Whole numbers

Skill	Achieved ?
Know that a **whole number** is a normal counting number such as 1, 2, 3, 4,…	
Know the meanings of **even number** and **odd number**	
Know that approximating means to get an answer close to the actual (true) answer	
Know that **rounding** means to approximate (estimate) to a given level of accuracy	
Round a whole number to the nearest unit	
Know the meaning of **add** and **subtract**	
Add and subtract whole numbers without a calculator	
Know the meaning of **multiply**	
Multiply a whole number (up to 4 digits) by a single digit without a calculator	
Know the meaning of **divide** and **remainder**	
Divide simple whole numbers without a calculator	
Know what **BIDMAS** stands for and add, subtract, multiply and divide other whole numbers using a calculator	
Know how to order numbers	
Know that an **integer** is a whole number or a negative whole number	
Know how to calculate negative numbers	
Know how to calculate with decimals	
Know and use basic standard form	
Know and understand the different types of numbers • Multiples • Factors • Prime numbers • Square numbers • Square roots (inverse of square number) • Cube numbers • Cube roots (inverse of cube numbers) • Prime factors • Lowest Common Multiple (LCM) • Highest Common Factor (HCF)	

Fractions, Percentages and Decimals

Skill	Achieved?
Know that a **fraction** is (usually) part of a whole and is written as: $\frac{\text{Numerator}}{\text{Denominator}}$	
Work out **unitary fractions** (numerator = 1) of a whole number without a calculator	
Know that a **percentage** is a fraction with a denominator = 100	
Know that 100% = 1 whole and 1% = 1 out of a 100	
Know that a **decimal** (number) is a whole number with a decimal point and a number of digits (fractional part) after the point	
Know other important equivalence between common fractions, percentages and decimals such as: 50% = ½ = 0.5 25% = ¼ = 0.25 75% = ¾ = 0.75 20% = ⅕ = 0.2 10% = $^1/_{10}$ = 0.1 33⅓ % = ⅓ = 0.33	
Work out common percentages of whole numbers without a calculator	
Work out other percentages of whole numbers with a calculator	
Round a decimal to the nearest unit	
Find a decimal on a number scale (up to hundredths)	
Add and subtract decimals (up to 2 d.p.) without a calculator	
Multiply and divide decimals (up to 2 d.p.) by a one digit whole number	
Multiply and divide decimals (up to 2 d.p.) by 10, 100 and 1000	
Add and subtract fractions	
Multiply and divide fractions	
Find fractions of a given quantity	
Find percentages of a given quantity	
Calculate percentage change Percentage change = $\frac{\text{change in value}}{\text{original value}} \times 100$	
Increase and decrease quantities by a percentage	
To express one quantity as a percentage of another	
To calculate reverse percentages – means working backwards from a final amount to an original amount	

Foundation Checklist

Basic Ratio and Proportion

Skill	Achieved?
To understand **ratios** are used to compare quantities	
Use ratio notation and reduce ratios to their simplest form by cancelling down	
Divide quantities into given ratios	
Apply ratio to real contexts and problems, including **best buys**	
Know that 2 things are in **direct proportion** if one increases at the same rate as the other	

Basic Algebra

Skill	Achieved?
Use and understand algebraic notation and vocabulary	
Understand 'Like Terms' are **terms** with the same **variable**	
To simplify an **expression** you collect like terms	
An expression does not contain an = sign	
To rearrange expressions	
To know when moving a term from one side of an **equation** to the other you must carry out the **inverse operation**	
Know an equation contains an = sign and can be solved	
To be able to **substitute,** replace a given variable with a number	
To **expand** (multiply out) brackets	

Patterns and sequences

Skill	Achieved?
Know the meaning of **pattern (sequence)**	
Spot a number pattern and continue it	
Spot a picture pattern with **constant differences** and fill out a table of values	
Work out a rule (in words) for a given pattern	
Work out missing terms in sequences	
To calculate **nth** terms of a linear sequence	
Recognise and use arithmetic and geometric sequences	
Recognise and use special sequences Triangular numbers Square numbers Cube numbers	

Coordinates and Linear graphs

Skill	Achieved?
Know that a **coordinate** is a pair of things (usually numbers) (x,y), x being the **x – coordinate** and y the **y - coordinate**	
Know that a coordinate grid consists of an equally spaced horizontal line (**x – axis**) an equally spaced vertical line (**y – axis**) and the **origin** (where the axes cross)	
Know that (x, y) is not the same as (y, x) unless x and y are the same	
Know that points such as (3, 0), (8, 0) and (0, 0) are on the x-axis	
Know that points such as (0, 2), (0, 9) and (0, 0) are on the y-axis	
Know the origin has coordinates (0, 0)	
Plot a coordinate when x and y are positive or zero	
Find and give the coordinates of an object on a grid with numbers and/or letters	
Work with coordinates in all four **quadrants**	
Plot graphs of **linear** functions	
Work out the equation of a line through two given points or through one point with a given **gradient**	
Work out the gradient and the **y-intercept** of a straight line in the form y=mx + c	
Interpret **distance – time** graphs	
Interpret **velocity – time** graphs	

Factorisation and Formulae

Skill	Achieved?
Know that **formula** is a way of describing a rule or fact	
A formula is written as an algebraic equation	
Work out answers using a formula written in words or symbols	
Understand that factorisation is the reverse of expanding brackets	
Know a binominal is an expression that contains 2 terms	
To understand binominal expansion	
Understand that an expression containing a squared term is called a **quadratic**	
Change a subject in a formula by rearranging using **inverse operations**	

Weight

Skill	Achieved?
Know that w**eight** is a measure of how heavy something is	
Know that **mass** is a measure of how much material there is	
Know that units of mass include **grams (g)** and **kilograms (kg)** and that these are related by: 1 kg = 1000 g	
Know that in maths, 'weight' is often (incorrectly) used for 'mass'	
Change kilograms into grams by multiplying by 1 000	
Change grams into kilograms by dividing by 1 000	

Perimeter and Area

Skill	Achieved?
Know that **length** is a measure of how long something is	
Know that units of length are the same as those of **distance**	
Know that **perimeter** is the total distance around a 2D shape	
Work out the perimeter of a rectangle	
Work out the perimeter of a shape that can be broken up into rectangles	
Know that **area** measures how much 2D space there is in a shape	
Know that units for area include **square centimetres (cm^2)** and **square metres (m^2)**	
Work out the area of a square (L = length), rectangle (L = length, W = width) and right angled triangle (B = base, H = height) by using the equations $A = L \times L$ (Square) $A = L \times W$ (Rectangle) $A = B \times H \div 2$ (Triangle)	
Work out areas of other shapes by counting squares and half squares	
Calculate the perimeter of rectangles and triangles	
Calculate the perimeter and area of composite shapes	

Volume

Skill	Achieved?
Know that **volume** measures how much 3D space there is in a shape	
Know that units for volume include **Cubic centimetres (cm^3), cubic metres (m^3), litres (l) and millilitres (ml),** and these last two are related by 1 l = 1 000 ml	
Change litres to millilitres by multiplying by 1 000	
Change millilitres into litres by dividing by 1 000	
Work out the volume of a cube or cuboid by using the equations: V = L x L x L (Cube) V = L x W x H (Cuboid)	
Work out the volume of a cuboid when told it's volume and 2 sides	
Work out the volume of a shape by counting cubes	
Calculate the volume and **surface area** of a cuboid	
Recall and use formulas for **circumference** and area of a circle $\boldsymbol{C = 2\pi r}$ **or** $\boldsymbol{C = \pi d}$ $\boldsymbol{A = \pi r^2}$	
Recall and use the formula for area of a trapezium $\boldsymbol{A = \frac{1}{2}(a+b)h}$	
Understand a **prism** is a 3D shape that has the same **cross-section** running all the way through it	
Calculate the volume of a prism Volume of prism = Area of cross-section x length	
Understand that **surface area** is the sum of the area of all the **faces**	
Calculate surface area of a prism	
Calculate volume and surface area of a cylinder **Volume of a cylinder** = $\boldsymbol{\pi r^2 h}$ **Surface area of a cylinder** = $\boldsymbol{2\pi rh + 2\pi r^2}$	

Compound Measures

Skill	Achieved?
Know that time is a measure of how long something lasts	
Know that time units include **seconds (s), minutes (min), hours (hr), days (d), weeks (wk), months (mth) and years (yr)** and know how these are related 1 min = 60 s 1 hr = 60 min 1 day = 24 hr 1 week = 7 days 1 year = 365 days 1 leap year = 366 days	
Know that there are 52 weeks in a year	
Change between different units of time	
Know the 7 days of the week and their order	
Know the 12 months of the year and their order	
Know how many days are in each month	
Know what **12-hour time** is and how it is written	
Know what **24-hour time** is and how it is written	
Change 12-hour time to 24-hour time	
Change 24-hour time to 12-hour time	
Work out time differences, including those on bus and train timetables, in the same half-day (for 12-hour time) or in the same day (for 24-hour time)	
Know that **distance** is a measure of how far away something is	
Know that units of distance include **millimetres (mm), centimetres (cm), metres (m), kilometres (km)** and **miles**	
Know that **speed** is a measure of how fast something moves	
Know that units of speed include **miles per hour (mph) and kilometres per hour (kph**)	
Recall and use the formula to calculate speed (s), distance (d) and time (t) $s = \frac{d}{t}$, $t = \frac{d}{s}$, $d = s \times t$	
Know that **density** is a measure of the quantity of some physical property (usually **mass**) per unit length, area, or volume (usually volume).	
Recall and use the formula to calculate density (d), mass (m) and volume (v) $d = \frac{m}{v}$, $v = \frac{m}{d}$, $m = d \times v$	

Know that **compound interest** is calculated on the total amount of money invested, plus any interest previously earned	
Recall and use the formula for compound interest Final Amount (A) = Original Amount x (1 + Rate / 100)	
To calculate **depreciation** (loss in value), the plus sign in the formula is changed to a minus sign	

2D Shapes

Skill	Achieved?
Know that a **2-dimensional (2D)** shape is a (closed) shape drawn on a flat surface	
Know there are several types of triangle	
Know that a quadrilateral is a 4-sided shape	
Know that a square is a quadrilateral with • All sides the same • 4 right angles • 2 diagonals that bisect each other • 2 lines of symmetry	
Know that a rectangle is a quadrilateral with • 2 pairs of parallel lines (different lengths) • 4 right angles • 2 diagonals that bisect each other • 4 lines of symmetry	
Know that **interior** angles of quadrilaterals add to 360°	
Understand the properties of other quadrilaterals	
Know that a **circle** is all points the same distance from a given point	
Know the meanings of **radius (r)** and **diameter (d)** and what they look like on a circle	
Know that d = 2 x r	
Work out the diameter of a circle when told it's radius	
Work out the radius of a circle when told it's diameter	
Identify parts of a circle and understand their basic properties	
Know a **polygon** is a closed shape with at least 3 straight sides	
Know the difference between regular and irregular polygons	
Recall and use the formula to find the sum of interior angles inside a polygon Sum = (n-2) x 180° Where n = number of sides	
Identify **congruent** and **similar** shapes	
State the criteria that congruent shapes satisfy	

Foundation Checklist

Solve problems involving similar figures	
Understand geometrical problems	
Recall and use the formula for **Pythagoras' Theorem** $a^2 + b^2 = c^2$	
Apply Pythagoras' Theorem to real-life problems	
Recall and use **trigonometric** ratios $\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$ $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$ $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$	
Calculate unknown lengths and angles using trigonometry	

3D Shapes

Skill	Achieved?
Know that a **3-dimensional (3D)** shape is a shape drawn in space	
Recognise shapes such as **cube, cuboid, cylinder, pyramid, cone** and **sphere**	
Know that a **net** of a 3D shape are flat 2D shapes which, when folded up, make the 3D shape	
Identify a 3D shape from its net	
Draw nets of 3D shapes	
Use **isometric** grids	
Interpret and draw **plans** and **elevations** of 3D shapes	

Angles, Bearings and Lines

Skill	Achieved?
Know that an **angle** is the shape made by 2 lines (**arms**) sharing a common **endpoint** and that a unit of angle is the **degree °**	
Know that an **acute angle** is strictly between 0° and 90°, and **obtuse angle** is strictly between 90° and 180° and a **reflex angle** is strictly between 180° and 360°	
Use a **protractor** to measure an angle	
Use a protractor to draw and angle	
Know that a **right angle** has 90°	
Know that a **straight line** has 180°	
Work out a missing angle on a straight line	
Know that a circle has 360°	
Work out the missing angle in a circle	
Know that the **four cardinal compass directions** are **North, South, East**	

and **West** and know in which direction they point	
Know that a bearing is an angle • Written using 3 digits • Measured clockwise from a North line	
Know the bearings of the 4 cardinal compass directions	
Work out the bearing of a point B from a point A by drawing the North line at A and measuring clockwise to B	
Know that **vertically opposite** angles are equal	
Know that parallel lines are lines that never meet	
Know that **alternate** and **corresponding** angles are equal	
Know that **co interior** or **allied** angles add up to 180°	
Know that angles in a triangle add to 180°	
Know that angles in a quadrilateral add to 360°	

Scale drawings, transformations and constructions

Skill	Achieved?
Know that a **scale** is a rule for working out an actual (real-life) length when told the measured length (and vice versa)	
Work out the real-life length when told the scale and measured length	
Identify, describe and construct transformations of shapes including • **Reflections** • **Rotations** • **Translations** • **Enlargements**	
Know what is meant by a **column vector**	
Add and subtract vectors	
Multiply a vector by a scale	
Carry out translations according to column vectors	
Use a ruler and a **pair of compasses** to produce different constructions including **bisectors**	
Describe a **locus** (the path taken by a point that is obeying certain rules) and solve problems involving **loci** (the plural of locus)	

Symmetry and Tessellations

Skill	Achieved?
Know that a shape has **symmetry** if, after reflecting or rotating it, the shape looks the same	
Know the meaning of **line of symmetry**	
Know what a vertical line of symmetry is	
Know what a horizontal line of symmetry is	

Foundation Checklist

Know the meaning of **rotational symmetry**	
Know that a **tessellation** (**tiling**) is a way of covering a flat surface without overlaps or gaps (like bathroom tiles)	
Know that any triangle, square, rectangle, quadrilateral and hexagon tessellate	
Know a pentagon does not tessellate	

Algebra

Skill	Achieved?
Recognise, sketch and interpret graphs of **quadratic functions**	
Identify and interpret **roots, intercepts** and **turning points** of quadratic functions	
Work out roots using **algebraic** methods	
Work out turning points	
Know that when solving a quadratic equation by **factorising** ensure it equals 0 first	
Know how to solve **simultaneous equations** by **elimination**	
Find approximate solutions to quadratic and simultaneous equations by using a graph	

Powers, Roots and Indices

Skill	Achieved?
Recognise and recall powers of 2, 3, 4 and 5	
Recall and recognise square numbers up to 15 x 15	
Calculate with powers and roots including negative indices	

Statistics

Skill	Achieved?
Know that a **tally mark** is a way of counting	
Know that a **frequency table** is a way of recording how many times something happens	
Draw or fill out a frequency table	
Know what **pictographs, bar charts, line graphs, pie charts** and **scatter graphs** are	
Pick out and read information from the above statistical diagrams	
Draw a pictograph , bar chart, line graph, pie chart and scatter graph	
Describe the **trend** in a statistical diagram	
Know that data can be **qualitative** (non-numerical) or **quantitative** (numerical)	

Foundation Checklist

Know numerical data can be **discrete** (certain values in a given range) or **continuous** (take any value in a given range)	
Know that a measure of average – **mode, median and mean**	
Know that the measure of spread is the **range**	
Know that mode is the most common thing and work out the mode from a list of data	
Know that median is a middle value in a list of data but only when ordered first	
Work out the mean (average) using the equation: Mean = Total ÷ How many numbers there are	
Know the range is found by subtracting the lowest value from the highest value	
Calculate the mean, median, mode and range of a set of data	
Understand how a **sample** can be used to represent a **population** (collection of individuals or items) and its limitations	
Know that **primary data** is collected by yourself or on your behalf	
Know that **secondary data** is collected from a different source e.g. the internet	

Probability

Skill	Achieved?
Know **probability** is the chance that an event is likely to occur	
Know and use words associated with probability: **impossible, unlikely, evens, likely** and **certain**	
Construct and use a **probability scale**	
Know probabilities can be based on **theory** or the results of an **experiment**	
Know that **relative frequencies** are probabilities based on experiments	
Know that the sum of the probabilities of all possible outcomes is 1	
Know that probabilities can be given as fractions, decimals or percentages	
Random means that each possible outcome is equally likely	
An event is **biased** when outcomes are not equally likely	
The **sample space** represents all possible outcomes from an event which can be shown in a list or a diagram	
Understand what **mutually exclusive events** are (outcomes cannot happen at the same time)	
Calculate probabilities using experimental data	
Calculate the probability of **independent** and **dependent combined** events	
Calculate probabilities using sample space and **tree diagrams**	
Calculate sets and combinations of sets using **tables, grids** and **Venn diagrams**	

Measures, Accuracy and Finance

Skill	Achieved?
Change pounds into pence and vice versa by using the rule: £ 1 = 100 p	
Know the meaning of **wage** and work out wage rises involving percentages	
Know that a discount is a **reduction** in the **normal cost price**	
Understand and solve problems relating to **household finance**	
Check calculations using **approximation** (round to 1 s**ignificant figure**)	
Round numbers and measures to an appropriate degree of accuracy (decimal places - d.p or significant figures - s.f)	
Convert between **metric** units ÷10 ÷100 ÷1000 > > > mm cm m km < < < x10 x100 x1000	
Use **conversion factors** to convert between metric units 1 000 mg = 1 g 1 000 g = 1 kg 1 000 kg = 1 tonne 1000 ml = 1 litre 1000 cm^3 = 1 litre	
Use conversion factors to convert between metric and **imperial** units 8 km = 5 miles 1 kg = 2.2 pounds 4.5 l = 1 gallon	