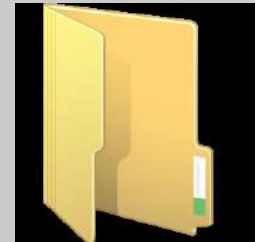
Resources

Activities:

Use of sweets to divide in a given ratio.

ICT: www.active-maths.co.uk/whiteboard

Secondary 11-16, Fractions, decimals, percentage, ratio and proportion



Teacher notes

- Emphasise the importance of reading the question carefully.
- Include ratios with decimals $0.2 : 1$.
- Converting imperial units to imperial units aren't specifically in the programme of study, but still useful and provide a good context for multiplicative reasoning.
- It is also useful generally for students to know rough metric equivalents of commonly used imperial measures, such as pounds, feet, miles and pints.

22. Algebraic manipulation (Factorising quadratics and DOTS)(6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Multiply a single number term over a bracket;
- Write and simplify expressions using squares and cubes;
- Simplify expressions involving brackets, i.e. expand the brackets, then add/subtract;
- Argue mathematically to show algebraic expressions are equivalent;
- Recognise factors of algebraic terms involving single brackets;
- Factorise algebraic expressions by taking out common factors;
- Write expressions to solve problems representing a situation;
- Define a 'quadratic' expression;
- Multiply together two algebraic expressions with brackets;
- Square a linear expression, e.g. $(x + 1)^2$;
- Factorise quadratic expressions of the form $x^2 + bx + c$;
- Factorise a quadratic expression $x^2 - a^2$ using the difference of two squares;

22. Algebraic manipulation (Factorising quadratics and DOTS)(6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ the ability to use negative numbers with the four operations and recall and use hierarchy of operations and understand inverse operations; ➤ dealing with decimals and negatives on a calculator; ➤ using index laws numerically. ➤ Students should be able to square negative numbers. ➤ Students should be able to substitute into formulae. ➤ Students should be able to plot points on a coordinate grid. ➤ Students should be able to expand single brackets and collect 'like' terms.	➤ $3(x + 4) = 3x + 4$. ➤ The convention of not writing a coefficient with a single value, i.e. x instead of $1x$, may cause confusion. ➤ Making mistakes with negatives, including the squaring of negative numbers. ➤ x terms can sometimes be 'collected' with x^2.
Problem solving	Keywords
➤ Visual proof of the difference of two squares.	Expression, identity, equation, formula, substitute, term, 'like' terms, index, power, collect, substitute, expand, bracket, factor, factorise, linear, simplify, Quadratic, function, solve, expression, graph, curve, coefficient,

22. Algebraic manipulation (Factorising quadratics and DOTS)(6 hours)

Resources

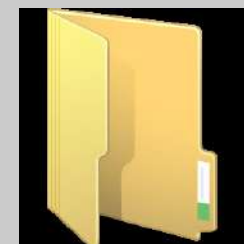
Activities:

Algebraic Pyramids

ICT:

www.mymaths.co.uk

Matching game – Algebra pairs,



Teacher notes

- This unit can be extended by including quadratics where $a \neq 1$.
- Emphasise the fact that x^2 and x are different 'types' of term – illustrate this with numbers.

23. Navigation and travel (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use and interpret maps and scale drawings;
- Estimate lengths using a scale diagram;
- Make an accurate scale drawing from a diagram;
- Understand clockwise and anticlockwise;
- Know and use compass directions;
- Use three-figure bearings to specify direction;
- Mark on a diagram the position of point B given its bearing from point A ;
- Give a bearing between the points on a map or scaled plan;
- Given the bearing of a point A from point B , work out the bearing of B from A ;
- Use accurate drawing to solve bearings problems;

Consolidate and extend:

- Draw straight line graphs for real-life situations, including ready reckoner graphs, conversion graphs, fuel bills graphs, fixed charge and cost per unit;
- Draw distance–time graphs and velocity–time graphs;
- Work out time intervals for graph scales;
- Interpret distance–time graphs, and calculate: the speed of individual sections, total distance and total time;
- Interpret information presented in a range of linear and non-linear graphs;
- Interpret graphs with negative values on axes;
- Interpret gradient as the rate of change in distance–time and speed–time graphs, graphs of containers filling and emptying, and unit price graphs.

23. Navigation and travel (4 hours)

Continued
on next
page

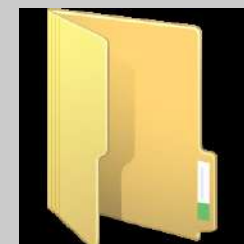
PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to measure and draw lines.	➤ With distance–time graphs, students struggle to understand that the perpendicular distance from the x-axis represents distance. ➤
Problem solving	Keywords
➤ Students should be able to decide what the scales on any axis should be to be able to draw a correct graph. ➤ Conversion graphs can be used to provide opportunities for students to justify which distance is further, or whether or not certain items can be purchase in different currencies.	bearing, degree, loci, map, scale, plan, region, Linear, graph, distance, time, coordinate, quadrant, real-life graph, gradient, intercept, function

23. Navigation and travel (4 hours)

Resources



Teacher notes

Drawings should be done in pencil.

Clear presentation of axes is important.

Ensure that you include questions that include axes with negative values to represent, for example, time before present time, temperature or depth below sea level.

Careful annotation should be encouraged: it is good practice to get the students to check that they understand the increments on the axes.

Use standard units of measurement to draw conversion graphs.

Use various measures in distance–time and velocity–time graphs, including miles, kilometres, seconds, and hours.

24. Sequences (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Recognise sequences of odd and even numbers, and other sequences including Fibonacci sequences;
- Use function machines to find terms of a sequence;
- Write the term-to-term definition of a sequence in words;
- Find a specific term in the sequence using position-to-term or term-to-term rules;
- Generate arithmetic sequences of numbers, triangular number, square and cube integers and sequences derived from diagrams;
- Recognise such sequences from diagrams and draw the next term in a pattern sequence;
- Find the next term in a sequence, including negative values;
- Find the n th term
 - for a pattern sequence;
 - a linear sequence;
 - of an arithmetic sequence;
- Use the n th term of an arithmetic sequence to
 - generate terms;
 - decide if a given number is a term in the sequence, or find the first term over a certain number;
 - find the first term greater/less than a certain number;

24. Sequences (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations. ➤ Know about odd and even numbers ➤ Recognise simple number patterns e.g. 1, 3, 5, ... ➤ Writing simple rules algebraically ➤ Raise numbers to positive whole number powers	
Problem solving	Keywords
➤ Evaluating statements about whether or not specific numbers or patterns are in a sequence and justifying the reasons.	Arithmetic, function, sequence, n th term, derive, triangular, cube, square, odd, even, substitute,

24. Sequences (4 hours)

Resources

Activities:

Use of matchsticks and dotty shape patterns

ICT:

www.mathematics.hellam.net Sequences



Teacher notes

- Emphasise use of $3n$ meaning $3 \times n$.
- Students need to be clear on the description of the pattern in words, the difference between the terms and the algebraic description of the n th term.

25. Constructions (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand congruence, as two shapes that are the same size and shape;
- Visually identify shapes which are congruent;
- Make accurate drawings of triangles and other 2D shapes using a ruler and a protractor;
- Construct diagrams of everyday 2D situations involving rectangles, triangles, perpendicular and parallel lines;
- Use straight edge and a pair of compasses to do standard constructions:
- understand, from the experience of constructing them, that triangles satisfying SSS, SAS, ASA and RHS are unique, but SSA triangles are not;
- construct the perpendicular bisector of a given line;
- construct the perpendicular from a point to a line;
- construct the bisector of a given angle;
- construct angles of 90° , 45° ;

25. Constructions (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to measure and draw lines.	➤ Correct use of a protractor may be an issue.
Problem solving	Keywords
➤ Link problems with other areas of mathematics, such as the trigonometric ratios and Pythagoras' Theorem.	Construct, congruent, angles, degree, bisect, perpendicular, loci,

25. Constructions (4 hours)

Resources



Teacher notes

- Drawings should be done in pencil.
- Construction lines should not be erased.

26. Transformations (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Identify congruent shapes by eye;
- Understand that rotations are specified by a centre, an angle and a direction of rotation;
- Find the centre of rotation, angle and direction of rotation and describe rotations fully using the angle, direction of turn, and centre;
- Rotate and draw the position of a shape after rotation about the origin or any other point including rotations on a coordinate grid;
- Identify correct rotations from a choice of diagrams;
- Understand that translations are specified by a distance and direction using a vector;
- Translate a given shape by a vector;
- Use column vectors to describe and transform 2D shapes using single translations on a coordinate grid;
- Understand that distances and angles are preserved under rotations and translations, so that any figure is congruent under either of these transformations;
- Understand that reflections are specified by a mirror line;
- Identify correct reflections from a choice of diagrams;
- Identify the equation of a line of symmetry;
- Transform 2D shapes using single reflections (including those not on coordinate grids) with vertical, horizontal and diagonal mirror lines;
- Describe reflections on a coordinate grid;

26. Transformations (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should recall basic shapes. ➤ Students should be able to plot points in all four quadrants. ➤ Students should have an understanding of the concept of rotation. ➤ Students should be able to draw and recognise lines parallel to axes and $y = x$, $y = -x$. ➤ Students will have encountered the terms clockwise and anticlockwise previously.	➤ The directions on a column vector often get mixed up. ➤ Student need to understand that the 'units of movement' are those on the axes, and care needs to be taken to check the scale. ➤ Correct language must be used: students often use 'turn' rather than 'rotate'. ➤
Problem solving	Keywords
➤ Students should be given the opportunity to explore the effect of reflecting in two parallel mirror lines and combining transformations.	Transformation, rotation, reflection, translation, single, mirror line, centre of rotation, column vector, vector, similarity, congruent, angle, direction, coordinate, describe

26. Transformations (4 hours)

Resources

Activities:

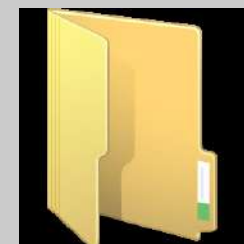
Rangoli.

ICT:

The Geometer's Sketchpad.

Omnigraph.

MyMaths.



Teacher notes

- Emphasise the need to describe the transformations fully, and if asked to describe a 'single' transformation they should not include two types.
- Include rotations with the centre of rotation inside the shape.
- Use trial and error with tracing paper to find the centre of rotation.
- It is essential that the students check the increments on the coordinate grid when translating shapes.
- Students may need reminding about how to find the equations of straight lines, including those parallel to the axes.
- When reflecting shapes, the students must include mirror lines on or through original shapes.

27. Angles (Congruency basic) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand congruence, as two shapes that are the same size and shape;
- Visually identify shapes which are congruent;
- Recall the properties and definitions of special types of quadrilaterals, including symmetry properties;
- List the properties of each special type of quadrilateral, or identify (name) a given shape;
- Draw sketches of shapes;
- Classify quadrilaterals by their geometric properties and name all quadrilaterals that have a specific property;
- Identify quadrilaterals from everyday usage;
- Given some information about a shape on coordinate axes, complete the shape; Understand and use the angle properties of quadrilaterals;
- Recognise and name pentagons, hexagons, heptagons, octagons and decagons;
- Identify a line perpendicular to a given line on a diagram and use their properties;
- Identify parallel lines on a diagram and use their properties;
- Find missing angles using properties of corresponding and alternate angles;
- Understand and use the angle properties of parallel lines.
- Understand 'regular' and 'irregular' as applied to polygons;
- Use the sum of angles of irregular polygons;
- Calculate and use the sums of the interior angles of polygons;
- Calculate and use the angles of regular polygons;
- Use the sum of the interior angles of an n -sided polygon;
- Use the sum of the exterior angles of any polygon is 360° ;
- Use the sum of the interior angle and the exterior angle is 180° ;
- Identify shapes which are congruent (by eye);
- Explain why some polygons fit together and others do not;

[Return to Routemap](#)

27. Angles (Congruency basic) (5 hours)

Continued
on next
page

PEARSON

edexcel

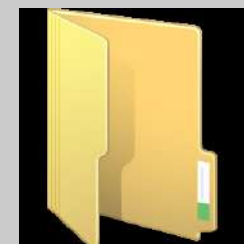
Prior Knowledge	Common misconceptions
➤ Accurate measuring skills. ➤ Names and basic properties of Triangles, Quadrilaterals and Polygons. ➤ Names of angles and some basic angle properties for straight lines and angles at a point.	➤ Pupils may believe, incorrectly, that perpendicular lines have to be horizontal/vertical or all triangles have rotational symmetry of order 3. ➤ Some students will think that all trapezia are isosceles, or a square is only square if 'horizontal', or a 'non-horizontal' square is called a diamond. ➤ Pupils may believe, incorrectly, that all polygons are regular.
Problem solving	Keywords
➤ Multi-step "angle chasing" style problems that involve justifying how students have found a specific angle. ➤ Geometrical problems involving algebra whereby equations can be formed and solved allow students the opportunity to make and use connections with different parts of mathematics. ➤ What is the same, and what is different between families of polygons? ➤ Problems whereby students have to justify the number of sides that a regular polygon has given an interior or exterior angle.	Quadrilateral, angle, polygon, interior, exterior, proof, tessellation, rotational symmetry, parallel, corresponding, alternate, co-interior, vertices, edge, face, sides, triangle, perpendicular, isosceles, scalene, clockwise, anticlockwise, hexagons, heptagons, octagons, decagons, obtuse, acute, reflex, quadrilateral, triangle, regular, irregular, two-dimensional, three-dimensional, measure, line, angle, order, intersecting

27. Angles (Congruency basic) (5 hours)

Resources

ICT:

The Geometer's Sketchpad.
www.mymaths.co.uk (Parallel Lines)



Teacher notes

- Emphasise that diagrams in examinations are seldom drawn accurately.
- Make sure drawings are neat, labelled and accurate.
- Give students lots of practice.
- Angles should be accurate to within 2° .
- Investigate Rangoli patterns.
- Emphasise the need to give geometric reasons when required.
- Study Escher drawings.
- Use examples of tiling patterns with simple shapes to help students investigate if shapes 'fit together'.

28. Fractions (consolidate) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use diagrams to find equivalent fractions or compare fractions;
- Write fractions to describe shaded parts of diagrams;
- Express a given number as a fraction of another, using very simple numbers, some cancelling, and where the fraction is both < 1 and > 1 ;
- Write a fraction in its simplest form and find equivalent fractions;
- Order fractions, by using a common denominator;
- Compare fractions, use inequality signs, compare unit fractions;
- Convert between mixed numbers and improper fractions;
- Add and subtract fractions;
- Add fractions and write the answer as a mixed number;
- Multiply and divide an integer by a fraction;
- Multiply and divide a fraction by an integer, including finding fractions of quantities or measurements, and apply this by finding the size of each category from a pie chart using fractions;
- Understand and use unit fractions as multiplicative inverses;
- Multiply fractions: simplify calculations by cancelling first;
- Divide a fraction by a whole number and another fraction;

28. Fractions (consolidate) (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to find common factors. ➤ Students have a basic understanding of fractions as being 'parts of a whole'.	➤ The larger the denominator the larger the fraction.
Problem solving	Keywords
➤ Questions that involve rates of overtime pay including simple calculations involving fractional (>1, e.g. 1.5) and hourly pay. These can be extended into calculating rates of pay given the final payment and number of hours worked.	addition, subtraction, multiplication, division, fractions, mixed, improper, recurring, integer,

28. Fractions (consolidate) (4 hours)

Resources

Use spider diagrams to list equivalent fractions.

ICT:

www.mymaths.co.uk

Fraction pairs matching game

www.mathematics.hellam.net

Equivalent Fractions

Fraction switch



Teacher notes

- When expressing a given number as a fraction of another, start with very simple numbers < 1 , and include some cancelling before fractions using numbers > 1 .
- When adding and subtracting fractions, start with same denominator, then where one denominator is a multiple of the other (answers ≤ 1), and finally where both denominators have to be changed (answers ≤ 1).
- Regular revision of fractions is essential.
- Demonstrate how to use the fraction button on the calculator.
- Use real-life examples where possible.

29. Circles and related shapes (Pi, Arcs and Sectors) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Draw circles and arcs to a given radius or given the diameter;
- Recall the definition of a circle and identify, name and draw parts of a circle including tangent, chord and segment;
- Recall and use formulae for the circumference of a circle and the area enclosed by a circle circumference of a circle = $2\pi r = \pi d$, area of a circle = πr^2 ;
- Use $\pi \approx 3.142$ or use the π button on a calculator;
- Give an answer to a question involving the circumference or area of a circle in terms of π ;
- Find radius or diameter, given area or perimeter of a circles;
- Find the perimeters and areas of semicircles and quarter-circles;
- Calculate perimeters and areas of composite shapes made from circles and parts of circles;
- Calculate arc lengths, angles and areas of sectors of circles;

29. Circles and related shapes (Pi, Arcs and Sectors) (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should know the formula for calculating the area of a rectangle. ➤ Students should know how to use the four operations on a calculator.	➤ Diameter and radius are often confused and recollection which formula to use for area and circumference of circles is often poor.
Problem solving	Keywords
➤ Calculate the radius/diameter given the area/circumference type questions could be explored, including questions that require evaluation of statements, such as Andy states “Diameter = $2 \times$ Radius” and Bob states “Radius = $2 \times$ Diameter”. Who is correct?	Area, perimeter, formula, length, width, measurement, circle, segment, arc, sector, circumference, radius, diameter, pi, segment, accuracy,

29. Circles and related shapes (Pi, Arcs and Sectors) (4 hours)

Resources



Teacher notes

- Emphasise the need to learn the circle formula: 'Cherry Pie's Delicious' and 'Apple Pies are too' are good ways to remember them.
- Ensure that students know it is more accurate to leave answers in terms of π but only when asked to do so.

30. Probability (tree diagrams) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate and extend:

- Distinguish between events which are impossible, unlikely, even chance, likely, and certain to occur;
- Mark events and/or probabilities on a probability scale of 0 to 1;
- Write probabilities in words or fractions, decimals and percentages;
- Find the probability of an event happening using theoretical probability;
- Use theoretical models to include outcomes using dice, spinners, coins;
- List all outcomes for single events systematically;
- Work out probabilities from frequency tables, frequency trees, and two way tables;
- Record outcomes of probability experiments in tables;
- Add simple probabilities;
- Identify different mutually exclusive outcomes and know that the sum of the probabilities of all outcomes is 1;
- Using $1 - p$ as the probability of an event not occurring where p is the probability of the event occurring;
- Find a missing probability from a list or table including algebraic terms;
- Find the probability of an event happening using relative frequency;
- Estimate the number of times an event will occur, given the probability and the number of trials – for both experimental and theoretical probabilities;
- List all outcomes for combined events systematically;
- Use and draw sample space diagrams;
- Work out probabilities from Venn diagrams to represent real-life situations and also 'abstract' sets of numbers/values;
- Use union and intersection notation;
- Compare experimental data and theoretical probabilities;
- Compare relative frequencies from samples of different sizes;
- Find the probability of successive events, such as several throws of a single dice;
- Use tree diagrams to calculate the probability of two independent events;
- Use tree diagrams to calculate the probability of two dependent events.

30. Probability (tree diagrams) (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should know how to add and multiply fractions and decimals. ➤ Students should have experience of expressing one number as a fraction of another number. ➤ Students should have a basic understanding of probability	➤ Not using fractions or decimals when working with probability trees.
Problem solving	Keywords
➤ Lotteries provides a real life link to probability. Work out the probabilities of winning on different lotteries. ➤ Students should be given the opportunity to justify the probability of events happening or not happening.	Probability, dependent, independent, conditional, tree diagrams, sample space, outcomes, theoretical, relative frequency, fairness, experimental

30. Probability (tree diagrams) (5 hours)

Resources



Teacher notes

- Use this as an opportunity for practical work.
- Probabilities written in fraction form should be cancelled to their simplest form.
- Probability without replacement is best illustrated visually and by initially working out probability 'with' replacement.
- Encourage students to work 'across' the branches working out the probability of each successive event. The probability of the combinations of outcomes should = 1.
- Emphasise that were an experiment repeated it will usually lead to different outcomes, and that increasing sample size generally leads to better estimates of probability and population characteristics.
- Probabilities written in fraction form should be cancelled to their simplest form.

31. Transformations (Enlargements, fractional and negative scale factors) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Scale a shape on a grid (without a centre specified);
- Understand that an enlargement is specified by a centre and a scale factor;
- Enlarge a given shape using $(0, 0)$ as the centre of enlargement, and enlarge shapes with a centre other than $(0, 0)$;
- Find the centre of enlargement by drawing;
- Describe and transform 2D shapes using enlargements by:
 - a positive integer scale factor;
 - a fractional scale factor;
- Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides, simple integer scale factors, or simple fractions;
- Understand that distances and angles are preserved under reflections, so that any figure is congruent under this transformation;
- Understand that similar shapes are enlargements of each other and angles are preserved – define similar in this unit;
- Describe and transform 2D shapes using combined rotations, reflections, translations, or enlargements.

31. Transformations (Enlargements, fractional and negative scale factors) (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should recall basic shapes. ➤ Students should be able to plot points in all four quadrants. ➤ Students should have an understanding of the concept of rotation. ➤ Students should be able to draw and recognise lines parallel to axes and $y = x$, $y = -x$. ➤ Students will have encountered the terms clockwise and anticlockwise previously. ➤ Students should have a good understanding of reflections, rotations and translations	➤ The directions on a column vector often get mixed up. ➤ Student need to understand that the 'units of movement' are those on the axes, and care needs to be taken to check the scale. ➤ Correct language must be used: students often use 'turn' rather than 'rotate'.
Problem solving	Keywords
➤ Students should be given the opportunity to explore the effect of reflecting in two parallel mirror lines and combining transformations.	Transformation, rotation, reflection, enlargement, translation, single, combination, scale factor, mirror line, centre of rotation, centre of enlargement, column vector, vector, similarity, congruent, angle, direction, coordinate, describe

31. Transformations (Enlargements, fractional and negative scale factors) (5 hours)

Resources

ICT:

The Geometer's Sketchpad.

MyMaths.



Teacher notes

- Emphasise the need to describe the transformations fully, and if asked to describe a 'single' transformation they should not include two types.
- Include rotations with the centre of rotation inside the shape.
- Use trial and error with tracing paper to find the centre of rotation.
- It is essential that the students check the increments on the coordinate grid when translating shapes.
- Students may need reminding about how to find the equations of straight lines, including those parallel to the axes.
- When reflecting shapes, the students must include mirror lines on or through original shapes.
- As an extension, consider reflections with the mirror line through the shape and enlargements with the centre of enlargement inside the shape.
- NB enlargement using negative scale factors is not included.

32. Percentages Consolidate (Compound interest) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Express a given number as a percentage of another number;
- Find a percentage of a quantity without a calculator: 50%, 25% and multiples of 10% and 5%;
- Find a percentage of a quantity or measurement (use measurements they should know from Key Stage 3 only);
- Calculate amount of increase/decrease;
- Use percentages to solve problems, including comparisons of two quantities using percentages;
- Percentages over 100%;
- Use percentages in real-life situations, including percentages greater than 100%:
- Price after VAT (not price before VAT);
- Value of profit or loss;
- Simple interest;
- Income tax calculations;
- Use decimals to find quantities;
- Find a percentage of a quantity, including using a multiplier;
- Use a multiplier to increase or decrease by a percentage in any scenario where percentages are used;
- Understand the multiplicative nature of percentages as operators.

New content:

- Express a given number as a percentage of another number in more complex situations;
- Calculate percentage profit or loss;
- Make calculations involving repeated percentage change, not using the formula;
- Find the original amount given the final amount after a percentage increase or decrease;
- Use compound interest;

[Return to Routemap](#)

32. Percentages Consolidate (Compound interest) (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to find a percentage of an amount and relate percentages to decimals.	➤ It is not possible to have a percentage greater than 100%. ➤ Some students may think that compound interest and simple interest are the same method of calculating interest. ➤ Incomplete methods when using multipliers, i.e. reduce £80 by 15% = 80×0.15.
Problem solving	Keywords
➤ Sale prices offer an ideal opportunity for solving problems allowing students the opportunity to investigate the most effective way to work out the “sale” price. ➤ Problems that involve consecutive reductions such as: Sale Prices are 10% off the previous day’s price. If a jacket is £90 on Monday, what is the price on Wednesday?	Decimal, percentage, inverse, addition, subtraction, multiplication, division, percentage, VAT, increase, decrease, multiplier, profit, loss

32. Percentages Consolidate (Compound interest) (5 hours)

Resources

ICT

www.mathematics.hellam.net

Percentage estimation



Teacher notes

- When finding a percentage of a quantity or measurement, use only measurements they should know from Key Stage 3.
- Amounts of money should always be rounded to the nearest penny.
- Use real-life examples where possible.
- Emphasise the importance of being able to convert between decimals and percentages and the use of decimal multipliers to make calculations easier.
- Encourage students to use a single multiplier.
- Include simple fractional percentages of amounts with compound interest and encourage use of single multipliers.

33. Expressions, brackets and formulae (Change the subject) (6 hours)



Candidates should be able to:

Consolidate:

- Know the difference between an equation and an identity and use and understand the $\neq$ symbol;
- Substitute numbers into simple algebraic expressions;
- Substitute numbers into expressions involving brackets and powers;
- Substitute positive and negative numbers into expressions;
- Derive a simple formula, including those with squares, cubes and roots;
- Substitute numbers into a (word) formula;

New content:

- Rearrange simple formulae;
- Rearrange simple equations;
- Substitute into a formula, and solve the resulting equation;
- Change the subject of a formula involving the use of square roots and squares;
- Answer 'show that' questions using consecutive integers $(n, n + 1)$, squares a^2, b^2 , even numbers $2n$, and odd numbers $2n + 1$;

33. Expressions, brackets and formulae (Change the subject) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ the ability to use negative numbers with the four operations and recall and use hierarchy of operations and understand inverse operations; ➤ dealing with decimals and negatives on a calculator; ➤ Students should be able to substitute into and solve equations. ➤ Students should have experience of using formulae. ➤ Students should recall and use the hierarchy of operations and use of inequality symbols.	➤ The convention of not writing a coefficient with a single value, i.e. x instead of $1x$, may cause confusion. ➤ Some students may think that it is always true that $a = 1$, $b = 2$, $c = 3$. ➤ If $a = 2$ sometimes students interpret $3a$ as 32. ➤ Making mistakes with negatives, including the squaring of negative numbers.
Problem solving	Keywords
➤ Forming and solving equations involving algebra and other areas of mathematics such as area and perimeter. ➤ involve the application of a formula with conflicting results such as: Pat and Paul are using the formula $y = 8n + 4$ When $n = 2$, Pat states that $y = 86$ and Paul states $y = 20$. Who is correct?	Expression, identity, equation, formula, substitute, term, 'like' terms, collect, substitute, linear, simplify, rearrange, subject, proof

33. Expressions, brackets and formulae (Change the subject) (6 hours)

Resources

Activities:

Use of real utility bills where formulae have been used.

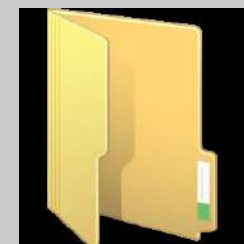
ICT:

www.bbc.co.uk/education/mathsfile

Late Delivery

www.mathematics.hellam.net

Substitution



Teacher notes

- Provide students with lots of practice.
- This topic lends itself to regular reinforcement through starters in lessons.
- Use formulae from mathematics and other subjects, expressed initially in words and then using letters and symbols.
- Include substitution into the kinematics formulae given on the formula sheet, i.e. $v = u + at$, $v^2 - u^2 = 2as$, and $s = ut + at^2$.
- Emphasise the need for good algebraic notation.

34. Linear equations (Simultaneous equations) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

➤ Solve simple equations including those:

- with integer coefficients, in which the unknown appears on either side or on both sides of the equation;
- which contain brackets, including those that have negative signs occurring anywhere in the equation, and those with a negative solution;
- with one unknown, with integer or fractional coefficients;

New content:

- Write simultaneous equations to represent a situation;
- Solve simultaneous equations (linear/linear) algebraically and graphically;
- Solve simultaneous equations representing a real-life situation, graphically and algebraically, and interpret the solution in the context of the problem;

34. Linear equations (Simultaneous equations) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ The ability to use negative numbers with the four operations and recall and use hierarchy of operations and understand inverse operations; ➤ Students should be able to substitute into and solve equations. ➤ Students should have experience of using formulae. ➤ Students should recall and use the hierarchy of operations and use of inequality symbols. ➤	➤ Any poor number skills involving negatives and times tables will become evident. ➤ Rules of adding and subtracting negatives. ➤ Inverse operations can be misapplied.
Problem solving	Keywords
➤ could be solved by forming equations such as: Pat and Paul have a combined salary of £800 per week. Pat earns £200 per week more than Paul. How much does Paul earn? ➤ Simple simultaneous equations can be formed and solved from real life scenarios, such as 2 adult and 2 child tickets cost £18, and 1 adult and 3 child tickets costs £17. What is the cost of 1 adult ticket?	Expression, equation, substitute, term, 'like' terms, substitute, expand, linear, simplify, Equation, balance, simultaneous, substitution, elimination,

34. Linear equations (Simultaneous equations) (6 hours)

Resources

ICT:

www.bbc.co.uk/education/mathsfile

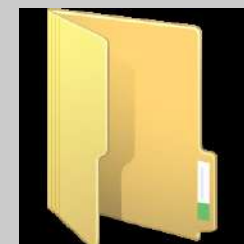
Equation Match

www.mymaths.co.uk

Matching game – Equation pairs

www.mathematics.hellam.net

Think of a number, Function machine



Teacher notes

- Emphasise correct use of symbolic notation, i.e. $3 \times y = 3y$ and not $y3$ and $a \times b = ab$.
- Plenty of practice should be given and reinforce the message that making mistakes with negatives and times tables is a different skill to that being developed.
- Students need to realise that not all linear equations can be solved by observation or trial and improvement, and hence the use of a formal method is important.
- Students can leave their answer in fraction form where appropriate.
- Emphasise the need for good algebraic notation.

35. Drawing and using quadratic graphs (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Generate points and plot graphs of simple quadratic functions, then more general quadratic functions;
- Identify the line of symmetry of a quadratic graph;
- Find approximate solutions to quadratic equations using a graph;
- Interpret graphs of quadratic functions from real-life problems;
- Identify and interpret roots, intercepts and turning points of quadratic graphs.

35. Drawing and using quadratic graphs (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Experience at plotting points in all quadrants ➤ Substituting numbers into algebraic expressions ➤ Rounding numbers to decimal places ➤ Experience of dealing with algebraic expression with one pair of brackets ➤ Draw linear graphs and reading off values.	➤ Squaring negative numbers can be a problem
Problem solving	Keywords
➤ Matching graphs with their respective functions.	Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket

35. Drawing and using quadratic graphs (3 hours)

Resources



Teacher notes

- The graphs should be drawn freehand and in pencil, joining points using a smooth curve.
- Encourage efficient use of the calculator.
- Extension work can be through plotting cubic and reciprocal graphs, solving simultaneous equations graphically.

36. Quadratic equations (Factorising and DOTS)(5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Define a 'quadratic' expression;
- Multiply together two algebraic expressions with brackets;
- Square a linear expression, e.g. $(x + 1)^2$;
- Factorise quadratic expressions of the form $x^2 + bx + c$;
- Factorise a quadratic expression $x^2 - a^2$ using the difference of two squares;

New content:

- Solve quadratic equations by factorising;
- Find the roots of a quadratic function algebraically.

36. Quadratic equations (Factorising and DOTS)(5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to square negative numbers. ➤ Students should be able to substitute into formulae. ➤ Students should be able to plot points on a coordinate grid. ➤ Students should be able to expand single brackets and collect 'like' terms. ➤ Students should be able to expand 2 brackets and collect 'like' terms ➤ Students should be able to factorise basic quadratic expressions	➤ x terms can sometimes be 'collected' with x^2.
Problem solving	Keywords
➤ Visual proof of the difference of two squares.	Quadratic, function, solve, expand, factorise, simplify, expression, graph, curve, factor, coefficient, bracket

36. Quadratic equations (Factorising and DOTS)(5 hours)

Resources

Activities:

Algebraic Pyramids

ICT:

www.mymaths.co.uk

Matching game – Algebra pairs,



Teacher notes

- This unit can be extended by including quadratics where $a \neq 1$.
- Emphasise the fact that x^2 and x are different 'types' of term – illustrate this with numbers.

37. Indices (Standard form) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Use index laws to simplify and calculate the value of numerical expressions involving multiplication and division of integer powers, fractions and powers of a power;
- Use numbers raised to the power zero, including the zero power of 10;

New content:

- Convert large and small numbers into standard form and vice versa;
- Add, subtract, multiply and divide numbers in standard form;
- Interpret a calculator display using standard form and know how to enter numbers in standard form.

37. Indices (Standard form) (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to write powers of 10 in index form and recognise and recall powers of 10, i.e. $10^2 = 100$. ➤ Students should recall the index laws.	➤ Some students may think that any number multiplied by a power of ten qualifies as a number written in standard form. ➤ When rounding to significant figures some students may think, for example, that 6729 rounded to one significant figure is 7.
Problem solving	Keywords
➤ Link with other areas of mathematics, such as compound measures, by using speed of light in standard form.	Add, subtract, multiply, divide, decimal, indices, standard form, power, reciprocal, index

37. Indices (Standard form) (4 hours)

Resources



Teacher notes

- Negative fractional indices are not included at Foundation tier, but you may wish to extend the work to include these.
- Standard form is used in science and there are lots of cross curricular opportunities.
- Students need to be provided with plenty of practice in using standard form with calculators.

38. Fractions and decimals (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Recall the fraction-to-decimal conversion and convert fractions to decimals;
- Convert a fraction to a decimal to make a calculation easier,
e.g. $0.25 \times 8 = \frac{1}{4} \times 8$, or $\frac{3}{8} \times 10 = 0.375 \times 10$;
- Recognise recurring decimals and convert fractions such as $\frac{3}{7}$, $\frac{1}{3}$ and $\frac{2}{3}$ into recurring decimals;
- Compare and order fractions, decimals and integers, using inequality signs;

New content:

- Add and subtract mixed number fractions;
- Multiply mixed number fractions;
- Divide mixed numbers by whole numbers and vice versa;
- Find the reciprocal of an integer, decimal or fraction;
- Understand 'reciprocal' as multiplicative inverse, knowing that any non-zero number multiplied by its reciprocal is 1 (and that zero has no reciprocal because division by zero is not defined).

38. Fractions and decimals (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use the four operations of number. ➤ Students should be able to find common factors. ➤ Students should know how to do the four operations with fractions.	➤ Incorrect links between fractions and decimals, such as thinking that $\frac{1}{5} = 0.15$, $5\% = 0.5$, $4\% = 0.4$, etc. ➤ The larger the denominator the larger the fraction.
Problem solving	Keywords
➤ Students should be able to justify when fractions are equal and provide correct answers as a counter-argument. ➤ Links with other areas of mathematics should be used where appropriate to embed the notion that fractions are not just used in isolation, e.g. use $6\frac{1}{2}$ cm instead of 6.5 cm.	Add, subtract, multiply, divide, mixed, improper, fraction, decimal,

38. Fractions and decimals (4 hours)

Resources

Activities:

Use spider diagrams to list equivalent fractions and decimals.
Use fraction walls, pupils can make their own.

ICT:

www.mymaths.co.uk

Matching Game – Decimals & Fractions



Teacher notes

- Regular revision of fractions is essential.
- Demonstrate how to use the fraction button on the calculator.
- Use real-life examples where possible.

39. Compound measures (Density and pressure) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand and use compound measures:
 - density;
 - pressure;
 - speed:
 - convert between metric speed measures;
 - read values in km/h and mph from a speedometer;
 - calculate average speed, distance, time – in miles per hour as well as metric measures;
 - use kinematics formulae from the formulae sheet to calculate speed, acceleration (with variables defined in the question);
 - change d/t in m/s to a formula in km/h, i.e. $d/t \times (60 \times 60)/1000$ – with support;

39. Compound measures (Density and pressure) (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to interpret scales on a range of measuring instruments. ➤ Students should know $\text{speed} = \text{distance}/\text{time}$, $\text{density} = \text{mass}/\text{volume}$.	
Problem solving	Keywords
➤ Speed/distance type problems that involve students justifying their reasons why one vehicle is faster than another.	compound measure, density, mass, volume, speed, distance, time, pressure, acceleration, velocity,

39. Compound measures (Density and pressure) (4 hours)

Resources



Teacher notes

- Use a formula triangle to help students see the relationship for compound measures – this will help them evaluate which inverse operations to use.
- Help students to recognise the problem they are trying to solve by the unit measurement given, e.g. km/h is a unit of speed as it is speed divided by a time.

40. Inequalities (3 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Show inequalities on number lines;
- Write down whole number values that satisfy an inequality;
- Solve an inequality such as $-3 < 2x + 1 < 7$ and show the solution set on a number line;
- Solve two inequalities in x , find the solution sets and compare them to see which value of x satisfies both;
- Use the correct notation to show inclusive and exclusive inequalities;
- Construct inequalities to represent a set shown on a number line;
- Solve simple linear inequalities in one variable, and represent the solution set on a number line;
- Round answers to a given degree of accuracy.

40. Inequalities (3 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use inequality signs between numbers. ➤ Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations. ➤ Students should be able to draw a number line	➤ When solving inequalities, students often state their final answer as a number quantity and either exclude the inequality or change it to $=$.
Problem solving	Keywords
	Integer, Number lines, Variables, Solving Inequalities, Regions, 'More than', Solutions, 'Less than'

40. Inequalities (3 hours)

Resources



Teacher notes

- Emphasise good use of notation.
- Students can leave their answer in fraction form where appropriate.
- Emphasise the importance of leaving their answer as an inequality (and not change to =).

41. Using ratio (Direct/Inverse proportion) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Understand and use proportion as equality of ratios;
- Solve word problems involving direct and indirect proportion;
- Work out which product is the better buy;
- Scale up recipes;
- Convert between currencies;
- Find amounts for 3 people when amount for 1 given;
- Solve proportion problems using the unitary method;

New content:

- Recognise when values are in direct proportion by reference to the graph form;
- Understand inverse proportion: as x increases, y decreases (inverse graphs done in later unit);
- Recognise when values are in direct proportion by reference to the graph form;
- Understand direct proportion ---> relationship $y = kx$.
- Use a variety of measures in ratio and proportion problems:
 - currency conversion;
 - rates of pay;
 - best value;
- Set up, solve and interpret the answers in growth and decay problems;
- Understand that X is inversely proportional to Y is equivalent to X is proportional to $\frac{1}{Y}$;
- Interpret equations that describe direct and inverse proportion.

41. Using ratio (Direct/Inverse proportion) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Using the four operations ➤ Ability to recognise common factors ➤ Knowledge of fractions ➤ Common Unit of length ➤ Converting Metric Units of length ➤ Working with basic ratios	
Problem solving	Keywords
➤ Calculations involving value for money are a good reasoning opportunity that utilise different skills. ➤ Working out best value of items using different currencies given an exchange rate.	Ratio, proportion, best value, proportional change, inverse, direct

41. Using ratio (Direct/Inverse proportion) (6 hours)

Resources



Teacher notes

- Find out/prove whether two variables are in direct proportion by plotting the graph and using it as a model to read off other values.
- Possible link with scatter graphs.

42. Sequences (Quadratic and geometric) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Find the next term in a sequence, including negative values;
- Find the n th term
 - for a pattern sequence;
 - a linear sequence;
 - of an arithmetic sequence;
- Use the n th term of an arithmetic sequence to
 - generate terms;
 - decide if a given number is a term in the sequence, or find the first term over a certain number;
 - find the first term greater/less than a certain number;

New content:

- Continue a geometric progression and find the term-to-term rule, including negatives, fraction and decimal terms;
- Continue a quadratic sequence and use the n th term to generate terms;
- Distinguish between arithmetic and geometric sequences.

42. Sequences (Quadratic and geometric) (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to use negative numbers with the four operations, recall and use the hierarchy of operations and understand inverse operations. ➤ Know about odd and even numbers ➤ Recognise simple number patterns e.g. 1, 3, 5, ... ➤ Writing simple rules algebraically ➤ Raise numbers to positive whole number powers	
Problem solving	Keywords
➤ Evaluating statements about whether or not specific numbers or patterns are in a sequence and justifying the reasons.	Arithmetic, geometric, function, sequence, n th term, derive, quadratic, triangular, cube, square, odd, even, substitute,

42. Sequences (Quadratic and geometric) (4 hours)

Resources

Activities:

Use of matchsticks and dotty shape patterns

ICT:

www.mathematics.hellam.net Sequences



Teacher notes

- Emphasise use of $3n$ meaning $3 \times n$.
- Students need to be clear on the description of the pattern in words, the difference between the terms and the algebraic description of the n th term.
- Students are not expected to find the n th term of a quadratic sequence.

43. Graphs (Gradients and other graphs) (5 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Find the coordinates of the midpoint of a line segment; Read values from straight-line graphs for real-life situations;
- Use function machines to find coordinates (i.e. given the input x , find the output y);
- Plot and draw graphs of $y = a$, $x = a$, $y = x$ and $y = -x$;

New content:

- Recognise straight-line graphs parallel to the axes;
- Recognise that equations of the form $y = mx + c$ correspond to straight-line graphs in the coordinate plane;
- Plot and draw graphs of straight lines of the form $y = mx + c$ using a table of values;
- Sketch a graph of a linear function, using the gradient and y -intercept;
- Identify and interpret gradient from an equation $y = mx + c$;
- Identify parallel lines from their equations;
- Plot and draw graphs of straight lines in the form $ax + by = c$;
- Find the equation of a straight line from a graph;
- Find the equation of the line through one point with a given gradient;
- Find approximate solutions to a linear equation from a graph;
- Find the gradient of a straight line from real-life graphs too.
- Find the equation of the line through two given points;
- Recognise, sketch and interpret graphs of simple cubic functions;
- Recognise, sketch and interpret graphs of the reciprocal function $y = \frac{1}{x}$ with $x \neq 0$;
- identify and interpret the gradient from an equation $ax + by = c$;
- Find an approximate solution to a linear equation using a graph;
- Solve problems involving inverse proportion using graphs, and read values from graphs;
- Use graphical representations of indirect proportion to solve problems in context;

43. Graphs (Gradients and other graphs) (5 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to plot coordinates and read scales ➤ Students should be able to substitute into a formula. Students should be able to draw linear graphs. Students should be able to plot coordinates and sketch simple functions with a table of values.	➤ When not given a table of values, students rarely see the relationship between the coordinate axes. ➤ The effects of transforming functions are often confused.
Problem solving	Keywords
➤ Students should be able to decide what the scales on any axis should in order to draw a correct graph.	Linear, graph, coordinate, quadrant, real-life graph, gradient, intercept, function, solution, parallel, Reciprocal, cubic,

43. Graphs (Gradients and other graphs) (5 hours)

Resources

ICT:

Use Omnigraph understanding of $y=mx+c$



Teacher notes

- Emphasise the importance of drawing a table of values when not given one.
- Values for a table should be taken from the x -axis.

44. Area, Surface area and Volume (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- Estimate surface areas by rounding measurements to 1 significant figure;
- Find the surface area of a prism;
- Find surface area using rectangles and triangles;
- Recall and use the formula for the volume of a cuboid;
- Find the volume of a prism, including a triangular prism, cube and cuboid;
- Calculate volumes of right prisms and shapes made from cubes and cuboids;

New content:

- Find the surface area and volume of a cylinder;
- Find the surface area and volume of spheres, pyramids, cones and composite solids;
- Round answers to a given degree of accuracy.

44. Area, Surface area and Volume (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should know the formula for calculating the area of a rectangle. ➤ Students should know how to calculate volume and surface area of prisms (not including cylinders) ➤ Students should know how to use the four operations on a calculator.	➤ Shapes involving missing lengths of sides often result in incorrect answers. ➤ Volume often gets confused with surface area. ➤ Often 5 sides only are drawn for a cuboid.
Problem solving	Keywords
➤ Problems involving straight-forward and compound shapes in a real-life context should be explored to reinforce the concept of area. For example, the floor plan of a garden linked to the purchase of grass seed.	Area, perimeter, formula, length, width, measurement, volume, circle, cylinder, circumference, radius, diameter, pi, sphere, cone, hemisphere, segment, accuracy, surface area

44. Area, Surface area and Volume (6 hours)

Resources



Teacher notes

- Use questions that involve different metric measures that need converting.
- Measurement is essentially a practical activity: use a range of everyday shapes to bring reality to lessons.
- Practical examples help to clarify the concepts, i.e. floor tiles, skirting board, etc.
- Discuss the correct use of units.
- Drawings should be done in pencil.
- Formulae for curved surface area and volume of a sphere, and surface area and volume of a cone, will be given on the formulae sheet in the examination.
- Ensure that students know it is more accurate to leave answers in terms of π but only when asked to do so.

45. Constructions and Loci (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

Consolidate:

- construct the perpendicular bisector of a given line;
- construct the perpendicular from a point to a line;
- construct the bisector of a given angle;
- construct angles of 90° , 45° ;

New content:

- Draw and construct diagrams from given instructions, including the following:
 - a region bounded by a circle and an intersecting line;
 - a given distance from a point and a given distance from a line;
 - equal distances from two points or two line segments;
 - regions may be defined by 'nearer to' or 'greater than';
- Find and describe regions satisfying a combination of loci;
- Use constructions to solve loci problems (2D only);
- Solve locus problems including bearings.

45. Constructions and Loci (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to measure and draw lines. ➤ Students should be able to carry out constructions using a compass and ruler	➤ Correct use of a protractor may be an issue.
Problem solving	Keywords
➤ Link problems with other areas of mathematics, such as the trigonometric ratios and Pythagoras' Theorem.	Construct, congruent, angles, degree, bisect, perpendicular, loci,

45. Constructions and Loci (4 hours)

Resources



Teacher notes

- Drawings should be done in pencil.
- Construction lines should not be erased.
- Relate loci problems to real-life scenarios, including mobile phone masts and coverage.

46. Congruence and similarity (2D) (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Use the basic congruence criteria for triangles (SSS, SAS, ASA and RHS);
- Solve angle problems involving congruence;
- Identify shapes which are similar; including all circles or all regular polygons with equal number of sides;
- Understand similarity of triangles and of other plane shapes, use this to make geometric inferences, and solve angle problems using similarity;
- Identify the scale factor of an enlargement of a shape as the ratio of the lengths of two corresponding sides;
- Understand the effect of enlargement on perimeter of shapes;
- Solve problems to find missing lengths in similar shapes;
- Know that scale diagrams, including bearings and maps are 'similar' to the real-life examples.

46. Congruence and similarity (2D) (4 hours)

Continued
on next
page

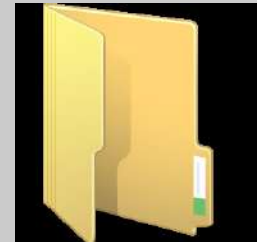
PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to recognise and enlarge shapes and calculate scale factors. ➤ Students know how to calculate area and volume in various metric measures. ➤ Students should be able to measure lines and angles and using compasses, ruler and protractor, and construct standard constructions.	➤ Students may incorrectly believe that all polygons are regular or that all triangles have a rotational symmetry of order 3. ➤ Often students think that when a shape is enlarged the angles also get bigger.
Problem solving	Keywords
➤ Using scale diagrams, including bearings and maps, provides a rich source of real-life examples and links to other areas of mathematics.	shape, volume, length, area, volume, scale factor, enlargement, similar, perimeter,

46. Congruence and similarity (2D) (4 hours)

Resources



Teacher notes

- Use simple scale factors that are easily calculated mentally to introduce similar shapes.
- Reinforce the fact that the sizes of angles are maintained when a shape is enlarged.
- Make links between similarity and trigonometric ratios.

47. Pythagoras' Theorem (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand, recall and use Pythagoras' Theorem in 2D, including leaving answers in surd form and being able to justify if a triangle is right-angled or not;
- Calculate the length of the hypotenuse and of a shorter side in a right-angled triangle, including decimal lengths and a range of units;
- Apply Pythagoras' Theorem with a triangle drawn on a coordinate grid;
- Calculate the length of a line segment AB given pairs of points;

47. Pythagoras' Theorem (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to rearrange simple formulae and equations, as preparation for rearranging Pythagoras' theorem. ➤ Students should recall basic angle facts. ➤ Students should understand when to leave an answer in surd form. ➤ Students can plot coordinates in all four quadrants and draw axes.	➤ Answers may be displayed on a calculator in surd form. ➤ Students forget to square root their final answer or round their answer prematurely.
Problem solving	Keywords
➤ Combined triangle problems that involve consecutive application of Pythagoras' Theorem ➤ In addition to abstract problems, students should be encouraged to apply Pythagoras' Theorem to real-life scenarios that require them to evaluate whether their answer fulfils certain criteria, e.g. the angle of elevation of 6.5 m ladder cannot exceed 65°. What is the greatest height it can reach?	Triangle, right angle, angle, Pythagoras' Theorem, hypotenuse, elevation, depression, length, accuracy

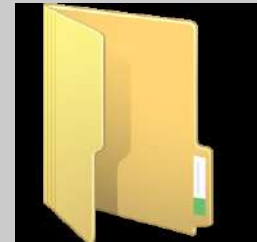
47. Pythagoras' Theorem (4 hours)

Resources

Activities:

Perigal's Dissection.

Ask class to remember:- Square it, Square it Add/Subtract it Square Root it



Teacher notes

- Students may need reminding about surds.
- Drawing the squares on the 3 sides will help to illustrate the theorem.
- Include examples with triangles drawn in all four quadrants.
- Scale drawings are not acceptable.

48. Trigonometry (exact values) (6 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand, use and recall the trigonometric ratios sine, cosine and tan, and apply them to find angles and lengths in general triangles in 2D figures;
- Use the trigonometric ratios to solve 2D problems including angles of elevation and depression;
- Round answers to appropriate degree of accuracy, either to a given number of significant figures or decimal places, or make a sensible decision on rounding in context of question;
- Know the exact values of $\sin \vartheta$ and $\cos \vartheta$ for $\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° ; know the exact value of $\tan \vartheta$ for $\vartheta = 0^\circ, 30^\circ, 45^\circ$ and 60° .

48. Trigonometry (exact values) (6 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students should be able to rearrange simple formulae and equations, as preparation for rearranging trigonometric formulae. ➤ Students should recall basic angle facts. ➤ Students should understand when to leave an answer in surd form. ➤ Students can plot coordinates in all four quadrants and draw axes.	➤ Answers may be displayed on a calculator in surd form. ➤ Students forget to square root their final answer or round their answer prematurely.
Problem solving	Keywords
➤ Combined triangle problems that involve consecutive application of Pythagoras' Theorem or a combination of Pythagoras' Theorem and the trigonometric ratios. ➤ In addition to abstract problems, students should be encouraged to apply Pythagoras' Theorem and/or the trigonometric ratios to real-life scenarios that require them to evaluate whether their answer fulfils certain criteria, e.g. the angle of elevation of 6.5 m ladder cannot exceed 65°. What is the greatest height it can reach?	Triangle, right angle, angle, Pythagoras' Theorem, sine, cosine, tan, trigonometry, opposite, hypotenuse, adjacent, ratio, elevation, depression, length, accuracy

48. Trigonometry (exact values) (6 hours)

Resources



Teacher notes

- Students may need reminding about surds.
- Scale drawings are not acceptable.
- Calculators need to be in degree mode.
- To find in right-angled triangles the exact values of $\sin \vartheta$ and $\cos \vartheta$ for $\vartheta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° , use triangles with angles of $30^\circ, 45^\circ$ and 60° .
- Use a suitable mnemonic to remember SOHCAHTOA.
- Use Pythagoras' Theorem and trigonometry together.

49. Vectors (4 hours)

Continued
on next
page

PEARSON

edexcel

Candidates should be able to:

- Understand and use column notation in relation to vectors;
- Be able to represent information graphically given column vectors;
- Identify two column vectors which are parallel;
- Calculate using column vectors, and represent graphically, the sum of two vectors, the difference of two vectors and a scalar multiple of a vector.

49. Vectors (4 hours)

Continued
on next
page

PEARSON

edexcel

Prior Knowledge	Common misconceptions
➤ Students will have used column vectors when dealing with translations. ➤ Students can recall and apply Pythagoras' Theorem on a coordinate grid.	➤ Students find it difficult to understand that two vectors can be parallel and equal as they can be in different locations in the plane.
Problem solving	Keywords
➤ Investigations involving vectors around 2D shapes such as a square can be extended to include considering the area enclosed in the same shapes.	Vector, direction, magnitude, scalar, multiple, parallel, collinear, ratio, column vector, congruence,

49. Vectors (4 hours)

Resources



Teacher notes

- Students find manipulation of column vectors relatively easy compared to the pictorial and algebraic manipulation methods – encourage them to draw any vectors that they calculate on the picture.