



# **St John's Catholic Primary School**

## **Mathematics Policy**

**L.Campbell**

Date of Review: 03.09.20

## Mission Statement

l o v e o f l e a r n i n g  
a n d p l a y i n g t o g e t h e r  
o n e c o m m u n i t y  
a i m i n g h i g h  
h e l p i n g e a c h o t h e r  
a n d p r a y i n g t o g e t h e r

O n o u r j o u r n e y w i t h C h r i s t

The aim of this policy is to guide teachers and support staff in providing the best possible learning experiences for our children. We believe that every child is a child of God; we will encourage in all children the knowledge and love of God, and in a concern and care for others; we will value each child for who they are and what they are; and we will ensure that every child has the opportunity to become the person God knows them to be, irrespective of their starting points, background or cultural and religious beliefs.

Our mission sets out our commitment to 'aiming high'. Improvements in the quality of teaching and learning are brought about through a process, which involves:

- reflection by individual professionals
- acting on planning feedback and guidance
- use of assessment data
- the target setting process
- sharing in-house expertise through
  - joint/team planning
  - discussion with colleagues, subject coordinators and SLT
  - Staff training at school
  - Team teaching lessons
  - Peer observation and lesson studies
- implementation of recommendations arising from classroom observation
- effective response to guidance from advisers and implementation of OfSTED Action Plan
- CPD courses

This policy will be reviewed regularly to enable us to take account of new initiatives, curriculum changes, technological developments and any changes to our pupil cohort profile.

## Aims and Objectives

See the National Curriculum – Appendix 1

## Teaching and learning

Differentiated learning is provided in every classroom with targeted, positive support to help those who are below ARE and experience difficulty with different concepts in mathematics, as well as those who are higher achievers. In line with the aims of the NC2014, differentiation focuses on all children achieving the same learning outcome and the differentiation is the way that different groups of children are supported to achieve this. Work is carried out using a balance of individual, paired and group work. Good practice at St John's includes differentiated starting points with higher ability children moving more rapidly onto reasoning and problem solving in most lessons. A high proportion of lesson time is devoted to direct teaching of methods and vocabulary through modelled examples to ensure that the children are fully confident to tackle independent tasks. Teachers demonstrate, explain and illustrate mathematical ideas to fully involve pupils and maintain their interest through appropriately challenging work.

Teachers use and expect pupils to use correct mathematical notation and vocabulary. Mathematical errors and misconceptions are dealt with as they are identified in a positive and supportive way, ensuring that children understand that we learn from our mistakes. The emphasis on pupil's learning begins with practical examples leading onto informal jottings and mental strategies, and finally to formal representations as laid out for year groups in the calculation policy. Children are given a variety of mathematical approaches to solving problems. They are encouraged to develop their own mathematical strategies as well as learning standard methods. We recognise and help to develop the children's abilities to select methods for problem solving mentally, recognising that these may differ from those used to solve pencil and paper problems.

Pupils are expected to present work carefully. Work in maths books is headed with the date and the learning objective. The children are expected to gain a wide range of experiences with a variety of materials including IT. A high priority will be placed on children reasoning and explaining their strategies. Children in KS1 and KS2 complete a weekly arithmetic test. They also begin the day with a maths multiplication timed activity. This lasts for 1 minute and the time reduces as the children move up the school. Our mathematics curriculum has been designed to revisit and repeat key concepts in mathematics as this supports our pupils in retaining and rapidly recalling methods. All maths lesson starters are themed with the whole school working on addition on Monday, subtraction on Tuesday, multiplication on Wednesday, division on Thursday and fractions on Friday. This ensures that children are able to rapidly recall the strategy that they need to solve a problem without taking extra time to remember the method necessary.

## Curriculum planning

The Long Term Plan is taken from the White Rose maths hub overviews and the objective guidance is used to inform short term planning. The LTP is used as a guidance tool in order to pace out coverage of the curriculum throughout the year. Teachers are encouraged to use professional discretion when deciding on how long is needed on particular curriculum area whilst ensuring all objectives are covered by the end of the academic year. Also, teachers are expected to ensure that objective are covered in SATs year groups before the May deadline. Short term planning is recorded each week on St John's planning sheets. These plans outline the topic area /focus with specific learning objectives to be taught that week. Plans are uploaded onto the school 'O' drive.

### Contribution to the Catholic Ethos

*I have come that they may have life, and have it to the full*

John 10:10

By preparing our pupils fully and appropriately in their mathematical knowledge and understanding, we are ensuring that they are best placed to fulfil their God-given potential and achieve success in their further education, chosen careers and be active contributors to society.

### Contribution to other curriculum areas

#### Art & Design

Many works of art can be either created or appreciated by the children:

- Symmetrical art can be analysed and the number of lines of symmetry can be found. Also, the order of rotational symmetry can be studied.
- Ratio is used to mix paints. For example, to make purple, mixing 3 parts red to 7 parts blue.
- Perspective can be used to show enlargement of shapes on square paper.

#### English

Conveying mathematical ideas is an important aspect of Maths.

- Spelling mathematical vocabulary correctly and using it in the correct context.
- Mastery of maths is advanced by children being able to explain their mathematical thinking to others and to justify methods and conclusions.
- English skills can be used to clearly interpret and discuss results from collecting data in maths lessons.
- Finding the average length of a sentence or word count for a page.
- Writing instructions or making a video (speaking and listening) of a mathematical process.
- Using inference skills to work out what is being asked for in a word problem.

- Using a maths dictionary to find information or as part of a guided reading session.

## Design & Technology

Maths is really useful in many aspects of Design and Technology, such as:

- Reading Scales.
- Measuring ingredients and working out proportions.
- Using ratios in recipes.
- Being able to measure things accurately.
- Estimation is also important when working out quantities of raw materials.

## Geography

From statistics to maps, Maths is also important in Geography:

- Collecting and representing data from field trips or for weather investigations.
- Grid references and coordinates.
- Using scales on Ordnance Survey maps to establish the correct distance between two points.
- Google Maths Maps can be used to bring Geography and Maths skills together.
- Timezones

## Computing

Maths and Computing have always been linked together as Computing relies heavily on Maths for many areas:

- Angles and direction which can be drawn and measured using floor robots and apps too.
- Information can be represented in Excel and calculations using formula can be done on the data here too.
- Logic is used in programming as is problem solving.
- Collaboration is important too when working on computational aspects of Maths.
- Scratch Maths allows children to use their mathematical skills to program computers.

## MFL

- Numbers are used to do calculations or times tables in French or Spanish.
- Asking what time it is in another language.

## Music

Music can be used in mathematics lessons for making up songs about basic facts or clapping, however it maths can also be used in music lessons:

- Time and speed represented by tempo which is the number of beats per minute (BPM).

- Equivalent fractions shown using musical notation where a different type of note is worth a different fraction of a whole beat.

## History

- Historical timelines can be used as a basis for finding the difference in dates.
- Historical dates can also be utilised for sequencing events.
- Charts and graphs can provide extremely useful historical information which children can analyse.

## Physical Education

- Maths Races can be played to allow the children to compete against each other whilst demonstrating mathematical knowledge.
- Time, distance and speed of races can be incorporated into Maths sessions to enable children to work out averages and convert between different measures.
- Data can be collected and analysed to assess performances.
- maths skills are needed when orienteering using grid references, angles and direction.
- Averages (Mean, Mode and Median) can be used to assess and athlete's performance.
- Create sequences for gymnastics.
- Create a treasure hunt around the school based on mathematical questions.
- Discuss symmetry on the football pitch or netball court.

## Science

Every scientific investigation is likely to require one or more of the mathematical skills of classifying, counting, measuring, calculating, estimating, and recording in tables or in graphs. *Algebra is useful when using formulas in Science.* Converting between metric units and between imperial and metric units. *Data handling is used extensively in Science. Most charts and graphs that are used in science are also used in maths.*

## Inclusion

At our school, we teach maths to all children, whatever their ability and individual needs. This is in line with the school's curriculum policy of providing a broad and balanced education to all children. Through our Maths teaching, we provide learning opportunities that enable all pupils to make good progress. We strive to meet the needs of those pupils with special educational needs, those with disabilities, those with special gifts and talents, and those learning English as an additional language, and we take all reasonable steps to achieve this. For further details see the SEND policy.

### Assessment for learning

Teacher's continually assess and make adjustments to their planning to meet the needs of the cohort on a day to day basis. Additionally, at the end of each block of work, the class teacher will assess the children on the particular part of the maths curriculum they have been focusing on. This will be recorded on our online tracking system, and used to make an overall judgement at the end of the term using the terminology 'working towards', 'expected standard' or 'greater depth'. This information is reported to parents throughout the year, on the end of year report and also passed onto the next class teacher.

### Monitoring and review

The subject leader will monitor teachers long term plans to ensure that all of the maths skills are being covered. Books will also be scrutinised to see evidence of maths that is practical and differentiated (work that is saved online will be included in scrutinies) and lesson observations will be undertaken to ensure high-quality delivery and a match between the planned curriculum and the learning taking place in classrooms.

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Appendix 1

**Year 1 programme of study**  
**Number - number and place value**

Pupils should be taught to:

count to and across 100, forwards and backwards, beginning with 0 or 1, or from any given number

count, read and write numbers to 100 in numerals; count in multiples of 2s, 5s and 10s given a number, identify 1 more and 1 less

identify and represent numbers using objects and pictorial representations including the number line, and use the language of: equal to, more than, less than (fewer), most, least

read and write numbers from 1 to 20 in numerals and words

### **Number - addition and subtraction**

Pupils should be taught to:

read, write and interpret mathematical statements involving addition (+), subtraction (–) and equals (=) signs

represent and use number bonds and related subtraction facts within 20

add and subtract one-digit and two-digit numbers to 20, including 0

solve one-step problems that involve addition and subtraction, using concrete objects and pictorial representations, and missing number problems such as  $7 = ? - 9$

### **Number - multiplication and division**

Pupils should be taught to:

solve one-step problems involving multiplication and division, by calculating the answer using concrete objects, pictorial representations and arrays with the support of the teacher

### **Number - fractions**

Pupils should be taught to:

recognise, find and name a half as 1 of 2 equal parts of an object, shape or quantity

recognise, find and name a quarter as 1 of 4 equal parts of an object, shape or quantity

### **Measurement**

Pupils should be taught to:

compare, describe and solve practical problems for:

lengths and heights [for example, long/short, longer/shorter, tall/short, double/half]

mass/weight [for example, heavy/light, heavier than, lighter than]

capacity and volume [for example, full/empty, more than, less than, half, half full, quarter]

time [for example, quicker, slower, earlier, later]

measure and begin to record the following:

lengths and heights

mass/weight

capacity and volume

time (hours, minutes, seconds)

recognise and know the value of different denominations of coins and notes

sequence events in chronological order using language [for example, before and after, next, first, today, yesterday, tomorrow, morning, afternoon and evening]

recognise and use language relating to dates, including days of the week, weeks, months and years

tell the time to the hour and half past the hour and draw the hands on a clock face to show these times

### **Geometry - properties of shapes**

Pupils should be taught to:

recognise and name common 2-D and 3-D shapes, including:

2-D shapes [for example, rectangles (including squares), circles and triangles]



3-D shapes [for example, cuboids (including cubes), pyramids and spheres]

### **Geometry - position and direction**

Pupils should be taught to:

describe position, direction and movement, including whole, half, quarter and three-quarter turns

### **Year 2 programme of study**

#### **Number - number and place value**

Pupils should be taught to:

count in steps of 2, 3, and 5 from 0, and in 10s from any number, forward and backward

recognise the place value of each digit in a two-digit number (10s, 1s)

identify, represent and estimate numbers using different representations, including the number line

compare and order numbers from 0 up to 100; use  $<$ ,  $>$  and  $=$  signs

read and write numbers to at least 100 in numerals and in words

use place value and number facts to solve problems

#### **Number - addition and subtraction**

Pupils should be taught to:

solve problems with addition and subtraction:

using concrete objects and pictorial representations, including those involving numbers, quantities and measures

applying their increasing knowledge of mental and written methods

recall and use addition and subtraction facts to 20 fluently, and derive and use related facts up to 100

add and subtract numbers using concrete objects, pictorial representations, and mentally, including:

a two-digit number and 1s

a two-digit number and 10s

2 two-digit numbers

adding 3 one-digit numbers

show that addition of 2 numbers can be done in any order (commutative) and subtraction of 1 number from another cannot

recognise and use the inverse relationship between addition and subtraction and use this to check calculations and solve missing number problems

#### **Number - multiplication and division**

Pupils should be taught to:

recall and use multiplication and division facts for the 2, 5 and 10 multiplication tables, including recognising odd and even numbers

calculate mathematical statements for multiplication and division within the multiplication tables and write them using the multiplication ( $\times$ ), division ( $\div$ ) and equals ( $=$ ) signs

show that multiplication of 2 numbers can be done in any order (commutative) and division of 1 number by another cannot

solve problems involving multiplication and division, using materials, arrays, repeated addition, mental methods, and multiplication and division facts, including problems in contexts

#### **Number - fractions**

Pupils should be taught to:

recognise, find, name and write fractions  $\frac{1}{3}$ ,  $\frac{1}{4}$ ,  $\frac{2}{4}$  and  $\frac{3}{4}$  of a length, shape, set of objects or quantity

write simple fractions, for example  $\frac{1}{2}$  of 6 = 3 and recognise the equivalence of  $\frac{2}{4}$  and  $\frac{1}{2}$

### **Measurement**

Pupils should be taught to:

choose and use appropriate standard units to estimate and measure length/height in any direction (m/cm); mass (kg/g); temperature (°C); capacity (litres/ml) to the nearest appropriate unit, using rulers, scales, thermometers and measuring vessels

compare and order lengths, mass, volume/capacity and record the results using >, < and =  
recognise and use symbols for pounds (£) and pence (p); combine amounts to make a particular value

find different combinations of coins that equal the same amounts of money

solve simple problems in a practical context involving addition and subtraction of money of the same unit, including giving change

compare and sequence intervals of time

tell and write the time to five minutes, including quarter past/to the hour and draw the hands on a clock face to show these times

know the number of minutes in an hour and the number of hours in a day

### **Geometry - properties of shapes**

Pupils should be taught to:

identify and describe the properties of 2-D shapes, including the number of sides, and line symmetry in a vertical line

identify and describe the properties of 3-D shapes, including the number of edges, vertices and faces

identify 2-D shapes on the surface of 3-D shapes, [for example, a circle on a cylinder and a triangle on a pyramid]

compare and sort common 2-D and 3-D shapes and everyday objects

### **Geometry - position and direction**

Pupils should be taught to:

order and arrange combinations of mathematical objects in patterns and sequences

use mathematical vocabulary to describe position, direction and movement, including movement in a straight line and distinguishing between rotation as a turn and in terms of right angles for quarter, half and three-quarter turns (clockwise and anti-clockwise)

### **Statistics**

Pupils should be taught to:

interpret and construct simple pictograms, tally charts, block diagrams and tables

ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity

ask-and-answer questions about totalling and comparing categorical data

## **Lower key stage 2 - years 3 and 4**

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the 4 operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written

and mental methods and perform calculations accurately with increasingly large whole numbers.

At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number.

By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work.

Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word-reading knowledge and their knowledge of spelling.

### **Year 3 programme of study**

#### **Number - number and place value**

Pupils should be taught to:

count from 0 in multiples of 4, 8, 50 and 100; find 10 or 100 more or less than a given number

recognise the place value of each digit in a 3-digit number (100s, 10s, 1s)

compare and order numbers up to 1,000

identify, represent and estimate numbers using different representations

read and write numbers up to 1,000 in numerals and in words

solve number problems and practical problems involving these ideas

#### **Number - addition and subtraction**

Pupils should be taught to:

add and subtract numbers mentally, including:

a three-digit number and 1s

a three-digit number and 10s

a three-digit number and 100s

add and subtract numbers with up to 3 digits, using formal written methods of columnar addition and subtraction

estimate the answer to a calculation and use inverse operations to check answers

solve problems, including missing number problems, using number facts, place value, and more complex addition and subtraction

#### **Number - multiplication and division**

Pupils should be taught to:

recall and use multiplication and division facts for the 3, 4 and 8 multiplication tables

write and calculate mathematical statements for multiplication and division using the multiplication tables that they know, including for two-digit numbers times one-digit numbers, using mental and progressing to formal written methods

solve problems, including missing number problems, involving multiplication and division, including positive integer scaling problems and correspondence problems in which  $n$  objects are connected to  $m$  objects

#### **Number - fractions**

Pupils should be taught to:

count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10

recognise, find and write fractions of a discrete set of objects: unit fractions and non-unit fractions with small denominators

recognise and use fractions as numbers: unit fractions and non-unit fractions with small denominators

recognise and show, using diagrams, equivalent fractions with small denominators

add and subtract fractions with the same denominator within one whole [for

example,  $\frac{5}{7} + \frac{1}{7} = \frac{6}{7}$  ]

compare and order unit fractions, and fractions with the same denominators

solve problems that involve all of the above

### **Measurement**

Pupils should be taught to:

measure, compare, add and subtract: lengths (m/cm/mm); mass (kg/g); volume/capacity (l/ml)

measure the perimeter of simple 2-D shapes

add and subtract amounts of money to give change, using both £ and p in practical contexts

tell and write the time from an analogue clock, including using Roman numerals from I to XII, and 12-hour and 24-hour clocks

estimate and read time with increasing accuracy to the nearest minute; record and compare time in terms of seconds, minutes and hours; use vocabulary such as o'clock, am/pm, morning, afternoon, noon and midnight

know the number of seconds in a minute and the number of days in each month, year and leap year

compare durations of events [for example, to calculate the time taken by particular events or tasks]

### **Geometry - properties of shapes**

Pupils should be taught to:

draw 2-D shapes and make 3-D shapes using modelling materials; recognise 3-D shapes in different orientations and describe them

recognise angles as a property of shape or a description of a turn

identify right angles, recognise that 2 right angles make a half-turn, 3 make three-quarters of a turn and 4 a complete turn; identify whether angles are greater than or less than a right angle

identify horizontal and vertical lines and pairs of perpendicular and parallel lines

### **Statistics**

Pupils should be taught to:

interpret and present data using bar charts, pictograms and tables

solve one-step and two-step questions [for example 'How many more?' and 'How many fewer?'] using information presented in scaled bar charts and pictograms and tables

## **Year 4 programme of study**

### **Number - number and place value**

Pupils should be taught to:

count in multiples of 6, 7, 9, 25 and 1,000

find 1,000 more or less than a given number

count backwards through 0 to include negative numbers

recognise the place value of each digit in a four-digit number (1,000s, 100s, 10s, and 1s)

order and compare numbers beyond 1,000  
identify, represent and estimate numbers using different representations  
round any number to the nearest 10, 100 or 1,000  
solve number and practical problems that involve all of the above and with increasingly large positive numbers  
read Roman numerals to 100 (I to C) and know that over time, the numeral system changed to include the concept of 0 and place value

### **Number - addition and subtraction**

Pupils should be taught to:  
add and subtract numbers with up to 4 digits using the formal written methods of columnar addition and subtraction where appropriate  
estimate and use inverse operations to check answers to a calculation  
solve addition and subtraction two-step problems in contexts, deciding which operations and methods to use and why

### **Number - multiplication and division**

Pupils should be taught to:  
recall multiplication and division facts for multiplication tables up to  $12 \times 12$   
use place value, known and derived facts to multiply and divide mentally, including:  
multiplying by 0 and 1; dividing by 1; multiplying together 3 numbers  
recognise and use factor pairs and commutativity in mental calculations  
multiply two-digit and three-digit numbers by a one-digit number using formal written layout  
solve problems involving multiplying and adding, including using the distributive law to multiply two-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as  $n$  objects are connected to  $m$  objects

### **Number - fractions (including decimals)**

Pupils should be taught to:  
recognise and show, using diagrams, families of common equivalent fractions  
count up and down in hundredths; recognise that hundredths arise when dividing an object by 100 and dividing tenths by 10  
solve problems involving increasingly harder fractions to calculate quantities, and fractions to divide quantities, including non-unit fractions where the answer is a whole number  
add and subtract fractions with the same denominator  
recognise and write decimal equivalents of any number of tenths or hundreds  
recognise and write decimal equivalents to  $\frac{1}{4}$ ,  $\frac{1}{2}$ ,  $\frac{3}{4}$   
find the effect of dividing a one- or two-digit number by 10 and 100, identifying the value of the digits in the answer as ones, tenths and hundredths  
round decimals with 1 decimal place to the nearest whole number  
compare numbers with the same number of decimal places up to 2 decimal places  
solve simple measure and money problems involving fractions and decimals to 2 decimal places

### **Measurement**

Pupils should be taught to:  
convert between different units of measure [for example, kilometre to metre; hour to minute]

measure and calculate the perimeter of a rectilinear figure (including squares) in centimetres and metres

find the area of rectilinear shapes by counting squares

estimate, compare and calculate different measures, including money in pounds and pence  
read, write and convert time between analogue and digital 12- and 24-hour clocks

solve problems involving converting from hours to minutes, minutes to seconds, years to months, weeks to days

### **Geometry - properties of shapes**

Pupils should be taught to:

compare and classify geometric shapes, including quadrilaterals and triangles, based on their properties and sizes

identify acute and obtuse angles and compare and order angles up to 2 right angles by size

identify lines of symmetry in 2-D shapes presented in different orientations

complete a simple symmetric figure with respect to a specific line of symmetry

### **Geometry - position and direction**

Pupils should be taught to:

describe positions on a 2-D grid as coordinates in the first quadrant

describe movements between positions as translations of a given unit to the left/right and up/down

plot specified points and draw sides to complete a given polygon

### **Statistics**

Pupils should be taught to:

interpret and present discrete and continuous data using appropriate graphical methods, including bar charts and time graphs

solve comparison, sum and difference problems using information presented in bar charts, pictograms, tables and other graphs

## **Upper key stage 2 - years 5 and 6**

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio.

At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them.

By the end of year 6, pupils should be fluent in written methods for all 4 operations, including long multiplication and division, and in working with fractions, decimals and percentages.

Pupils should read, spell and pronounce mathematical vocabulary correctly.

### **Year 5 programme of study**

#### **Number - number and place value**

Pupils should be taught to:

read, write, order and compare numbers to at least 1,000,000 and determine the value of each digit

count forwards or backwards in steps of powers of 10 for any given number up to 1,000,000

interpret negative numbers in context, count forwards and backwards with positive and negative whole numbers, including through 0

round any number up to 1,000,000 to the nearest 10, 100, 1,000, 10,000 and 100,000

solve number problems and practical problems that involve all of the above

read Roman numerals to 1,000 (M) and recognise years written in Roman numerals

### **Number - addition and subtraction**

Pupils should be taught to:

add and subtract whole numbers with more than 4 digits, including using formal written methods (columnar addition and subtraction)

add and subtract numbers mentally with increasingly large numbers

use rounding to check answers to calculations and determine, in the context of a problem, levels of accuracy

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

### **Number - multiplication and division**

Pupils should be taught to:

identify multiples and factors, including finding all factor pairs of a number, and common factors of 2 numbers

know and use the vocabulary of prime numbers, prime factors and composite (non-prime) numbers

establish whether a number up to 100 is prime and recall prime numbers up to 19

multiply numbers up to 4 digits by a one- or two-digit number using a formal written method, including long multiplication for two-digit numbers

multiply and divide numbers mentally, drawing upon known facts

divide numbers up to 4 digits by a one-digit number using the formal written method of short division and interpret remainders appropriately for the context

multiply and divide whole numbers and those involving decimals by 10, 100 and 1,000

recognise and use square numbers and cube numbers, and the notation for squared (<sup>2</sup>) and cubed (<sup>3</sup>)

solve problems involving multiplication and division, including using their knowledge of factors and multiples, squares and cubes

solve problems involving addition, subtraction, multiplication and division and a combination of these, including understanding the meaning of the equals sign

solve problems involving multiplication and division, including scaling by simple fractions and problems involving simple rates

### **Number - fractions (including decimals and percentages)**

Pupils should be taught to:

compare and order fractions whose denominators are all multiples of the same number

identify, name and write equivalent fractions of a given fraction, represented visually, including tenths and hundredths

recognise mixed numbers and improper fractions and convert from one form to the other

and write mathematical statements  $> 1$  as a mixed number [for example,  $\frac{2}{5} + \frac{4}{5} = \frac{6}{5} = 1\frac{1}{5}$ ]

add and subtract fractions with the same denominator, and denominators that are multiples of the same number

multiply proper fractions and mixed numbers by whole numbers, supported by materials and diagrams

read and write decimal numbers as fractions [for example,  $0.71 = \frac{71}{100}$ ]

recognise and use thousandths and relate them to tenths, hundredths and decimal equivalents

round decimals with 2 decimal places to the nearest whole number and to 1 decimal place

read, write, order and compare numbers with up to 3 decimal places

solve problems involving number up to 3 decimal places

recognise the per cent symbol (%) and understand that per cent relates to 'number of parts per 100', and write percentages as a fraction with denominator 100, and as a decimal fraction

solve problems which require knowing percentage and decimal equivalents

of  $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{5}$ ,  $\frac{2}{5}$ ,  $\frac{4}{5}$  and those fractions with a denominator of a multiple of 10 or 25

### **Measurement**

Pupils should be taught to:

convert between different units of metric measure [for example, kilometre and metre; centimetre and metre; centimetre and millimetre; gram and kilogram; litre and millilitre]

understand and use approximate equivalences between metric units and common imperial units such as inches, pounds and pints

measure and calculate the perimeter of composite rectilinear shapes in centimetres and metres

calculate and compare the area of rectangles (including squares), including using standard units, square centimetres (cm<sup>2</sup>) and square metres (m<sup>2</sup>), and estimate the area of irregular shapes

estimate volume [for example, using 1 cm<sup>3</sup> blocks to build cuboids (including cubes)] and capacity [for example, using water]

solve problems involving converting between units of time

use all four operations to solve problems involving measure [for example, length, mass, volume, money] using decimal notation, including scaling

### **Geometry - properties of shapes**

Pupils should be taught to:

identify 3-D shapes, including cubes and other cuboids, from 2-D representations

know angles are measured in degrees: estimate and compare acute, obtuse and reflex angles

draw given angles, and measure them in degrees (°)

identify:

angles at a point and 1 whole turn (total 360°)

angles at a point on a straight line and half a turn (total 180°)

other multiples of 90°

use the properties of rectangles to deduce related facts and find missing lengths and angles

distinguish between regular and irregular polygons based on reasoning about equal sides and angles

### **Geometry - position and direction**

Pupils should be taught to:



identify, describe and represent the position of a shape following a reflection or translation, using the appropriate language, and know that the shape has not changed

### **Statistics**

Pupils should be taught to:

solve comparison, sum and difference problems using information presented in a line graph complete, read and interpret information in tables, including timetables

### **Year 6 programme of study**

#### **Number - number and place value**

Pupils should be taught to:

read, write, order and compare numbers up to 10,000,000 and determine the value of each digit

round any whole number to a required degree of accuracy

use negative numbers in context, and calculate intervals across 0

solve number and practical problems that involve all of the above

#### **Number - addition, subtraction, multiplication and division**

Pupils should be taught to:

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

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

divide numbers up to 4 digits by a two-digit number using the formal written method of short division where appropriate, interpreting remainders according to the context

perform mental calculations, including with mixed operations and large numbers

identify common factors, common multiples and prime numbers

use their knowledge of the order of operations to carry out calculations involving the 4 operations

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

solve problems involving addition, subtraction, multiplication and division

use estimation to check answers to calculations and determine, in the context of a problem, an appropriate degree of accuracy

#### **Number - Fractions (including decimals and percentages)**

Pupils should be taught to:

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

compare and order fractions, including fractions  $>1$

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

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

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

associate a fraction with division and calculate decimal fraction equivalents [for example, 0.375] for a simple fraction [for example,  $\frac{3}{8}$  ]

identify the value of each digit in numbers given to 3 decimal places and multiply and divide numbers by 10, 100 and 1,000 giving answers up to 3 decimal places  
multiply one-digit numbers with up to 2 decimal places by whole numbers  
use written division methods in cases where the answer has up to 2 decimal places  
solve problems which require answers to be rounded to specified degrees of accuracy  
recall and use equivalences between simple fractions, decimals and percentages, including in different contexts

### **Ratio and proportion**

Pupils should be taught to:

solve problems involving the relative sizes of 2 quantities where missing values can be found by using integer multiplication and division facts  
solve problems involving the calculation of percentages [for example, of measures and such as 15% of 360] and the use of percentages for comparison  
solve problems involving similar shapes where the scale factor is known or can be found  
solve problems involving unequal sharing and grouping using knowledge of fractions and multiples

### **Algebra**

Pupils should be taught to:

use simple formulae  
generate and describe linear number sequences  
express missing number problems algebraically  
find pairs of numbers that satisfy an equation with 2 unknowns  
enumerate possibilities of combinations of 2 variables

### **Measurement**

Pupils should be taught to:

solve problems involving the calculation and conversion of units of measure, using decimal notation up to 3 decimal places where appropriate  
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 3 decimal places  
convert between miles and kilometres  
recognise that shapes with the same areas can have different perimeters and vice versa  
recognise when it is possible to use formulae for area and volume of shapes  
calculate the area of parallelograms and triangles  
calculate, estimate and compare volume of cubes and cuboids using standard units, including cubic centimetres ( $\text{cm}^3$ ) and cubic metres ( $\text{m}^3$ ), and extending to other units [for example,  $\text{mm}^3$  and  $\text{km}^3$ ]

### **Geometry - properties of shapes**

Pupils should be taught to:

draw 2-D shapes using given dimensions and angles  
recognise, describe and build simple 3-D shapes, including making nets  
compare and classify geometric shapes based on their properties and sizes and find unknown angles in any triangles, quadrilaterals, and regular polygons  
illustrate and name parts of circles, including radius, diameter and circumference and know that the diameter is twice the radius  
recognise angles where they meet at a point, are on a straight line, or are vertically opposite, and find missing angles

**Geometry - position and direction**

Pupils should be taught to:

describe positions on the full coordinate grid (all 4 quadrants)

draw and translate simple shapes on the coordinate plane, and reflect them in the axes

**Statistics**

Pupils should be taught to:

interpret and construct pie charts and line graphs and use these to solve problems

calculate and interpret the mean as an average