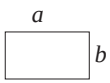
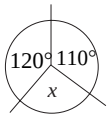
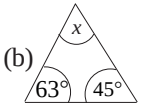
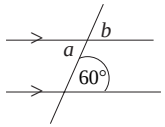
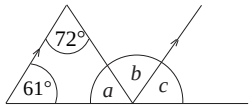
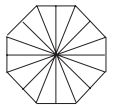
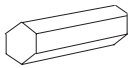
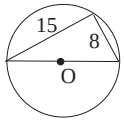
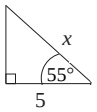
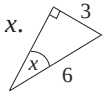
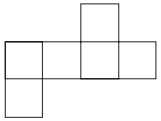
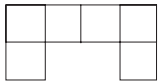
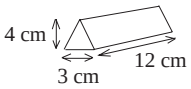
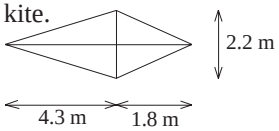
Hrs	Topic	Notes	Examples	References	Page
(4)	**1. <u>INDICES</u>**				
	R: Squares, cubes; square roots and cube roots	Positive integers only	Find 3^2, 2^3 $\sqrt{25}$, $\sqrt[3]{64}$		
	Prime factors		Find the HCF of 216 and 240		
	C: Index notation	Positive integer powers only	Simplify $a^5 \times a^3$; $m^4 \div m^2$		
	Laws of indices				
	E: Standard form	With and without calculator	Evaluate $\left(2.762 \times 10^{-12}\right) \times \left(4.97 \times 10^{21}\right)$(cal.)		
		including negative indices	Evaluate $\left(2.8 \times 10^4\right) + \left(7 \times 10^6\right)$ (no cal.)		
			Evaluate $\left(2.8 \times 10^4\right) \div \left(7 \times 10^6\right)$ (no cal.)		
(7)	**2. <u>FORMULAE</u>**				
	R: Construct and use simple formulae		Find perimeter of  when $a = 8$ and $b = 3$.		
	C: Substitution of any numbers	Opportunity for revision of negative	Given $q = -2$, $v = 2.1$, find the value of		
	into simple formulae	numbers, decimals, simple fractions	$\sqrt{v^2 - q^2}$.		
	E: More complex formulae		Given $u = 2$, $v = -3$, find f when $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$		
	C: Change of subject	Subject appears only once	Make L the subject of $t = 2\pi\sqrt{\frac{L}{g}}$		
	E: More complex change of subject		Make v the subject of $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$		
	Common term factorisation		Factorise $x^3y^4 - x^4y^3 + x^2y$		

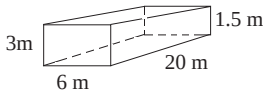
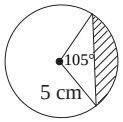
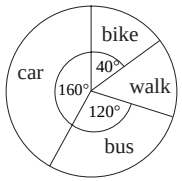
Hrs	Topic	Notes	Examples	References	Page
(5)	**3. <u>ANGLE GEOMETRY</u>**				
	R: Angle properties of straight lines, points, triangles, quadrilaterals, parallel lines		Find x when (a)  (b) 		
			Find a and b.  Find a, b and c 		
	C: Angle symmetry properties of polygons	Include line and rotational symmetry	Calculate the interior angle of a regular decagon Shade in the diagram so that it has rotational symmetry of order 4 but no lines of symmetry. 		
	Symmetry properties of 3–D shapes	Include plane, axis and point symmetry	Describe fully the symmetries of this shape. 		
	Compass bearings	8 compass points and 3 figure bearings	Scale drawings of 2-stage journeys		
	E: Angle in a semi-circle *Radius perpendicular to tangent* *Radius is perpendicular bisector of chord*	Application of Pythagoras and Trig. (after Unit 4 has been taught)	Calculate the radius. 		
(6)	**4. <u>TRIGONOMETRY: PYTHAGORAS' THEOREM</u>**				
	R: Pythagoras' Theorem	2-D only	Find x. 		
	C: Trigonometry (sin, cos, tan)	Angles of elevation and depression Bearings 2-D with right-angled triangles only	A ship goes from A to B on a bearing 040° for 20 km. How far north has it travelled? Find x.  Find x. 		

Hrs	Topic	Notes	Examples	References	Page
(10)	**5. <u>PROBABILITY</u>**				
	R: Simple probability	$\sum p_i = 1;\quad p + p' = 1$	$p(\text{heads on fair coin}) = \frac{1}{2}$		
	Complementary events		If $p(\text{rain tomorrow}) = \frac{2}{3}$, what is $p(\text{dry tomorrow})$?		
	Listing combined outcomes of 2 experiments	Tree diagrams to help find all possible outcomes	Complete table for sums of numbers on 2 dice. What is the probability of scoring 7?		
	C: Relative frequency – experimental probability and expected results		Experiment to find probability of drawing pin landing point up If $p(\text{rain}) = \frac{2}{3}$, then we would expect $\frac{2}{3} \times 30 = 20$ sunny days out of 30.		
	Appropriate methods of determining probabilities	Using symmetry, experiment Simple tree diagrams	$p(\text{ace}) = \frac{4}{52} = \frac{1}{13}$ There are 5 green, 3 red and 2 white balls in a bag. What is the probability of obtaining (a) a green ball (b) a red ball (c) a non-white ball?		
	Probability of 2 events	By listing, tabulation or tree diagrams			
	Multiplication law for independent events	Sampling **with** replacement	Find the probability of obtaining a head on a coin and a 6 on a die.		

	1	2	3	4	5	6
1	2	3	4	...	...	...
2	...	...	...	...	...	...
3	...	...	...	...	...	...
4	...	...	...	...	...	...
5	...	...	...	...	...	...
6	...	...	...	...	...	...

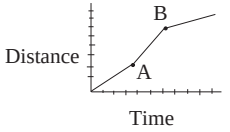
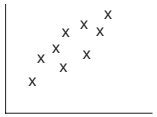
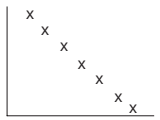
Hrs	Topic	Notes	Examples	References	Page
	E: Addition law for mutually exclusive events		If P (size 6 feet) = 0.2 and P (size 7 feet) = 0.3, calculate the probability of size 6 feet **or** size 7 feet.		
	Conditional probability; dependent events	Sampling **without** replacement	A bag contains 3 green, 5 red and 8 blue counters. Two counters are taken from the bag. Find the probability that (a) both counters are the same colour, (b) one is green and the other is red.		
(6)	**6. NUMBER SYSTEM: DECIMALS**				
	R: +, –, ×, ÷ whole numbers including long multiplication and division		127×23, $465 \div 15$		
	Multiplying and dividing by powers of 10.	Without the use of a calculator	25.62×100, $216.2 \div 10$, $14 \div 0.2$		
	Rounding off	Decimal places and significant figures	$\frac{1}{7}$ to 2 d.p.; 39.96 to 3 s.f.		
	+, –, ×, ÷ decimals		$9.7 - 3.86$; £3.36×7; £$114.81 \div 3$		
	C: Estimating answers		$\frac{29.4 + 61.2}{14.8} \approx \frac{30 + 60}{15} \approx 6$		
	Use of brackets and memory on a calculator		$\frac{2.5 \times 14.3}{7.8 + 2.95} = 3.32558$ (to 5 d.p.)		
	E: Upper and lower bounds, including use in formulae	Including area, density, speed	9.7 means $9.65 \le x < 9.75$ 100 metres (to nearest cm) is run in 9.8 s (to nearest 0.1 s). Give the range of values within which the runner's speed must lie.		

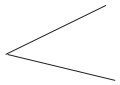
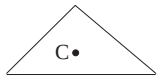
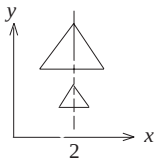
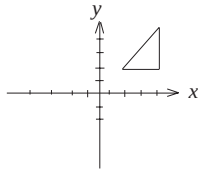
Hrs	Topic	Notes	Examples	References	Page
(12)	**7. MENSURATION**				
	R: Constructing nets of cuboids prisms, tetrahedrons	Nets can be used (see below) for surface areas and volumes.	Which of these is the net of a cube? (a)  (b) 		
	Appropriate degree of accuracy	Rounding sensibly for the range of measures used and the context			
	Conversion of units	Familiarity with mm, cm, m, km, g, kg, tonne; inches, feet, yards, miles, oz, lb, stones, litres, gallons	A gallon is about $4\frac{1}{2}$ litres. How many litres will an 8 gallon petrol tank hold?		
	Area and perimeter of squares, rectangles, triangles Volumes of cubes and cuboids	**These must be known 'by heart'**			
	Area/ circumference of circles Volumes of triangular prisms and cylinders	$A = \pi r^2$, $C = \pi D$ V = Area of cross-section × length $V = \pi r^2 h$	What is the volume of this chocolate bar? 		
	C: 2-D representations of 3-D objects	Use of isometric paper	For the side and plan elevations shown, draw an isometric diagram. 		
	Difference between discrete and continuous measures	To include **estimation** of measures	Illustrate current postal rates; shoe sizes		
	Areas of parallelograms, trapezia, kites, rhombuses and composite shapes		Find the area of this kite. 		
	Volumes of prisms and composite solids	Area of cross-section × length of prism			

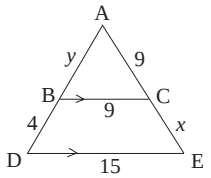
Hrs	Topic	Notes	Examples	References	Page
	Surface area of simple solids: cubes, cuboids, cylinders				
	Volume/capacity problems	Include compound measures such as density	Find the mass of water to fill this swimming pool. 		
	E: Upper and lower bounds		$l = 9.57$ m $\Rightarrow$ $9.565 \leq l < 9.575$		
	Volume of pyramid, cone and sphere		Calculate the radius of a sphere which has the same volume as a solid cylinder of base radius 5 cm and height 12 cm.		
	Length of circular arc, areas of sectors and segments of a circle		Calculate the shaded area 		
	Dimensions	Notation [L] [T] [M] as basic dimensions	Which of the following formulae could be volumes? πrl, x^3, $ab + cd$, $\frac{(ab)^2}{b}$ (*r, l, x, a, b, c, d,* are lengths)		
(7)	**8. <u>DATA HANDLING</u>**				
	R: Two way tables including timetables and mileage charts	12 hour and 24 hour clock	If a train arrives at a station at 13:26, and the connection leaves at 14:12, how long do you have to wait?		
	Interpreting and constructing pie charts and line graphs	Calculation of angles (total frequency a factor or multiple of 360)	72 pupils travel by car to school. How many walk? 		
	Questionnaires and surveys	Fairness and bias			
	C: Frequency graphs	For grouped data; equal intervals Include freqency polygons and histograms			

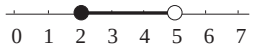
Hrs	Topic	Notes	Examples	References	Page
	E: Construct and interpret histograms with unequal intervals *Frequency polygons*	Understand and use frequency density			
(5)	**9. DATA ANALYSIS** R: Mean for discrete data and tally charts		Find the mean number of goals on these games. No of goals | 0 1 2 3 4 5 6 or more Frequency | 2 4 5 3 0 1 0		
	C: Problems involving the mean Mean, median, modal class for grouped data	Including discrete and continuous data	The mean of 6 numbers is 12.3. When an extra number is added, the mean changes to 11.9. What is the extra number? invested at 7% p.a. for 3 years.		
	E: Cumulative frequency graphs; median, quartiles	Including percentiles Interquartile / semi-interquartile range			
(10)	**10. EQUATIONS** R: Negative numbers in context Number lines	Temperature problems	$-6^\circ + 4^\circ = ?$		
	Ordering directed numbers +, –, ×, ÷ directed numbers Simplifying expressions		$2a + 3b - a + 2b = ?$		
	Manipulating and solving simple linear equations		$2(a+6) = ?$ Solve $x+3=7$; $x-5=10$; $3x=15$		
	C: Linear equations **Trial + improvement methods** **Expansion of brackets**	One fraction and/or one bracket	Solve $2x-3=7$; $3x-4=x+18$ Solve for x to 2 d.p. $x^3+7x-6=20$ Multiply out $(2r+3s)(2r-5s)$		
	E: Simultaneous equations	Algebraic solutions	Solve $2x + y = 5$ $x - 4y = 7$		

Hrs	Topic	Notes	Examples	References	Page
(6)	**11. <u>FRACTIONS and PERCENTAGES</u>**				
	R: Expressing quantities as a percentage or a fraction		30 out of 50 ?		
	Finding fractions and percentages of quantities		$\frac{3}{8}$ of 72 = ? 13% of £97		
	C: Percentage and fractional changes	Discount, VAT, commission	VAT on hotel bill of £200?		
	Manipulating fractions	+, −, ×, ÷ with or without a calculator	$\frac{1}{2}+\frac{1}{3}=?,\ \frac{3}{8}\times\frac{1}{3}=?,\ \frac{1}{2}\div\frac{1}{8}=?$		
	E: Compound interest	Repeated proportional change	Find the compound interest earned by £200 invested at 5% per annum. for 3 years.		
	Appreciation + depreciation		A car costs £5 000. It depreciates at a rate of 20% per annum. What is its value after 3 years?		
	Reverse percentage problems		The price of a television is £79.90 including 17.5% VAT. What would have been the price with no VAT?		
(5)	**12. <u>NUMBER PATTERNS and SEQUENCES</u>**				
	R: Recognise and continue number patterns	Explain the patterns in words	Fibonacci – 1, 1, 2, 3, 5, ..., ... 1, 4, 7, 10, ..., ...		
	Construct number patterns		For sequence  , ..., the number of sides is 3, 5, 7, ..., ... How many sides in the 100 th member?		
	C: Find formula for the *n* th term of a linear sequence.		*n* th term in sequence 8, 11, 14, 17, ..., ..., ...		
	E: Find a quadratic formula for the n th term of a sequence		Find the *n* th term for (a) 3, 6, 11, 18, ..., $\left(n^2+2\right)$ (b) 6, 7, 10, 15, ..., $\left(n^2-2n+7\right)$		

Hrs	Topic	Notes	Examples	References	Page
(7)	**13. GRAPHS**				
	R: Coordinates	4 quadrants; directed numbers	Identify coordinates of points in the *xy*-plane.		
	Plotting straight lines and curves given values		Plot graph for values $\begin{array}{c\|ccccccc} x & -3 & -2 & -1 & 0 & 1 & 2 & 3 \\ \hline y & 9 & 4 & 1 & 0 & 1 & 4 & 9 \end{array}$		
	C: Graphs in context, including conversion and travel graphs ($s-t$ and $v-t$) and an understanding of speed as a compound unit	Draw and interpret Gradient and area under graph for **polygon** graphs only	Calculate speed between A and B from graph. 		
	Scatter graphs and lines of best fit		Name the type of correlations illustrated below. (a)  (b) 		
	E: Equations of straight lines	Opportunity for use of IT	Find equation of straight line joining points (1, 2) and (4, 4).		
	Graphical solution of simultaneous equations				
	Graphs of common functions	Quadratic, cubic, reciprocal			
	Solve equations by graphical methods	Quadratic, cubic, reciprocal and exponential equations	Use the graph of $y = x^2 - 5x$ to solve $x^2 - 5x = 7$. Draw graph of $y = x^2 + 5x$ and $y = x^3$ to solve $x^2 + 5x = x^3$. Solve graphically $2^x = 5$.		

Hrs	Topic	Notes	Examples	References	Page
(9)	**14. LOCI and TRANSFORMATIONS**				
	R: Scale drawings	Notation 1 : 200, etc.	Make scale drawing of garden or playground		
	Construction using protractor and compasses	Triangle and other shapes			
	Simple enlargements and reflections	Positive integer scale factors for enlargements			
	C: Construction of loci	About point(s) and line(s)	Construct the locus of points equidistant from both lines. 		
	Enlargements	Positive integers and simple fractions for scale factor	Enlarge diagram by scale factor $\frac{1}{3}$, centre C. 		
	Reflections	Reflect lines in oblique lines	Reflect these shapes in the given mirror line (a)  (b) 		
		Describe the mirror line using simple equations.	Equation of mirror line? 		
	Rotations	90°, 180°, in a given direction. Find the centre of rotation by inspection			
	Translations	Using vector notation	Draw image after translation $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$ 		

Hrs	Topic	Notes	Examples	References	Page
	E: Combination of two transformations				
	Congruence – conditions for triangles	SSS SAS AAS RHS			
	Similarity – similar triangles, line, area and volume ratio	Internal line ratio, e.g. 3:2 in example	Calculate (a) x and y (b) ratio of areas of ABC and BCED.  *SUDSO* is available in 800 g and 2.7 kg boxes which are similar in shape. The smaller box uses 150 cm^2 of card. How much card is needed for the larger box?		
	Enlargements	Negative scale factors Finding the centre of enlargement			
(5)	**15. <u>VARIATION: RATIO and PROPORTION</u>**				
	R: Unitary ratios; direct and inverse proportion	Recipes	If 5 books cost £15, what is the cost of 8 books? If 8 people take 3 days to paint some railings, how long would 6 people take?		
	Map scales / ratios	Mixed units	e.g. 1:20 00; 1 cm to 2 km If the map scale is 1:250 000, what is the actual distance between two churches 3 cm apart on the map?		
	C: Proportional division		Share £30 in the ratio 2:3.		
	Direct and inverse variation		For the following data, is y proportional to x? x: 3 4 5 6 y: 8 10 12 14		
	E: Functional representation	$y \propto x$, $y \propto x^2$, $y \propto x^3$,	If y is proportional to the square of x and $y = 9$ when $x = 4$, find the positive value of x for which $y = 25$.		
	Graphical representation	$y \propto \frac{1}{x}$, $y \propto \frac{1}{x^2}$			

Hrs	Topic	Notes	Examples	References	Page
(5)	**16. <u>INEQUALITIES</u>**				
	R: Solutions to inequalities on a number line	Notation: $\leq$ or $\geq$, $<$ or $>$, ● or ○	List whole numbers n which satisfy $-4 < n < 2$ List whole numbers n which satisfy  		
	C: Solution of linear inequalities, simple quadratic inequalities		Solve for x (a) $5x + 2 < x + 16$ (b) $x^2 \leq 25$		
	E: Graphical applications	Locating and describing regions of graphs	Sketch lines $y = x + 1$, $y = 3 - x$ and $x = 2$. Hence shade the region for which $y > x + 1$, $y < 3 - x$ and $x < 2$.		