Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6
Number & Place Value
Round any whole number to a required degree of accuracy.
Large numbers can found be in practical contexts in distances, heavy objects, vast containers, the universe, archaeological eras, populations, mountain peaks, etc.
Round large numbers to the nearest power of 10 required, using the most significant digit for the task. (This extends the work from Year 5 by one more power of 10.)
Round decimals to the nearest whole number or to one-, two- or three-decimal places.
Solve problems which require answers to be rounded to specified degrees of accuracy. (Number: Fractions, including decimals and %, Year 6)
Make appropriate decisions about the power of 10 to round to, e.g., for the number of children in a school, grains of sand in a bucket or spectators at a football match.
Estimate the position of numbers on a number line with different starting and finishing points and justify, e.g., Suggest which number lies about two-fifths of the way along a line from 0 to 1,000,000 line, or a line from 0 to 1.
Use rounding to find an approximate answer when checking calculations.
Solve number and practical problems that involve all of the above. (Number: Number and Place Value, Year 6)
Use negative numbers in context, and calculate intervals across zero.
Count forwards and backwards across zero from different starting points and in different steps, including some decimals, e.g., 0·5s.
Order a set of positive and negative numbers, e.g., on a number line.
Find the difference between pairs of negative numbers, or one positive and one negative number, in context, e.g., transactions with a bank account.
Solve number and practical problems that involve all of the above. (Number: Number and Place Value, Year 6)
Solve number and practical problems that involve all of the above.
Solve problems involving ordering and comparing large numbers, e.g., Order major world cities by population.
Solve problems requiring rounding to different degrees of accuracy, e.g., Round the number of children in a school to the nearest 50.
Solve problems with negative numbers, e.g., negative bank balances and owing money.
Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit. (Number: Number and Place Value, Year 6)
Round any whole number to a required degree of accuracy. (Number: Number and Place Value, Year 6)
Use negative numbers in context, and calculate intervals across zero. (Number: Number and Place Value, Year 6)
Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit.
Recall how to read large numbers by counting the digits to the left of any decimal place in chunks of three.
Write out the partitioning for any number up to 10 million.
Know what each digit is worth in a number, e.g., There are two 5s in this number, how much is each worth? 45, 327,651.
Order a set of numbers up to 10,000,000, including those with up to three-decimal places.
Compare a set of numbers up to 10,000,000, including those with up to three-decimal places.
Solve number and practical problems that involve all of the above. (Number: Number and Place Value, Year 6)
Multiply multi-digit numbers up to 4 digits by a two-digit whole number. (Number: Addition, Subtraction, Multiplication and Division, Year 6)

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Addition, Subtraction, Multiplication & Division

Multiply multi-digit numbers up to 4 digits by a two-digit whole number.

Read, write, order and compare numbers up to 10,000,000 and determine the value of each digit. (Number: Place Value, Year 6)

Estimate results and check them for reasonableness against the outcome.

Recognise column value within formal procedures, e.g., Understand that multiplying 6 by 4 might be 2·4, 24, 240, etc., depending on the place value of the digits.

Accurately multiply multi-digit numbers up to four digits by a two-digit whole number.

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication. (Number: Addition, Subtraction, Multiplication and Division, Year 6) continues with formal written methods which are not required for the KPI.

Solve problems involving addition, subtraction, multiplication and division.

Explain to somebody else how a problem might be solved to clarify thinking.

Create a sequence of steps with jottings and / or diagrams to showing the processes necessary to solve the problem and the order of operations.

Estimate results and check them for reasonableness against the outcome.

Solve word problems or equations involving the four rules, e.g.:

Explore square numbers for extended multiplication times tables facts, e.g., 80 × 80 = 6,400;

Compare the length, width, height, capacity and draught of two different sailing vessels;

Find the differences in population of major world cities.

Solve scaling problems, e.g.:

Work out price increases of 10% on different items.

Re-draw diagrams to scale.

Find approximate metric to imperial equivalences, e.g., 8km ≈ 5 miles.

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts. (Number: Ratio and Proportion)

Solve missing values and sequence problems, e.g.:

Find two numbers with a product of 899.

Write in the missing number: 32·45 ×□= 253·11,

3·2 ÷ n = 0·4;

Place a different two-place decimal in each box to make the calculation correct: □+ □+ □= 1.

London to Sydney is 10,571·387 miles. London to Singapore is 6,766·86 miles. How much further is it from London to Sydney than London to Singapore?

Multiply multi-digit numbers up to 4 digits by a two-digit whole number using the formal written method of long multiplication.

Multiply multi-digit numbers up to 4 digits by a two-digit whole number. (Number: Addition, Subtraction, Multiplication and Division, Year 6) is the KPI part of this objective

Decimal places are introduced in formal written methods for the first time in Year 6.

Understand and use the grid method for multiplication involving decimal numbers.

Be secure with formal written methods for Th H T U × T U.

Use formal written methods for calculations involving one decimal place.

Use formal written methods for calculations involving two decimal places.

Use formal written methods for numbers with up to three decimal places.

Divide numbers up to 4 digits by a two-digit whole number and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.

Year 6 Mathematics Curriculum Objectives

Divide numbers up to 4 digits by a one-digit number using the formal written method of short division. (Number: Multiplication and Division Year 5)

Estimate results and check them for reasonableness against the outcome.

Interpret the result of the division in context of the problem, including:

extracting the quotient and / or the remainder as required;

interpreting remainders in context of the question and present as a mixed number, a fraction, a decimal, a number that is rounded up or down to a specific number of places.

Understand number facts in context of the column values and position within written methods of division.

Know that zeros may need to be added to calculate an answer to a problem that has a remainder, e.g., share £1,447 equally between 4 people (£361·75).

Perform mental calculations, including with mixed operations and large numbers.

Make effective choices about calculation methods, based on the numbers involved.

Use mental jottings and record them accurately and tidily.

Use number bonds, extended number bonds, related subtraction facts and strategies learned over time to find the most efficient solutions to addition and subtraction problems.

Continue to use all the multiplication tables to calculate mathematical statements.

Derive related multiplication and division facts for numbers, drawing on knowledge of number facts and place value, e.g., 120 × 700 or 48,000 ÷ 120 or 0·8 × 90 or 6·4 ÷ 80.

Refine strategies for simplifying calculations, e.g., 400 × 97 = (400 × 100) - (40 × 3).

Mentally calculate mixed operations problems, e.g., I'm thinking of a number that is the multiple of 30 and 40. From this I have subtracted the square of 7. What's my number?

Identify common factors, common multiples and prime numbers.

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination. (Number: Fractions, including Decimals and Percentages, Year 6)

Explain the mathematical meaning of common factor, common multiple and prime number.

Find common factors of given numbers, e.g., Find the common factors of 36 and 15.

Find common multiples / lowest common multiple of given numbers, e.g., Find common multiples of 6 and 8 by drawing hops on a number line, or colouring numbered grids.

Identify prime numbers by applying knowledge of multiples and tests of divisibility.

Use their knowledge of the order of operations to carry out calculations involving the four operations.

Express missing number problems algebraically. (Algebra, Year 6)

Appreciate that, in an equation, a calculation inside brackets must be calculated first.

Know the order of calculating operations is Brackets, Indices (powers), Multiplication, Division, Addition, Subtraction – BIDMAS.

Practise calculating equations with brackets and mixed operations using the BIDMAS principle, e.g.:

$45 + (9^2 \times 2)$.

$230 + 1045 \times (15 - 6)$.

Explore how grouping numbers together in different ways can affect the outcome, e.g.:

How many different answers can be found by placing brackets round one or more pairs of adjacent numbers in a series of numbers such as 35 - 5 + 6 x 4 ÷ 2?

Apply the correct order of operations when solving problems, e.g.:

Butter costs £4.50 for 1 kg. Marie buys 200 grams of butter. How much does she pay?

A box contains 220 matches and weighs 33 grams. The empty box weighs 12 grams. Calculate the weight of one match.

Solve addition and subtraction multi-step problems in contexts, deciding which operations and methods to use and why.

Understand, and interpret correctly, mathematical vocabulary in word problems, e.g., 'Find the difference' is subtraction, the word 'more' can appear in a subtraction problem.

Apply the correct order of operations when solving problems.

Explain how a problem can be solved.

Year 6 Mathematics Curriculum Objectives

Estimate results and check them for reasonableness against the outcome.
Solve multi-step problems involving addition and subtraction, including decimals, e.g., SATS past papers, measures and money problems.
Use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy.
Estimate results and check them for reasonableness against the outcome.
Make estimations in practical contexts, e.g., The volume of a cuboid, the area of a playground, the weight of objects.
Round answers to the nearest or the specified power of 10.
Refine the rounding of answers to a specified degree of accuracy that is not necessarily a power of 10, e.g., Round to the nearest, 20, 50, etc.
Divide numbers up to 4 digits by a two-digit whole number using the formal written method of long division, and interpret remainders as whole number remainders, fractions or by rounding, as appropriate for the context.
See Mathematics programmes of study: key stages 1 and 2: Mathematics Appendix 1 (formal methods).
The first part of this objective is outlined under 'Divide numbers up to 4 digits by a two-digit whole number and interpret remainders as whole number remainders, fractions, or by rounding, as appropriate for the context.' (Number: Addition, Subtraction, Multiplication and Division, Year 6)
Use formal written methods for short division.
Use formal written methods for division of up to four-digit numbers by a two-digit number (long division).

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Fractions

Compare and order fractions, including fractions > 1

Recall and explain the terms denominator, numerator, common denominator.

Understand the relationships between common fractions through practical experience, e.g., $\frac{1}{7}$ is smaller than $\frac{1}{6}$ and $\frac{1}{6}$ is half of $\frac{1}{3}$.

Use patterns to predict and test similar relationships, e.g., $\frac{1}{10}$ is half of $\frac{1}{5}$.

Solve problems involving fractions such as:

What fraction lies halfway between $\frac{3}{10}$ and $\frac{7}{10}$?

Which of these fractions is less than $\frac{1}{2}$? $\frac{7}{10}$, $\frac{6}{100}$, $\frac{2}{5}$, $\frac{1}{10}$, $\frac{11}{20}$, $\frac{1}{20}$.

Order a set of fractions in which some are not in their lowest form.

Use common factors to simplify fractions; use common multiples to express fractions in the same denomination.

Identify common factors, multiples and prime numbers. (Addition, Subtraction, Multiplication, Division, Year 6)

Find common factors of two or more numbers and relate to finding equivalent fractions.

Know that finding the greatest common factor of two or more numbers is the quickest way to simplify fractions.

Simplify fractions, including remainders after division, by cancelling common factors of the numerator and denominator, e.g., Divide the numerator and the denominator of $\frac{14}{35}$ by 7 to simplify to $\frac{2}{5}$.

Know that a common multiple is a number that is a multiple of two or more numbers.

Be able to find the least common multiple (LCM) of two numbers, i.e., the smallest number (not zero) that is a multiple of both, to express fractions in the same denomination.

Add and subtract fractions with different denominators and mixed numbers, using the concept of equivalent fractions.

Mentally recall multiples of two or three numbers in readiness for finding common denominators, e.g., A multiple of 5 and 6 is 30 and another is 60, a multiple of 3 and 5 and 2 is 30, etc.

Find all the factors of a given number, e.g., Which numbers divide into 30?

Understand that to make equivalent fractions scaling is used.

Mentally calculate some equivalent fractions using multiplication and division facts.

Add and subtract two fractions with different denominators in the same fraction family by changing one fraction into an equivalent fraction with the same denominator, e.g., $1\frac{1}{2} + 2\frac{7}{8} = 3 + \frac{4}{8} + \frac{7}{8} = 3 + \frac{11}{8} = 4\frac{3}{8}$.

Know that to add and subtract two fractions from different fraction families both fractions need to be changed to an equivalent fraction with the same denominator, e.g., $1\frac{1}{3} + \frac{1}{5} = 1 + \frac{5}{15} + \frac{3}{15} = 1\frac{8}{15}$.

Explain why the numerator is 'added' or 'subtracted' and the denominator remains the same.

Multiply simple pairs of proper fractions, writing the answer in its simplest form [for example, $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$].

Be aware that pupils often think that the process of multiplying will produce a larger answer.

Use models and images to explain and describe how fractional parts can themselves be divided into fractions, writing equations for the outcome, e.g.:

One-quarter of one-half is $\frac{1}{4} \times \frac{1}{2} = \frac{1}{8}$.

Three-quarters of one-half is $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$.

Use known answers to understand how equations can be calculated without the need for drawings, i.e., multiplying numerator by numerator and denominator by denominator.

Understand that when multiplying proper fractions together the answer is always smaller than the starting quantity and use this to check if answers make sense.

Know that a proper fraction multiplied by a proper fraction is always less than 1.

Calculate answers without the need for diagrams.

Divide proper fractions by whole numbers [for example, $\frac{1}{3} \div 2 = \frac{1}{6}$].

Year 6 Mathematics Curriculum Objectives

Be able to visualise a fraction being shared into equal parts, e.g., Sharing $\frac{1}{3}$ of a pizza between 2 would result in there being $\frac{1}{6}$ each.
Use known answers to equations to understand how equations can be calculated without the need for drawings, i.e., when dividing a proper fraction by a whole number the numerator remains the same and the denominator is divided by the whole number.
Calculate answers without the support of diagrams.
Associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example, $\frac{3}{8}$].
It makes sense to include percentages here in some activities.
Recall that $\frac{1}{2}$ is the same as 1 ÷ 2 and $\frac{4}{5}$ is the same as 4 ÷ 5, etc.
Explore dividing the numerator by the denominator for a systematic set of unit fractions ($\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, etc.) noting that some of them 'never end' (recurring number patterns), e.g., Could use a calculator for this and generalise about the results.
Know that fractions with recurring decimal equivalents are rounded to 2 or 3 decimal places (in context), e.g., $\frac{1}{3}$ = 0·33 or 0·333, $\frac{2}{3}$ = 0·67 or 0·667.
Use standard written methods to find the decimal equivalents for unit and non-unit fractions, e.g., $\frac{3}{8}$ = 3 ÷ 8 = 0·375.
Identify the value of each digit in numbers given to three decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to three decimal places.
Say, read and write numbers up to 10,000,000 with decimal fractions accurately.
Understand that the value of adjacent columns is ten times more to the left or ten times less to the right.
Place one-, two- and three-decimal place numbers accurately on number lines.
Explain why a place keeping 0 may be necessary.
Consolidate understanding of multiplication by 10, 100 and 1,000 as movement of place not the 'adding of 0s', e.g., Adding two 0s to 3·4 when multiplying by 100 produces the wrong outcome.
Know the value of each digit of any number up to 10,000,000 with up to three decimal places.
Order a set of decimal numbers in ascending / descending order recognising that the left-most, non-zero column is the most significant.
Multiply one-digit numbers with up to two decimal places by whole numbers.
Practise 'informal' methods of recording with decimals before moving onto formal columnar methods.
Multiply a number less than 10 with one decimal place by whole numbers in practical contexts, e.g., Two pieces of tape each 0·4 m long are needed for a cushion cover. How much tape must be bought?
Multiply a number less than 10 with two decimal places by a whole number, e.g., Each box weighs 0·45 kg. How much do 7 boxes weigh? (Estimation 0·5 x 7 is 3·5 so it will be between 3 kg and 3·5 kg.)
Estimate answers to calculations, by rounding accurately, to get an idea of the magnitude of the answer and check answers for sense.
Solve multiplication problems, e.g., Place three digits to make a U·t × U calculation and find examples where the answer is a whole number, e.g., 4·2 × 5.
Use written division methods in cases where the answer has up to two decimal places.
See Mathematics programmes of study: key stages 1 and 2: Mathematics Appendix 1 (formal methods).
Estimate and check answers to calculations, by rounding accurately, to get an idea of the magnitude of the answer.
Refine estimates.
Check answers using inverse operations.
Recognise and appreciate column place value within the formal written method.
Use written division methods in cases where the answer has up to two decimal places.
Solve problems which require answers to be rounded to specified degrees of accuracy.
Recurring fractions will always need rounding.
Decide, in context of the problem, what to do with a remainder – round up, round down, ignore.
Decide, in context of the problem, how many decimal places should be presented.
Solve problems, e.g.:
A bill of £9·50 is shared equally between 4 people. What is the minimum each needs to pay?

Year 6 Mathematics Curriculum Objectives

How many portions of cheese weighing 100 g each can be cut from a block that is 824 g?

Pizzas are £1·49 each. They are packed in boxes of 20. How much will a box cost to the nearest pound?

A carpenter cuts a plank of wood that is 3·73 m long into 5 equal pieces. What is the length of each piece in cm?

Pencil boxes are 0·18 m long. How long would a carton need to be to put 9 boxes end to end?

Round any whole number to a required degree of accuracy. (Number: Number and Place Value, Year 6)

Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts.

Solve problems involving the calculation of percentages (e.g., of measures) such as 15% of 360 and the use of percentages for comparison. (Number: Ratio and Proportion, Year 6)

Interpret pie charts and line graphs and use these to solve problems. (Statistics, Year 6)

Simplify fractions to their lowest term when presenting answers.

Find the fraction / percentage that one number is of another, e.g., What fraction or % of 60 is 45?

Find equivalent fractions, both fraction notation and decimals, to aid efficiency when calculating.

Recognise and use fractional and decimal equivalents when calculating with percentages, e.g., 25% = $^{25}/_{100}$ = 0·25 = ¼, so to find 25% divide by 4.

Solve related problems, e.g., Which of these are equivalent amounts? 0·4, ⅓, 40%, 0·3, ⅖, 0·75, $^{6}/_{15}$.

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Ratio & Proportion

Solve problems involving the relative sizes of two quantities where missing values can be found by using integer multiplication and division facts.

Solve problems involving addition, subtraction, multiplication and division. (Number: Addition, Subtraction, Multiplication and Division, Year 6)

Understand that scaling involves increasing / decreasing a quantity by a given factor, e.g., if 100g of rabbit food costs 70p then 200 g would cost £1·40 and 50 g would cost £·35.

Solve problems using integer multiplication and division, e.g.:

A pet food recipe gives amounts to fill 6 sacks. Explain how you would change the amounts to fill 2 sacks.

Complete a recipe for different amounts of people (see table).

Interpret map scales and say what real-life distances would be.

The distance from A to B is three times as far as from B to C. The distance from A to C is 60 centimetres. Calculate the distance from A to B.

Solve problems involving the calculation of percentages [for example, of measures, and such as 15% of 360] and the use of percentages for comparison.

Recall and use equivalences between simple fractions, decimals and percentages, including in different contexts. (Number: Fractions, Year 6)

Use known strategies for finding percentages of amounts, e.g., One-quarter is 25% so 25% of £1.60 can be found by quartering (halving and halving again).

Understand that the same percentage of one amount or quantity will not be the same as that of a different amount or quantity, e.g., 20% of 500 g is not the same as 20% of 100 g.

Understand that a smaller percentage of an amount might be larger or smaller than a larger percentage of another, e.g., 10% of 100 is greater than 25% of 20.

Link percentages of 360 to calculating angles of a pie chart and relate these to fractions.

Solve proportional and percentage problems by finding equivalent fractions and then scaling, e.g.:

6 boxes out of the 50 boxes of strawberries collected were spoilt. What % of the strawberries was spoilt?

In a sale shirts that should have cost £50 were reduced to £25. What percentage discount was given?

Which is the most, 40% of 3 l or 55% of 2 l?

What percentage of pupils had a banana at breakfast club this morning? How many pupils is that? What is the ratio of apples:strawberries:bananas?

Interpret pie charts . . . and use these to solve problems. (Statistics, Year 6)

Solve problems involving similar shapes where the scale factor is known or can be found.

Know that when two figures are similar, the ratios of the lengths of their corresponding sides are equal and all their corresponding angles are equal.

Recognise similar (proportional) shapes within a mixed set of shapes, e.g., Match similar triangles on a sheet of triangles where not all the triangles are similar and explain what has been done.

Scale shapes up and down to make them proportionately larger and smaller, e.g.:

A triangle has sides of 3cm, 4cm and 5cm. If the longest side was increased to 12.5 cm, how long would the other sides be?

Draw a rectangle. Now draw 2 other, similar rectangles - one bigger and one smaller. Explain what has been done.

Use drawing tools in computer programs to produce different scaled models.

Solve problems involving unequal sharing and grouping using knowledge of fractions and multiples.

General Skills

Know that proportion describes the relationships between two or more quantities of the same kind.

Know that there could be any number / measure in the count when expressing proportion.

Know that proportion can be expressed as ratios, fractions and percentages, e.g.:

Brown paint is made with yellow, red and blue paint in the ratio of 7:2:1.

One-fifth of the paint mixture is red.

Year 6 Mathematics Curriculum Objectives

10% of the paint is blue.

Recognise and interpret the vocabulary of ratio and proportion, e.g.:

There are 3 blue bricks to every / for every 2 red bricks.

3 in every 5 bricks are blue and 2 in every 5 bricks are red.

$\frac{3}{5}$ of the bricks are blue and $\frac{2}{5}$ are red.

60% of the bricks are blue and 40% are red.

The ratio of blue to red is 3:2.

Understand and use ratio notation with the colon, e.g., 6:5.

Reduce ratios to their simplest form by finding the largest common factor, e.g., Given a recipe of 200g flour, 100g sugar, 50g butter, divide by 50 to give a ratio of 4:2:1.

Problems

Solve unequal grouping and sharing problems, e.g.:

Brown paint is made with yellow, red and blue paint in the ratio of 3:2:1. If there is 420 ml of yellow paint how much red and blue is needed?

A pattern of tiles is organised so that there are 3 red tiles for every 7 yellow tiles. How many yellow tiles are needed for a pattern that contains 12 red tiles? How did you work this out?

Suppose that Jim had apples to oranges in the ratio of 2:1 and oranges to bananas in the ratio of 2:1. What is the ratio of apples to bananas?

There are 45 children at the gym club. There are 2 boys for every 3 girls. How many boys are at the gym club?

What proportion of the Smarties in the tube is yellow?

Write different ratio, fractions and percentage sentences for a batch of assorted cupcakes (see diagram).

Work through past SATs papers examples.

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6
Algebra
Use simple formulae.
Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles. (Geometry: Properties of Shape, Year 6)
Understand that letters or symbols always represent the same number wherever they appear, e.g., 2y + y = 15, where y is constant.
Know that there can be more than one variable in a formula and that a different symbol represents each variable, e.g., χ + χ + ◯ = 6.
Know that the multiplication symbol is not used between numbers followed by a letter, e.g., If pens are 15p each then n pens 15n pence.
Recognise that an equation is balanced around the equals symbol, e.g., Use a balance and centicubes to illustrate a missing number problem, such as 2n = 3 + 5.
Recognise that performing the same operation to each side of an equation retains the balance, i.e., 5x = 17 can be solved by dividing both sides of the equation by 5, because multiplying x by 5 and then dividing 5x by 5 gives you what you started with.
Recognise that, in solving an equation, the variable needs to be isolated to find its value, e.g., 2y + y = 15 so 3y = 15 so y = 15 ÷ 3.
Describe in words the process of finding the solution to a problem.
Estimate values for unknown amounts and explain reasoning.
Solve single step problems using formulae in a range of contexts, including finding:
variables in equations, e.g., 8 = 4x;
variables in a measures context, e.g.: A = L x W. What is L if A = 24 and W = 6? What are the two unknown angles in an isosceles triangle where one angle is known?
variables that are decimals or fractions, e.g., 3y = 15;
variables in co-ordinates, e.g., Given two co-ordinates for a right angled triangle, what could the third co-ordinate (x, y) be?
Generate and describe linear number sequences. (Number: Algebra, Year 6)
Express missing number problems algebraically. (Number: Algebra, Year 6)
Find pairs of numbers that satisfy an equation with two unknowns. (Number: Algebra, Year 6)
Enumerate possibilities of combinations of two variables. . (Number: Algebra, Year 6)
Calculate the area of parallelograms and triangles. (Measurement, Year 6)
Recognise when it is possible to use formulae for area and volume of shapes. (Measurement, Year 6)
Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm3) and cubic metres (m3), and extending to other units [e.g., mm3 and km3]. (Measurement, Year 6)
Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons. (Geometry: Properties of Shape, Year 6)
Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius. (Geometry: Properties of Shape, Year 6)
Generate and describe linear number sequences.
Linear sequences change by the same amount at each interval.
Describe and explain sequences, patterns and relationships involving numbers and / or shapes, e.g., Physically model drawing a series of arches and discuss it.
Know that a sequence is predictable and can be continued systematically, e.g.: Complete a table that extends beyond the terms already written / drawn in the sequence. Draw a line graph and interpret it, such as, finding the point representing the number of blocks for 9 arches or finding the point representing the number of arches for 18 blocks?
Find the nth term in a linear sequence using a formula, e.g., Find how many blocks would be in 45 arches?
Describe the rule as an equation, e.g., 2 + 3a, where a is the number of arches.
Discuss expressions, e.g., 3a + 2.

Year 6 Mathematics Curriculum Objectives

Evaluate expressions by substitution.

There is no requirement that pupils should derive the most efficient formula for a sequence.

Use simple formulae. (Algebra, Year 6)

Express missing number problems algebraically.

Use their knowledge of the order of operations to carry out calculations involving the four operations. (Number: Addition, Subtraction, Multiplication and Division)

Understand that the usual mathematical rules still apply in equations with formulae, i.e., BIDMAS.

Substitute symbols into an equation or statement to represent variables, e.g.:

16 chews cost 48p, what does one chew cost? (Answer: 16n = 48)

The change from £2 for two cakes is 46p. What is the cost of one cake? (Answer: C = (200 - 46) ÷ 2 pence). What is the cost of 6 cakes?

Use simple formulae. (Algebra, Year 6)

Find pairs of numbers that satisfy an equation with two unknowns.

Find pairs of numbers that satisfy an equation with two unknowns, e.g.,

× a = 10.

4a + 2y = 8.

8 - a - n = n.

÷ 15 = c.

There may be more than one possibility for these problems but the expectation is that only one pair needs to be found. Decimals could also feature in the solutions.

Use simple formulae. (Algebra, Year 6)

Enumerate possibilities of combinations of two variables.

Find all possibilities of combinations of two variables in a formula, e.g.,

◯ × △ = 24, what could the circle and triangle be?

If a = 2b, what values could a have that are less than 20?

+ □ + 7 = 21. What values could the hexagon and the square be?

Use simple formulae. (Algebra, Year 6)

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Measurement

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate.

Interpret . . . line graphs and use these to solve problems. (Statistics, Year 6)

Solve practical problems converting units of measure if necessary, e.g.:

How many 30 cm^2 tiles would you need to cover a floor that is 2·4 m wide by 3·5 m long?

Plan a car journey / or holiday: distance travelled by scaling a map; capacity of fuel tank; time taken to get from A to B, etc.

Find weights and measures for very small objects by scaling, e.g.:

How could you find the weight of one grain of rice? (Find the weight of 100 grains);

What is the thickness of one sheet of paper? (Find the thickness of 100).

Solve problems involving money, e.g.:

Butter costs £4·80 for 1 kg. Maisie buys 200 grams of butter. How much does she pay?

Cheese costs £6·80 for 1 kg. Mark pays 85p for a piece. How many grams of cheese is that?

Convert between units of time in a problem context, e.g., days to months, minutes to hours or seconds to minutes.

Work out a flight time from knowing the take-off time in one time zone to landing time in another;

How fast am I travelling if I travel 150 km in 2½ hours?

Investigate sporting records.

Solve calendar problems, e.g.:

Find the time interval between two dates;

Predict what day a certain date will fall on from seeing only part of a calendar.

Solve timetable problems, e.g.:

Interpret train and bus timetables.

Use flight schedules.

Use TV schedules to find which of two programmes is longer / the time between, etc.

Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places.

Use the most appropriate measuring tools / units of measurement for a task, e.g., surveyor's tapes, trundle wheels, force metres, bathroom scales or pipettes.

Estimate length, height, width, mass, capacity and volume for several objects, using benchmarks, order and check (if practical).

Interpret un-numbered divisions on a range of measuring scales accurately, e.g., On a thermometer with whole numbers marked and sub-divided into tenths.

Round to the nearest appropriate or given unit.

Convert between units multiplying / dividing whole numbers and decimals by 10, 100 and 1,000, e.g., 4·5 litres in millilitres.

Be aware of the most appropriate way to present measures when recording:

avoiding unnecessarily large numbers or trailing zeros, e.g., write 4 m rather than 4,000 mm or 95 cm rather than 950 mm;

using whole numbers and avoid decimal points if possible, e.g., Write 25 mm rather than 2·5 cm.

Convert units of time in order to complete calculations, e.g., Jim started digging in the garden at 10:20. He worked for $3\frac{3}{4}$ hours. What time did he finish?

Change money amounts from pounds to pence and vice versa, e.g., Total $\frac{3}{4}$ of £3·60 and $\frac{5}{8}$ of £7·20.

Interpret . . . line graphs and use these to solve problems. (Statistics, Year 6)

Year 6 Mathematics Curriculum Objectives

Convert between miles and kilometres.

This objective refers only to one equivalent measure but other conversions might be included.

Construct pie charts and line graphs. (Statistics, Year 6)

Find and use the conversion rate of miles to kilometres and vice versa, e.g., Make a line graph to convert miles to kilometres to find how far 10 km is in miles.

Recall benchmarks such as 5 miles ≈ 8 kilometres, and check to see if an answer is sensible.

Recognise that shapes with the same areas can have different perimeters and vice versa.

Know that shapes with the same area may have different perimeters, e.g., Make different shapes, not necessarily rectangles, using 12 cm^2 tiles and compare perimeters of the shapes with the same area.

Know that shapes with the same perimeter may have different areas, e.g., Cut a piece of string 20 cm long and use all of it as the perimeter to enclose different shapes. Compare the area of the shapes.

Solve area and perimeter problems, e.g.:

The buildings supervisor has 36 m2 rubber paving slabs to make a soft landing area under the climbing frame. The climbing frame is 1 m wide by 4 m long and it must have at least one slab on either side of it. What arrangements are possible? Which take up the least area?

Use models and algebraic representations to compare area and perimeter, e.g., Area and perimeter of a rectangle might be (A = l × w, p = 2l + 2w), Substitute a different range of numbers to represent l and w.

Recognise when it is possible to use formulae for area and volume of shapes.

Use simple formulae (Year 6 Number: Algebra)

Find the area of a 2-D shape that can be dissected into other shapes where the area formula is known for the component parts, i.e., can be dissected into rectangles, parallelograms and right angled triangles.

Find the volume of a 3-D shape that can be dissected into two or more cuboids by totalling the volumes of all the dissections.

Know that the area of some shapes might have to be found by using different strategies other than applying formulae, e.g., Put a transparent cm grid on top of the shape, count the whole squares and match off the remaining bits to approximately make whole squares.

Know that the volume of some shapes might have to be found using different strategies from applying formulae, i.e., they cannot be dissected into solids with known formulae. (The volume of solids that sink could be found by displacement.)

Calculate the area of parallelograms and triangles.

Use simple formulae (Year 6 Number: Algebra)

Recognise that a parallelogram can be dissected into a rectangle and two right angled triangles and re-assembling in a different way allows the area to be calculated.

Understand and use the formulae in words and symbols to calculate the area of a parallelogram (area = base multiplied by perpendicular height or A = bh).

Recognise that a right angled triangle has the same area as half the corresponding rectangle.

Understand and use the formulae in words and symbols to calculate the area of a right angled triangle (area = ½ base multiplied by perpendicular height or A = bh/2).

Apply the given formulae to solving problems where there are known and unknown variables.

Solve area problems, e.g., Make triangles on geoboards and explore ways of calculating their areas and writing formulae.

Calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres (cm^3) and cubic metres (m^3), and extending to other units [for example, mm^3 and km^3].

Use simple formulae (Year 6 Number: Algebra)

Know and use the standard formula for calculating cuboids (rectangular prisms) l × w × h.

Compare two or more containers by calculating the volume of each based on a formula.

Visualise how big 1 cubic metre is, e.g., Make 12 rolls of newspaper that are 1 m long and fasten them together to make a skeleton cube and speculate what would fit inside.

Estimate the volume of large spaces in cubic metres, such as the classroom, and check.

Know that tiny and massive volumes might be measured in smaller or larger units such as mm^3 and km^3. 1,000 mm^3 is just one millilitre and is used predominantly in the context of medicine; km^3 used for planet measurements, volcanic eruptions, etc.

Solve problems and undertake investigations, e.g.:

Find missing variables from known variables in the formula l × w × h.

Make as many different cuboids as possible with 36 cm^3, sketch and label (could also find the surface areas of these cuboids and look for patterns).

Investigate growing cubes and their sequence of numbers and differences.

Year 6 Mathematics Curriculum Objectives

1,000 centimetre cubes occupy the same space as one litre. True or false?

Investigate the relationship between: mm^3, ml, m^3 and l.

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Geometry : properties of shapes

Draw 2-D shapes using given dimensions and angles.

Measure and draw straight lines to within 1 mm with a ruler.

Measure and draw angles to within 1^0 with a protractor.

Draw, by constructing accurately, a shape that is congruent to another, e.g., Replicate a triangle from a picture in a book.

Apply known shape properties when constructing shapes from a limited amount of information.

Draw a similar shape to one given, using knowledge of scaling.

Solve problems involving similar shapes where the scale factor is known or can be found. (Number: Ratio and Proportion, Year 6)

Use conventional shape markings, e.g.:

parallel / congruent lines;

right angles / other angles;

lower case letters to represent length;

capital letters to represent points.

Solve problems, e.g.:

Draw a shape that has the length of each side twice as long / two and a half times as long, etc., as an original.

There are opportunities here for extending this into work on area and perimeter.

Construct a 5-pointed star from a diagram and one given measurement. Indicate on it which angles / sides, etc., are the same.

Given half or a quarter of a shape, construct the complete shape around one or more lines of symmetry (without squared paper guidance). Given the lengths of the diagonals of a parallelogram and the vertically opposite angles at the intersection of the diagonals, create the shape.
Use an ICT program, such as Logo, to draw a house that has 2 square windows.

Instruct a floor robot to move in the path of a parallelogram with an angle of 50^0.

Recognise, describe and build simple 3-D shapes, including making nets.

Identify and visualise shapes, e.g., Describe the shape generated by cutting through a tetrahedron or a triangular right prism in a plane parallel to a base.

Classify 3-D shapes, e.g., has at least one pair of parallel faces.

Build a range of shapes from instructions, e.g., Put 72 interlocking cubes together to make a 2 x 3 x 12 cuboid and work out what other cuboids can be made using 72 cubes (link with volume).

Nets

Deconstruct 3-D models in different ways, recognising that these are the basis of nets, e.g., a cube, a square-based pyramid or a triangular prism.

Draw / sketch possible nets of solids from deconstructing 3-D shapes (not forgetting the correct number of flaps), e.g., a closed cube, a pentagonal prism.

Make a net for a given solid.

Solve shape net problems, e.g.:

Identify / visualise which of a set of diagrams is a net for a solid, e.g., Which of these are nets of a square-based pyramid (see diagram)?

Create a set of nesting boxes from card.

Make a box for an unusual present. The box cannot be a cuboid.

Compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons.

Use simple formulae. (Algebra, Year 6)

Use precise vocabulary when describing shapes, e.g., isosceles trapezium or oblique cylinder.

Compare different shapes and sort them by size / properties, e.g., 3-criteria Carroll or Venn diagrams.

Year 6 Mathematics Curriculum Objectives

Know that the internal angles of a regular polygon are calculated by dividing 360^0 by the number of sides.

Interpret and use simple formulae for missing values in triangles, e.g., a = 180 – b – c or a = 180 – (b + c).

Interpret and use simple formulae for missing values in quadrilaterals, e.g., The formula for the kite opposite could be a = (360 – 100 - 40) ÷ 2 or a = (360 - b - c) ÷ 2.

Formulae will vary depending on the particular quadrilateral and its properties but is based on the internal angles totalling 360^0.

Solve related problems, e.g.:

Explore which quadrilaterals have pairs of parallel and / or perpendicular sides.

Measure the angle between the lines of symmetry of shapes with 2, 3, 4, 5, . . . lines of symmetry. Comment on patterns and relationships.

Create own simple formula, e.g., For the external angles of a regular polygon, a = 360 ÷ s where s is the number of sides.

Illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius.

Use simple formulae. (Algebra, Year 6)

Know and use the language associated with circles, such as centre, diameter, radius, circumference, and arc.

By reasoning and deduction (or measuring the radius and diameter of different circles), recognise that the diameter is twice the length of the radius.

Understand and use the formulae for diameter as $d = 2r$, e.g., Investigate the relationship between the diameters of a set of concentric circles and their radii.

Solve related problems, e.g.:

Visualise the size of circle from its radius, e.g., 'Tell me an example of a circular object that would have a radius of about 5 cm. What about 50 cm? 500 cm?'

Draw circles and arcs with a compass to make a pattern.

Draw a circle with a compass. Now construct a regular hexagon with its vertices on the circumference of the circle.

Recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles.

Use simple formulae. (Algebra, Year 6)

Interpret pie charts and line graphs and use these to solve problems. (Statistics, Year 6)

Know that vertically opposite angles are angles opposite each other where two lines cross, e.g., 145^0 is vertically opposite *y* in the diagram opposite.

Apply angle properties associated with geometric shapes, such as, the angle sum of a triangle (180°) and the sum of angles around a point (360°), e.g.:

Work out how many degrees the hour hand rotates from 2 o'clock to 4 o'clock.

Investigate vertically opposite angles and generalise about findings.

Given some dimensions of an isosceles triangle, work out the remainder.

Work out an unmarked angle on a pie chart.

Demonstrate an application of number knowledge and skills to geometric problem solving, e.g., bonds, division facts, halves, etc.

Solve angle problems, e.g.:

Investigate angles at the points and at the diagonal intersections of a regular polygon, generalising about findings.

One of the angles of a parallelogram is 65^0. Its sides are 4·5cm long and 6·5cm long. Construct the shape and measure the angles where the diagonals intersect.

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6
Geometry : Position & Direction
Describe positions on the full coordinate grid (all four quadrants).
Know on a co-ordinate grid that :
The horizontal and vertical axes cross at 0 and this is known as the origin.
The x-axis scale is in ascending order from left to right.
The y-axis scale in descending order from top to bottom.
The scale can be any increment, and need not be the same on both axes.
Navigate the quadrants by interpreting the given scales.
Write co-ordinates for a shape that is wholly or partially in any quadrant, e.g., Given three vertices of a rectangle, establish the co- ordinates of the fourth vertex.
Read and plot co-ordinates in order to draw, complete and locate shapes, e.g., Given two co-ordinates of a rectangle give different sets of co-ordinates for its completion.
Draw and translate simple shapes on the coordinate plane, and reflect them in the axes.
The co-ordinate plane is a two-dimensional surface on which points are plotted and located by their x and y co-ordinates.
Demonstrate an understanding of the language of transformation, including:
reflection - recognise that a shape is a reflection of another and be able to say where / draw where the axes of symmetry are;
translation - recognise that a shape has been translated and in which direction(s) it has been moved.
Reflect a given shape, on one or more axes of symmetry, which has points in any of the four quadrants.
Draw the translation of a shape where the original and the 'copy' are located in any part of the four quadrants.
Solve transformation problems, including with ICT tools, e.g.:
Visualise shapes from descriptions and draw outcomes.
Produce a kaleidoscope pattern with 2 axes of symmetry.
Identify missing information, e.g., The co-ordinate of the 4th vertex of the rectangle with vertices at (−3, −1), (−1, −2), (1, 2).
Draw the shape with the co-ordinates (−5, 1) (−4, −1) (−5, −4) (−6, −1). Describe the properties of this shape. Can you create the same shape in a position where all of the co-ordinates will be positive?

Year 6 Mathematics Curriculum Objectives

Mathematics – Year 6

Statistics

Interpret pie charts and line graphs and use these to solve problems.

Pie Charts

Understand the correspondence between a stacked column chart and a pie chart, e.g., Generate ICT charts using the same data and compare / interpret them.

Know that the area of the circle in a pie chart provides a visual model for the proportion of data falling into different categories.

Apply work on angles, fractions and percentages to the interpretation of pie charts and draw conclusions, e.g., 'United won half of their games but City only won one-sixth.'

Interpret and compare pie charts where it is not necessary to measure angles; e.g.:

- Compare two pie charts that represent two different groups.
- Use past SATs papers examples.

Recognise angles where they meet at a point . . . (Geometry: Properties of Shape, Year 6)

Recall and use equivalences between simple fractions, decimals and percentages,. . .. (Fractions . . . Year 6)

Solve problems involving the calculation of percentages . . . (Number: Ratio and Proportion, Year 6)

Line Graphs

Recall the difference between continuous and discrete data.

Understand and interpret line graphs showing the relationship between two measures.

Recognise and use keys, labels and axis representation; e.g., time and distance, time and speed or time and temperature.

Read a range of scales with a degree of accuracy - negative, partly numbered and decimal – including estimating the value of points between two marks on the scale.

Connect conversion charts to graphical representation; e.g., Interpret a line graph to convert pounds to kilograms in a measures context.

Convert between miles and kilometres. (Measurement, Year 6)

Solve problems involving the calculation and conversion of units of measure, using decimal notation up to three decimal places where appropriate. (Measurement, Year 6)

Use, read, write and convert between standard units, converting measurements of length, mass, volume and time from a smaller unit of measure to a larger unit, and vice versa, using decimal notation to up to three decimal places. (Measurement, Year 6)

Interpret and construct pie charts and line graphs and use these to solve problems.

Pie Charts

Calculate the fraction of 360 required for each category on the pie chart.

Choose appropriate construction tools, such as, protractor and compass.

Choose a pie chart when it is the most appropriate way to display the answer to questions or test hypotheses (usually those expressed as fractions of one or percentages); e.g.:

- Find the proportion of pupils that like different drinks.
- Is it true that City scored more than two goals in over ¼ of their matches last season?

Line Graphs

Draw a line graph, both in a mathematics context and across the curriculum; e.g.:

- Tell the story of the hare and the tortoise by creating a line graph.
- Create a line graph for the cooling rate of a liquid and respond to questions such as, 'How many minutes did it take for . . . ?'
- Create and use conversion line graphs for a foreign currency exchange rate.

Convert between miles and kilometres. (Measurement, Year 6)

Calculate and interpret the mean as an average.

Know the mean is a way of finding the average of a data set; e.g., average goals scored in the Premier League matches on a particular day.

Year 6 Mathematics Curriculum Objectives

Understand the mean is calculated by totalling the values and dividing by the count of values.
Appreciate the mean does not have to exist as a member of the set; e.g., 3·5 people is not possible.
Use the mean to answer questions / solve problems in context, e.g.:
On average, how much pocket money does the class / group have per week? Calculate average amount of sleep of boys and girls from knowing bed-times and waking times.