

number

Strand/substrand	Ref	Basic foundation content	
Structure and calculation	N1	a	Order positive and negative integers,
		b	decimals
		c	and fractions;
		d	use the symbols =, ≠, <, >, ≤, ≥
	N2	a	Apply the four operations (+, -) including formal written methods, to integers,
		b	decimals
		c	and simple fractions (proper and improper), and mixed numbers – all both positive and negative;
		d	apply the four operations (×, ÷), including formal written methods, to integers,
		e	decimals
		f	and simple fractions (proper and improper), and mixed numbers – all both positive and negative;
		g	understand and use place value (e.g. when working with very large or very small numbers,
		h	and when calculating with decimals).
	N3	a	Recognise and use relationships between operations, including inverse operations (e.g. cancellation to simplify calculations and expressions);
		b	use conventional notation for priority of operations, including brackets,
		c	powers,
		d	roots
		e	and reciprocals.
	N4	a	Use the concepts and vocabulary of prime numbers,
		b	factors (divisors),
		c	multiples,
		d	common factors,
		e	common multiples
		f	highest common factor,
		g	lowest common multiple,
		h	prime factorisation,
		i	including using product notation and the unique factorisation theorem.
N5	a	Apply systematic listing strategies	
	b		
	a	Use positive integer powers	

Nur

Fractions, decimals and percentages	N6	b	and associated real roots (square, cube and higher),
		c	recognise powers of 2, 3, 4, 5;
		d	
	N7	a	
		b	
		c	
	N8	a	Calculate exactly with fractions,
		b	
		c	
		d	
		e	
	N9	a	Calculate with and interpret standard form $A \times 10^n$, where $1 \leq A < 10$ and n is an integer.
	N10	a	Work interchangeably with terminating decimals and their corresponding fractions (such as 3.5 and $\frac{7}{2}$ or 0.375 or $\frac{3}{8}$).
		b	
		c	
	N11	a	Identify and work with fractions in ratio problems.
N12	a	Interpret fractions as operators	
	b	and percentages as operators.	
N13	a	Use standard units of mass,	
	b	length,	
	c	time,	
	d	money	
	e	and other measures (including standard compound measures) using decimal quantities where appropriate.	
N14	a	Estimate answers;	
	b	check calculations using approximation and estimation,	
	c	including answers obtained using technology	
N15	a	round numbers and measures to an appropriate degree of accuracy (e.g. to a specified number of decimal places or significant figures)	
	b		
N16	a		
	b		
		a	Use and interpret algebraic notation, including: ab in place of $a \times b$

Notation, vocabulary and manipulation

A1	b	$3y$ in place of $y + y + y$ and $3 \times y$
	c	a^2 in place of $a \times a$, a^3 in place of $a \times a \times a$, a^2b in place of $a \times a \times b$
	d	a/b in place of $a \div b$
	e	coefficients written as fractions rather than as decimals
	f	brackets.
A2	a	Substitute numerical values into formulae and expressions,
	b	including scientific formulae.
A3	a	Understand and use the concepts and vocabulary of expressions,
	b	equations,
	c	formulae,
	d	
	e	inequalities,
	f	terms,
	g	and factors.
A4	a	Simplify and manipulate algebraic expressions
	b	
	c	
	d	collecting like terms
	e	multiplying a single term over a bracket
	f	taking out common factors
	g	
	h	
	i	
	j	
	k	
	l	simplifying expressions involving sums,
	m	products
	n	and powers,
o	including the laws of indices.	
A5	a	Understand and use standard mathematical formulae;
	b	rearrange formulae to change the subject.
A6	a	
	b	
	c	

Algebra

Graphs

	d	
A7	a	Where appropriate, interpret simple expressions as functions with inputs and outputs;
	b	
	c	
A8	a	Work with coordinates in all four quadrants.
A9	a	Plot graphs of equations that correspond to straight-line graphs in the coordinate plane;
	b	
	c	
	d	
	e	
A10	a	Identify and interpret gradients of linear functions
	b	graphically
	c	and algebraically;
	d	and intercepts of linear functions graphically
	e	and algebraically.
A11	a	
	b	
	c	
	d	
	e	
A12	a	Recognise, sketch and interpret graphs of linear functions,
	b	quadratic functions,
	c	
	d	
	e	
	f	
A13		
A14	a	Plot and interpret graphs
	b	
	c	
	d	and graphs of non-standard functions in real contexts,
	e	to find approximate solutions to problems

		f	such as simple kinematic problems involving distance, speed and acceleration.
	A15	a	
		b	
		c	
	A16	a	
		b	
Solving equations and inequalities	A17	a	Solve linear equations in one unknown algebraically;
		b	
		c	find approximate solutions using a graph.
	A18	a	
		b	
		c	
		d	
		e	
	A19	a	
		b	
		c	
	A20		
	A21	a	
		b	
		c	
	A22	a	
		b	
		c	
		d	
		e	
f			
A23	a	Generate terms of a sequence from either a term-to-term	
	b	or a position-to-term rule.	
		a	Recognise and use sequences of triangular,
		b	square

es of change

Sequences		A24	
		c	and cube numbers,
d	simple arithmetic progressions		
e			
f			
g			
h			
i			
A25		a	Deduce expressions to calculate the n th term of linear sequences
		b	
R1		a	Change freely between related standard units (e.g. time, length, area, volume/capacity, mass) in numerical contexts
		b	and compound units (e.g. speed, rates of pay, prices) in numerical contexts
		c	
		d	
R2		a	Use scale factors,
		b	scale diagrams
		c	and maps.
R3		a	Express one quantity as a fraction of another, where the fraction is less than 1
		b	or greater than 1.
R4		a	Use ratio notation
		b	including reduction to simplest form.
R5		a	Divide a given quantity into two parts in a given part:part
		b	or part:whole ratio;
		c	express the division of a quantity into two parts as a ratio;
		d	apply ratio to real contexts and problems (such as those involving conversion, comparison, scaling, mixing, concentrations).
R6		a	Express a multiplicative relationship between two quantities as a ratio
		b	or a fraction.
R7		a	Understand and use proportion as equality of ratios.
R8		a	Relate ratios to fractions
		b	and to linear functions.
		a	Define percentage as 'number of parts per hundred';
		b	interpret percentages as a fraction

Ratio, proportion and rates of change

Ratio, proportion and rates of change

R9	c	or a decimal,
	d	interpret percentage changes as a fraction
	e	or a decimal
	f	and interpret these multiplicatively;
	g	express one quantity as a percentage of another
	h	compare two quantities using percentages;
	i	work with percentages greater than 100%;
	j	solve problems involving percentage change,
	k	including percentage increase/decrease
	l	and original value problems,
	m	and simple interest including in financial mathematics.
R10	a	Solve problems involving direct
	b	and inverse proportion,
	c	including graphical
	d	and algebraic representations.
R11	a	Use compound units such as speed,
	b	rates of pay,
	c	unit pricing
	d	
	e	
R12	a	Compare lengths, areas and volumes using ratio notation
	b	
	c	and scale factors.
R13	a	
	b	
	c	
	d	
R14	a	
	b	
	c	
R15	a	
	b	
	c	
	d	
	e	
	f	
	g	
	a	

	R16	b	
		c	
		d	
		e	
	G1	a	Use conventional terms and notations: points, lines, vertices, edges, planes, parallel lines, perpendicular lines, right angles,
		b	polygons,
		c	regular polygons and polygons with reflection and/or rotation symmetries;
		d	use the standard conventions for labelling and referring to the sides and angles of triangles;
		e	draw diagrams from written description.
	G2	a	
		b	
		c	
		d	
		e	
		f	
	G3	a	Apply the properties of angles at a point, angles at a point on a straight line, vertically opposite angles;
b		understand and use alternate and corresponding angles on parallel lines;	
c		derive and use the sum of angles in a triangle	
d		use the sum of angles in a triangle	
e		(e.g. to deduce and use the angle sum in any polygon, and to derive properties of regular polygons).	
G4	a	Derive	
	b	and apply the properties and definitions of: special types of quadrilaterals, including square, rectangle, parallelogram, trapezium, kite and rhombus; and triangles and other plane figures using appropriate language.	
G5	a		
G6	a		
	b		
	c		
	d		

Geometry and measures

	e	
	f	
	g	
G7	a	Identify, describe and construct congruent and similar shapes, including on coordinate axes, by considering rotation, reflection, translation
	b	and enlargement
	c	
	d	
G8	a	
G9	a	Identify and apply circle definitions and properties, including: centre, radius, chord, diameter, circumference,
	b	
G10	a	
G11	a	Solve geometrical problems on coordinate axes.
G12	a	Identify properties of the faces, surfaces, edges and vertices of: cubes, cuboids, prisms, cylinders, pyramids, cones and spheres.
G13	a	
	b	interpret plans and elevations of 3D shapes.
G14	a	Use standard units of measure and related concepts (length,
	b	area,
	c	volume/capacity,
	d	mass,
	e	time,
	f	money, etc.)
G15	a	Measure line segments and angles in geometric figures,
	b	including interpreting maps and scale drawings
	c	and use of bearings.
G16	a	Know and apply formulae to calculate: area of triangles, parallelograms, trapezia;
	b	volume of cuboids
	c	and other right prisms
	d	(including cylinders).
	a	Know the formulae: circumference of a circle = $2\pi r$ = πd , area of a circle = πr^2 ;

	Mensuration and calculation	G17	b	calculate: perimeters of 2D shapes, including circles;
			c	areas of circles and composite shapes;
			d	
			e	
		G18	a	
			b	
			c	
		G19	a	
			b	
		G20	a	
			b	
			c	
			d	
			e	
	f			
	g			
	G21	a		
		b		
	G22	a		
		b		
	G23	a		
	Vectors	G24	a	Describe translations as 2D vectors.
		G25	a	
b				
c				
d				
e				
P1	a	Record describe and analyse the frequency of outcomes of probability experiments using tables		
	b	and frequency trees.		

Probability

Probability

P2	a	Apply ideas of randomness, fairness and equally likely events to calculate expected outcomes of multiple future experiments.
P3	a	Relate relative expected frequencies to theoretical probability, using appropriate language and the 0 - 1 probability scale.
P4	a	Apply the property that the probabilities of an exhaustive set of outcomes sum to one;
	b	apply the property that the probabilities of an exhaustive set of mutually exclusive events sum to one.
P5	a	
P6	a	Enumerate sets and combinations of sets systematically, using tables, grids,
	b	Venn diagrams
	c	
P7	a	Construct theoretical possibility spaces for single experiments with equally likely outcomes and use these to calculate theoretical probabilities
	b	and combined experiments with equally likely outcomes and use these to calculate theoretical probabilities.
P8	a	
	b	
	c	
P9	a	
	b	
	c	
S1	a	
	b	
S2	a	Interpret and construct tables, charts and diagrams,
	b	including frequency tables,
	c	bar charts,
	d	pie charts
	e	and pictograms for categorical data,
	f	vertical line charts for ungrouped discrete numerical data,
	g	
	h	and know their appropriate use.

Statistics

Statistics

S3	a	
	b	
	c	
	d	
	e	
	f	
S4	a	Interpret,
	b	analyse
	c	and compare the distributions of data sets from univariate empirical distributions through:
	d	- appropriate graphical representation involving discrete,
	e	continuous
	f	and grouped data
	g	
	h	- appropriate measures of central tendency (median,
	i	mean,
	j	mode and modal class)
	k	and spread (range,
	l	including consideration of outliers,
	m	
	n	
S5	a	Apply statistics to describe a population.
S6	a	Use and interpret scatter graphs of bivariate data;
	b	recognise correlation
	c	
	d	
	e	
	f	

	and proofs.
	interpret the reverse process as the 'inverse function';
	interpret the succession of two functions as a 'composite function' (the use of formal function notation is expected).
use the form $y = mx + c$ to identify parallel lines;	
	and perpendicular lines;
find the equation of the line through two given points,	
or through one point with a given gradient.	
Identify and interpret roots, intercepts,	
turning points of quadratic functions graphically;	
deduce roots algebraically	
	and turning points by completing the square.
simple cubic functions,	
the reciprocal function $y = 1/x$ with $x \neq 0$	
	exponential functions $y = k^x$ for positive values of k ,
	and the trigonometric functions (with arguments in degrees) $y = \sin x$, $y = \cos x$ and $y = \tan x$ for angles of any size.
	Sketch translations and reflections of a given function.
(including reciprocal graphs	
	and exponential graphs)

	Calculate or estimate gradients of graphs (including quadratic and other non-linear graphs)
	and areas under graphs (including quadratic and other non-linear graphs),
	and interpret results in cases such as distance-time graphs, velocity-time graphs and graphs in financial contexts.
	Recognise and use the equation of a circle with centre at the origin;
	find the equation of a tangent to a circle at a given point.
(including those with the unknown on both sides of the equation);	
Solve quadratic equations algebraically by factorising	
	(including those that require rearrangement);
	by completing the square
	and by using the quadratic formula;
find approximate solutions using a graph.	
Solve two simultaneous equations in two variables (linear/linear)	
	or linear/quadratic) algebraically;
find approximate solutions using a graph.	
	Find approximate solutions to equations numerically using iteration
translate simple situations or procedures into algebraic expressions or formulae;	
derive an equation (or two simultaneous equations),	
solve the equation(s) and interpret the solution.	
Solve linear inequalities in one variable	
	or two variables;
	and quadratic inequalities in one variable;
represent the solution set on a number line,	
	using set notation
	and on a graph.

solve	
and interpret the answers in growth and decay problems,	
including compound interest	
	and work with general iterative processes.
Use the standard ruler and compass constructions (perpendicular bisector of a line segment,	
constructing a perpendicular to a given line from/at a given point,	
bisecting a given angle);	
use these to construct given figures	
and solve loci problems;	
know that the perpendicular distance from a point to a line is the shortest distance to the line.	
Use the basic congruence criteria for triangles (SSS, SAS, ASA, RHS).	
Apply angle facts,	
triangle congruence,	
similarity	
and properties of quadrilaterals to conjecture and derive results about angles and sides,	

surface area and	
volume of spheres, pyramids, cones and composite solids.	
Calculate arc lengths,	
angles	
and areas of sectors of circles.	
Apply the concepts of congruence and similarity, including the relationships between lengths,	
	areas and volumes in similar figures.
Know the formulae for: Pythagoras' theorem, $a^2 + b^2 = c^2$,	
and the trigonometric ratios, $\sin\theta = \text{opposite/hypotenuse}$, $\cos\theta = \text{adjacent/hypotenuse}$	
and $\tan\theta = \text{opposite/adjacent}$;	
apply them to find angles	
and lengths in right-angled triangles in two dimensional figures	
	and, where possible, general triangles in two
	and three dimensional figures.
Know the exact values of $\sin\theta$ and $\cos\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ, 60^\circ$ and 90° ;	
know the exact value of $\tan\theta$ for $\theta = 0^\circ, 30^\circ, 45^\circ$ and 60° .	
	Know and apply the sine rule, $a/\sin A = b/\sin B = C/\sin C$
	and cosine rule, $a^2 = b^2 + c^2 - 2bc \cos A$, to find unknown lengths and angles.
	Know and apply $\text{Area} = 1/2 ab \sin C$ to calculate the area, sides or angles of any triangle.
Apply addition and subtraction of vectors,	
multiplication of vectors by a scalar,	
and diagrammatic	
and column representations of vectors.	
	Use vectors to construct geometric arguments and proofs.

Understand that empirical unbiased samples tend towards theoretical probability distributions, with increasing sample size.	
and tree diagrams.	
Calculate the probability of independent and dependent combined events, including using tree diagrams and other representations, and know the underlying assumptions.	
	Calculate and interpret conditional probabilities through representation using expected frequencies with two-way tables,
	tree diagrams
	and Venn diagrams.
Infer properties of populations or distributions from a sample, whilst knowing the limitations of sampling.	
tables and line graphs for time series data	

