Lewisham

Key Stage 3 Medium-term plans

Year 9: Core (Pupils that have achieved levels 5c – 5a) Autumn term

Teaching objectives for the oral and mental activities

- Order, add, subtract, multiply and divide integers.
- Multiply and divide decimals by 10, 100, 1000, 0.1 and 0.01.
- Count on and back in steps of 0.4, 0.75, $^3/_4$…
- Round numbers, including to one or two decimal places.
- Know and use squares, cubes, roots and index notation.
- Know or derive quickly prime numbers less than 30 and factor pairs for a given number.
- Convert between fractions, decimals and percentages. Know that 0.005 is half of one per cent.
- Find fractions and percentages of quantities.

- Know or derive complements of 0.1, 1, 10, 50, 100, 1000.
- Add and subtract several small numbers or several multiples of 10, e.g. 250 + 120 – 190.
- Use jottings to support addition and subtraction of whole numbers and decimals.
- Use knowledge of place value to multiply and divide, e.g. 432 × 0.01, 37 ÷ 0.01, 0.04 × 8, 0.03 ÷ 5, 13 × 1.4.
- Recall multiplication and division facts to 10 × 10. Derive products and quotients of multiples of 10, 100, 1000.
- Use factors to multiply and divide mentally, e.g. 22 × 0.02, 420 ÷ 15.

- Multiply and divide a two-digit number by a one-digit number.
- Use approximations to estimate the answers to calculations, e.g. 39 × 2.8.

- Solve equations, e.g. $n(n - 1) = 56$, $\square + \square = {}^{-}46$.

- Visualise, describe and sketch 2-D shapes.
- Recall and use formulae for the perimeter of a rectangle, and areas of rectangles and triangles.
- Calculate volumes of cuboids.
- Estimate and order acute, obtuse and reflex angles.

- Use metric units (length, mass, capacity) and units of time for calculations.
- Use metric units for estimation (length, mass, capacity).
- Convert between metric units, including area, volume and capacity measures.

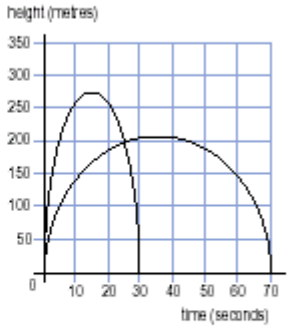
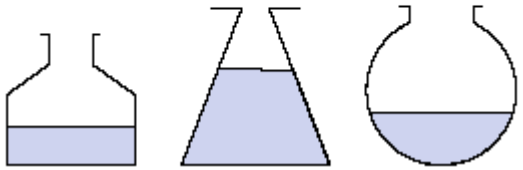
- Discuss and interpret graphs.
- Calculate a mean using an assumed mean.

- Apply mental skills to solve simple problems.

Algebra 1/2 (2 weeks)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Sequences, functions and graphs (148–163, 172–177) **Generate terms of a sequence using term-to-term and position-to-term definitions of the sequence, on paper and using ICT.** 5a – 6c Generate sequences from practical contexts and **write an expression to describe the *n*th term of an arithmetic sequence.** 6c **Find the inverse of a linear function.** 5b	**Generate a sequence given a rule for finding each term from its position in the sequence,** referring to terms as T(1) = first term, T(2) = second term, …, T(*n*) = *n*th term. For example: • The *n*th term of a sequence is 2*n*, i.e. T(*n*) = 2*n*. Write the first five terms. • Write the first five terms of a sequence whose *n*th term or T(*n*) is: a. $5n + 4$ c. $99 - 9n$ e. $3n - 0.1$ b. $105 - 5n$ d. $n + ½$ f. $n \times 0.1$ Find the *n*th term of any linear (arithmetic) sequence. For example: • Find the *n*th term of 21, 27, 33, 39, 45, … The difference between successive terms is 6, so the *n*th term is of the form T(*n*) = 6*n* + *b*. T(1) = 21, so 6 + *b* = 21, leading to *b* = 15. T(*n*) = 6*n* + 15 Check by testing a few terms. • Find the *n*th term of these sequences: 54, 62, 70, 78, 86, … 68, 61, 54, 47, 40, … 2.3, 2.5, 2.7, 2.9, 3.1, … $^{-}5$, $^{-}14$, $^{-}23$, $^{-}32$, $^{-}41$, …	

Algebra 1/2 (continued)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Construct functions arising from real-life problems and plot their corresponding graphs. 6a	Draw and use graphs to solve distance–time problems. For example: • This graph shows how high two rockets went during a flight. Rocket A reached a greater height than rocket B.  Estimate how much higher rocket A reached than rocket B. Estimate the time after the start when the two rockets were at the same height. Estimate the number of seconds that rocket A was more than 200 m above the ground. Sketch a graph of the depth of water against time when water drips steadily from a tap into these bottles. 	9.3 chapter 14 LINK TO SCIENCE GEOGRAPHY

Algebra 1/2 (continued)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Solving problems (26–27) **Represent problems and synthesise information in algebraic, geometric or graphical form; move from one form to another to gain a different perspective on the problem. 5b – 6b**	Five coins A game involves tossing five coins for a 10p stake. If you score exactly two heads you win 20p and get your stake back; otherwise you lose. Give mathematical reasons to justify whether this is a sensible game to play. Related objectives: Present a proof, making use of symbols, diagrams and graphs and related explanatory text; *justify generalisations and choice of presentation, explaining selected features.*	GAMBLING PREDICTIONS

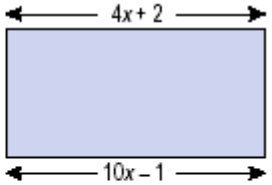
Number 1 (3 weeks)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Proportional reasoning, including: **Fractions, decimals, percentages, ratio and proportion (66–81)** • **Use efficient methods to add, subtract, multiply and divide fractions, interpreting division as a multiplicative inverse; cancel common factors before multiplying or dividing. 5a – 6a** • **Recognise when fractions or percentages are needed to compare proportions; solve problems involving percentage changes. 6a** • **Use proportional reasoning to solve a problem, choosing the correct numbers to take as 100%, or as a whole; compare two ratios; interpret and use ratio in a range of contexts, including solving word problems. 5a – 6b**	• A slogan on a tube of mints says that it is 23% bigger. It contains 20 mints. How many mints are there in the normal tube? • Which is the better buy: a 400 g pack of biscuits at 52p, or a pack of biscuits with 400 g + 25% extra, at 57p? • In a phone bill, VAT at 17.5% is added to the total cost of calls and line rental. What percentage of the total bill is VAT? • In 1999, about 50% of the world's tropical rain forests had been destroyed. About 180 000 square kilomentres are now destroyed each year. This represents about 1.2% of the remainder. Estimate the original area of the tropical rain forests.	SCIENCE GEOGRAPHY FINANCE BUSINESS STUDIES

Number 1 (continued)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Calculations (82–103, 110–111) **Understand the effects of multiplying and dividing by numbers between 0 and 1; use the laws of arithmetic and inverse operations. 5a – 6c** **Use known facts to derive unknown facts; extend mental methods of calculation, working with decimals, fractions, percentages, factors, powers and roots; solve word problems mentally. 5a – 6b** **Make and justify estimates and approximations of calculations. 5c – 6b**	Apply mental skills to solving simple problems, using jottings if appropriate. For example: **Oral questions** • Two years ago Jim's height was 1.48 metres. Now Jim's height is 1.7 metres. How much has Jim grown? • Two of the angles of a triangle are 47° and 85°. Calculate the third angle. • You get \$56 for £40. How many dollars do you get for £100? • 75 miles per hour is about the same as 33 metres per second. About how many metres per second is 50 miles per hour? • In a raffle, half of the tickets are bought by men. One third are bought by women. The rest are bought by children. What fraction of the tickets are bought by children? • The ratio of men to women in a room is 3 to 5. There are 12 men. How many women are there? • $x = 2$ and $y = 3$. Work out the value of x to the power y plus y to the power x. Make and justify estimates of calculations such as: • $(2095 \times 302) + 396$ • $3.75 \times (2.36 - 0.39)$ • $\frac{103 \times 0.44}{\sqrt{(16.1)}}$	NUMERACY

Algebra 3 (2 weeks)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Equations, formulae and identities (112–113, 122–125, 132–137) • **Distinguish the different roles played by letter symbols in equations, identities, formulae and functions. 5c – 6b** • **Construct and solve linear equations with integer coefficients (with and without brackets, negative signs anywhere in the equation, positive or negative solution) using an appropriate method. 6c – 6a** • **Use systematic trial and improvement methods and ICT tools to find approximate solutions of equations such as *x*3 + *x* = 20. 6b - 6a** • **Solve problems involving direct proportion using algebraic methods, relating algebraic solutions to graphical representations of the equations; use ICT as appropriate. 6c – 6a**	The length of a rectangle is three times its width. Its perimeter is 24 centimetres. Find its area. The area of this rectangle is 10 cm².  Calculate the value of *x* and use it to find the length and width of the rectangle. The length of one side of a rectangle is *y*. This equation shows the area of the rectangle. $y(y + 2) = 67.89$ Find the value of *y*. Show your working. You may find this table helpful. 	*y*	*y* + 2	*y* (*y* + 2)	
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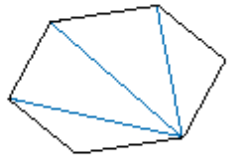
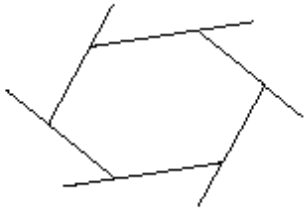
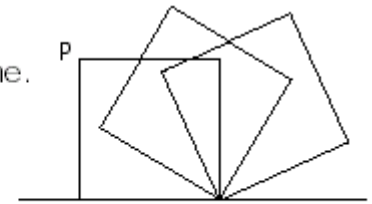
8	10	80	too large
					D&T CONSTRUCTION INDUSTRY SCIENCE

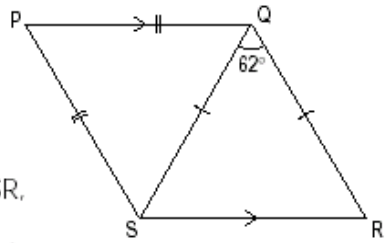
Shape, space and measures 1 (3 weeks)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Geometrical reasoning: lines, angles and shapes (178–189, 194–197) • **Distinguish between conventions, definitions and derived properties. 6c** • **Explain how to find, calculate and use:** - **the sums of the interior and exterior angles of quadrilaterals, pentagons and hexagons, 6b** - **the interior and exterior angles of regular polygons. 6b** • **Solve problems using properties of angles, of parallel and intersecting lines, and of triangles and other polygons, justifying inferences and explaining reasoning with diagrams and text. 5a – 6a** • **Know the definition of a circle and the names of its parts; explain why inscribed regular polygons can be constructed by equal divisions of a circle. 6b – 6a**	Explain how to find the interior angle sum and the exterior angle sum in (irregular) quadrilaterals, pentagons and hexagons. For example: • A polygon with n sides can be split into $n - 2$ triangles, each with an angle sum of 180°.  So the interior angle sum is $(n - 2) \times 180°$, giving 360° for a quadrilateral, 540° for a pentagon and 720° for a hexagon. At each vertex, the sum of the interior and exterior angles is 180°.  For n vertices, the sum of n interior and n exterior angles is $n \times 180°$. But the sum of the interior angles is $(n - 2) \times 180°$, so the sum of the exterior angles is always $2 \times 180° = 360°$.	

Shape, space and measures 1 (continued)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Construction and loci (220–227) **Use straight edge and compasses to construct a triangle, given right angle, hypotenuse and side (RHS); use ICT to explore constructions of triangles and other 2-D shapes. 6a** **Find the locus of a point that moves according to a simple rule, both by reasoning and by using ICT. 7a**	Use the method for constructing a perpendicular from a point on a line to construct triangles, given right angle, hypotenuse and side (RHS). For example: • A 10 metre ladder rests against a wall with its foot 3 metres away from the wall. Construct a diagram to scale. Then use a ruler and protractor to measure as accurately as possible: a. how far up the wall the ladder reaches; b. the angle between the ladder and the ground. Imagine a square being rolled along a straight line. What path would the point P trace?  A spider is dangling motionless on a single web. I move a finger so that its tip is always 10 cm from the spider. What is the locus of my finger tip? *(The surface of a sphere.)* I hold a ruler in my left hand, then move the tip of my right forefinger so that it is always 8 cm from the ruler. What is the locus of my fingertip? *(The surface of a cylinder with a hemisphere on each end.)*	

Shape, space and measures 1 (continued)

Learning objectives – what should the pupils be able to do?	Outcomes – what will success look like?	Resources
Solving problems (14–17) **Explore connections in mathematics across a range of contexts: shape and space. 5a – 6a**	For example: • In the diagram: PQ = PS, QR = QS, PQ is parallel to SR, angle SQR is 62°. Calculate the sizes of the other angles.  Triangle T has vertices at (1, 2), (2, 4) and (3, 4). a. Draw T on squared paper. b. Triangle R is obtained by reflecting T in the *x*-axis. Draw R. What are the coordinates of its vertices? c. Triangle S is obtained by reflecting R in the *y*-axis. Draw S. What are its coordinates? d. There is a transformation that takes triangle T directly to triangle S. Describe this transformation as precisely as you can.	