

NC Learning Objectives: Key Skills

The following documents are used to provide us with a long term planning structure for teaching and learning over the year. We use the combination alongside our own teacher judgement and remain flexible for several reasons, taking into account:

- The pace of the children’s understanding in line with our whole class teaching for mastery approach

	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8	Week 9	Week 10	Week 11	Week 12
Autumn	Number: Place value			Number: Addition and Subtraction				Measurement: Money		Number: <u>Multiplication and Division</u>		
Spring	Number: <u>Multiplication and Division</u>		Statistics		Geometry: Properties of Shape		Number: Fractions			Measurement: length and height	Consolidation	
Summer	Position and direction			Problem solving and efficient methods		Measurement: Time		Measurement: Mass, Capacity and Temperature		Investigations		

The white rose overview above is closely adhered to but the weeks each topic is carried out may change.

NC Learning Objectives: Key Skills

- solve 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

Concrete

Pictorial

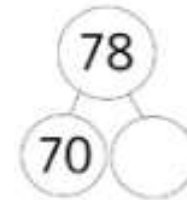
Abstract



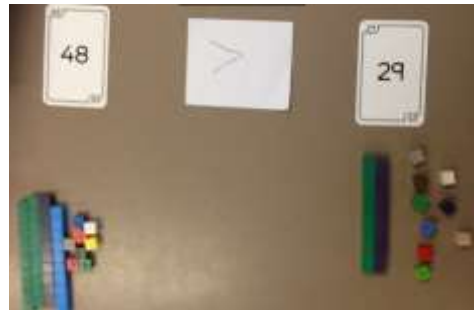
Use of dienes for showing the number of tens and ones in a number.



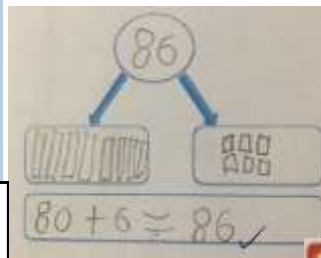
Drawing dienes to show the number of tens and ones in a number and to help answer word problems.



Using whole part models to partition numbers.



Numicon useful for odd and even numbers and counting in 2s, 5s and 10s.



10s	1s
2	7

< | > | =
Less than | Greater than | Equal to



Key Vocabulary:

tens, ones, partition, compare, greater than, less than, equal to, part, whole, whole part model

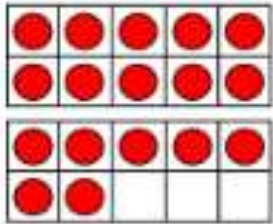
STEM Sentences:

- _____ true or false?
- _____ prove it
- _____ Always, sometimes or never?

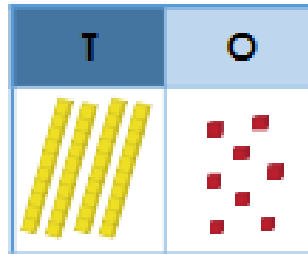
Additional Knowledge Covered in this area of Maths:

Place in here any additional Knowledge you think appropriate in each element having reviewed the knowledge organiser for your year group for each of the strands of maths.

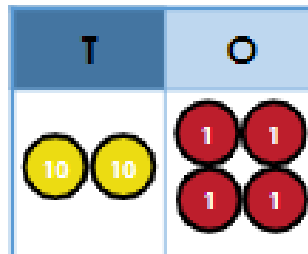
Numbers can also be shown in a ten frame.



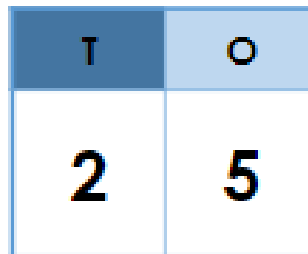
This shows a complete ten and 7 ones. This means that it shows the number 17.



This place value chart shows a number using base 10. There are 4 tens (40) and 8 ones so it represents the number 48.



This place value chart shows a number using counters. There are 2 tens (20) and 4 ones. It represents the number 24.

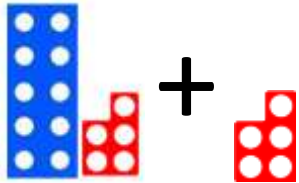


In this place value chart, the 2 digit is in the tens place, so it really means 20. The 5 digit is in the ones place so it means 5.

NC Learning Objectives: Key Skills

- 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 and adding 3 one-digit numbers

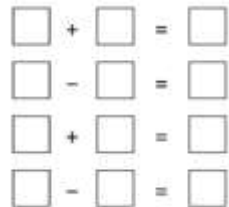
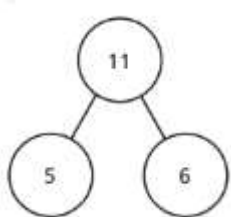
Concrete



Numicon useful for having a visual aid for counting.



Dienes useful for having a visual aid for addition and subtraction.

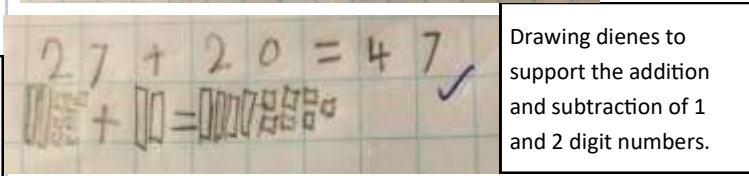
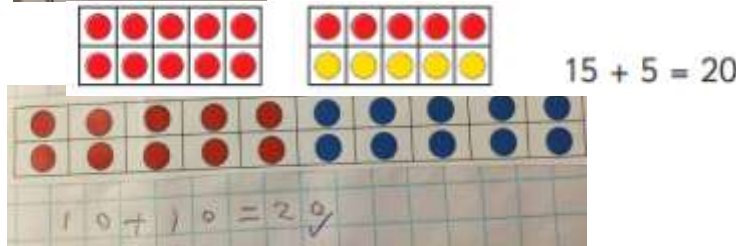


Whole part models

Pictorial

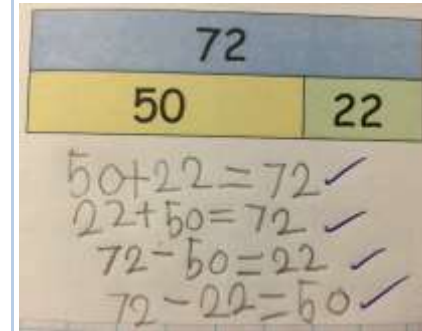


Use of pictures or counters to show number families.



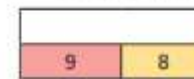
Drawing dienes to support the addition and subtraction of 1 and 2 digit numbers.

Abstract



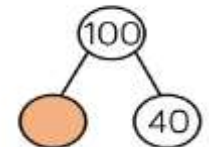
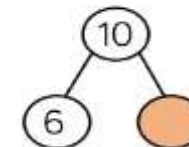
Use of whole part models to understand the inverse relationship between + and - and consequently solve missing number problems.

There are 9 boys and 8 girls in a class. Complete the bar model to represent this.



Write the fact family for the bar model.

Complete the part-whole models below.



Key Vocabulary:

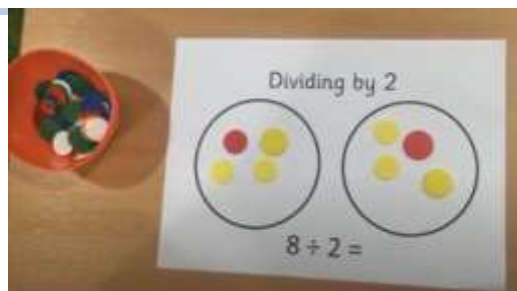
tens, ones, partition, add, subtract, equal to, total, left, part, whole, whole part model

STEM Sentences:

- _____ true or false?
- _____ prove it
- _____ Always, sometimes or never?

- NC Learning Objectives:
- 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 (x), division (÷) and equals (=) signs
- show that multiplication of two numbers can be done in any order (commutative) and division of one 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

Concrete



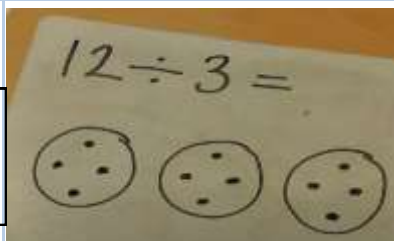
Sharing counters to make equal groups.



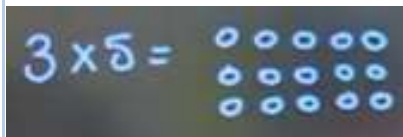
$5 + 5 + 5 + 5 = 20$

Using counters to create arrays to introduce multiplication,

Pictorial



Drawing circles and sharing dots to visually represent division.



Using arrays to solve multiplication.

Abstract



Complete the sentences.

a) There are counters in each row.

There are rows.

There are counters altogether.

Addition:	Multiplication:
$2 + 2 + 2 + 2$	4×2
$5 + 5 + 5$	
$3 + 3 + 3 + 3 + 3$	
	2×10

Complete the pattern.

- $5 \times 2 = 5 + 5 = \square$
- $5 \times 3 = 5 + 5 + 5 = \square$
- $5 \times 4 = 5 + 5 + 5 + 5 = \square$
- $5 \times 5 = \square$

What comes next?

Key vocabulary:

Multiply, multiple, lots of, times, multiplication, repeated addition, division, divide, share, equal, groups, grouping.

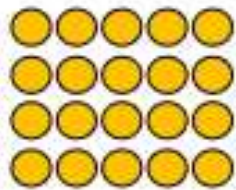
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Arrays can also be used and described like so...



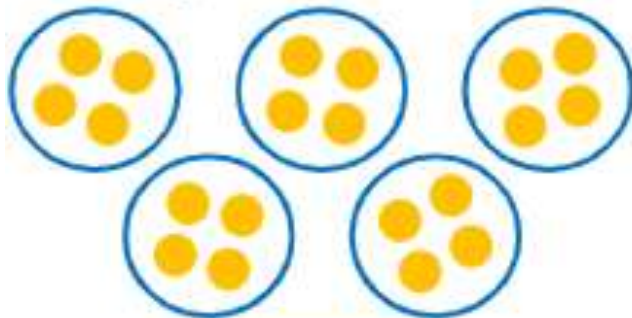
$$5 + 5 + 5 + 5 = 20$$

$$4 \text{ fives} = 20$$

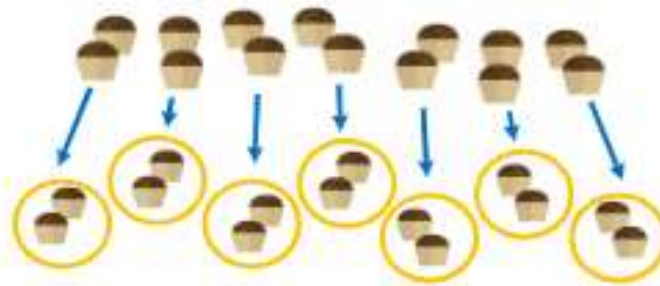
$$4 \times 5 = 20$$

Mental methods include informal ways of showing the way of working out. For example drawings when sharing:

There are 20 sweets. They are shared between 5 children, how many sweets will each child get?



$$20 \div 5 = 4$$



There are 7 groups of 2. 14 divided by 2 is 7.

Now the division equation is introduced.

$$14 \div 2 = 7$$

A secure knowledge of multiplication facts allows problems to be solved efficiently.

For example, Marlon has 10 sweets and he wants to share them equally with Caleb.



It could be drawn out and shared between 2 people but...

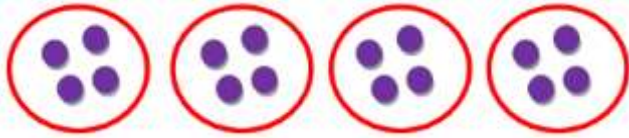
If I know $5 \times 2 = 10$,
I know $10 \div 2 = 5$
so they will both get 5.



NC Learning Objectives:

- 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 $6 = 3$
- recognise the equivalence of $\frac{2}{4}$ and $\frac{1}{2}$

Concrete

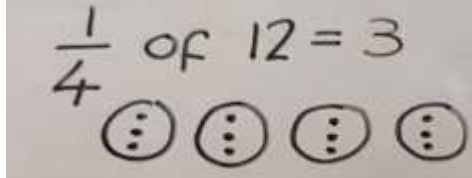


Sharing counters to make equal groups.



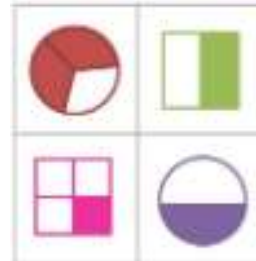
Folding paper shapes into equal parts to show fractions.

Pictorial



Drawing circles and sharing dots.

Shade $\frac{1}{3}$ of each shape.



Abstract

Circle one quarter of the cars.

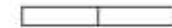


One quarter of ___ is ___

___ is $\frac{1}{4}$ of ___

$\frac{1}{2}$ of 12 =

$\frac{1}{4}$ of 12 =



$\frac{1}{2}$ of 20 =

$\frac{1}{4}$ of 20 =



$\frac{1}{2}$ of 8 =

$\frac{1}{4}$ of 8 =

Which shapes represent one third?



Explain why the other circles do not represent one third.

Key Vocabulary:

Fraction, part, whole, share, equal groups, equal, half, quarter, third, equivalence.

STEM Sentences:

_____ true or false?

_____ prove it

_____ Always, sometimes or never?

Additional Knowledge Covered in this area of Maths:

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Unit Fractions

Unit fractions only involve looking at one of the equal parts.

Starting with these unit fractions helps to develop an understanding what happens when the denominator (the amount of groups you are dividing the whole into) changes. The more equal parts the whole is split into, the smaller the fraction is. For example, sharing 12 into different equal parts shows:



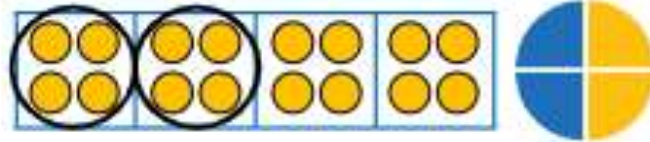
Non-Unit Fractions

These fractions concern more than one of the equal parts.

If the both parts of the fraction are the same the fraction is describing the whole.



Two Quarters

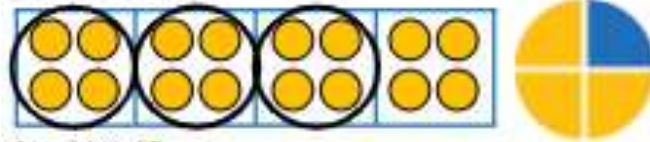


$\frac{2}{4}$ of 16 is 8

Two quarters is shown by taking two of the four equal parts that the shape or quantity has been divided into.

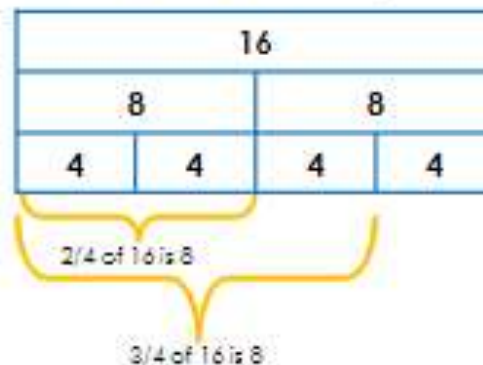
Three Quarters

To establish three quarters the same strategies can be used.



$\frac{3}{4}$ of 16 is 12

Once there is a secure understanding of a quarter being half of a half, a bar model can be used to work more abstractly:



Writing Fractions

All of this practical work will lead to writing of fractions in the mathematical form:

$$\frac{1}{3} \text{ of } 12$$

And also using words such as one quarter, one third etc.

NC Learning Objectives:

- 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.

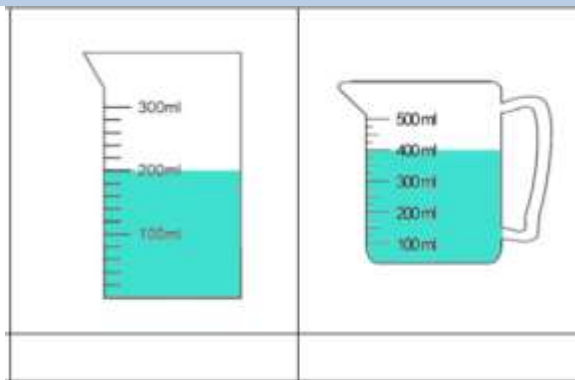
Concrete



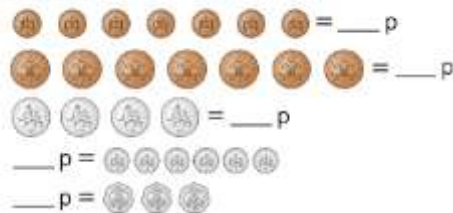
Recognising and counting coins— counting in 2s, 5s and 10s.



Pictorial

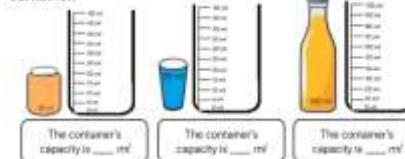


Count the money.



Abstract

Draw the level on the scale to show the capacity of each container.



< > =

12m □ 10m

3cm □ 1cm

Estimate the amount of water in the container.



Always, sometimes, never

Money in notes is worth more than money in coins.

Explain why you have given your answer.

Key Vocabulary:

Measure, Temperature, Thermometer, Degrees Celsius, Hot, Cold, Volume, Jug, Litres, Millilitres, Measure, Capacity, Full, Half full, Liquid, Cup, Container, Mass, Weigh, Scales, Heavy, Light, Gram, Kilogram, morning, evening, afternoon, midday, midnight, night, o'clock, analogue, digital, half past, quarter past, quarter to, minute hand, hour hand, clock hands, clock face

STEM Sentences:

_____ true or false?
 _____ prove it
 _____ Always, sometimes or never?

Additional Knowledge Covered in this area of Maths:

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In Year 2, there is no expectation for any units of measure to be mixed.

For example, describing an object as 2m and 20cm in length is not necessary. Children work using metres or centimetres, so the object would simply be described as more than 2m.

Compare and Order

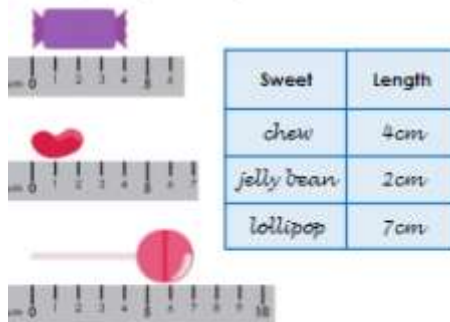
Once skills of measuring have been secured, it is possible to combine them with the skill of using $<$, $>$ and $=$ learnt earlier in the year to compare two objects:



The burger is heavier than the cake.



Ordering involves measuring more objects and then organising according to the results:



jelly bean $<$ chew $<$ lollipop

Find Different Combinations

When confidence has grown with making different amounts, pupils should begin to find different ways to make the same total.

How many different ways can you make 20p?



I know $10 + 10 = 20$, so I could use two 10ps instead.



I know that $5 + 5 = 10$, so I can swap one of my 10ps for two 5ps.



I could use 5 pennies instead of a 5p.



This is a good opportunity to develop ways of working systematically, for example exchanging one coin for others of equivalent value.

Simple Problems

Applying these skills to real life problems helps to understand the purpose of the maths involved.

To start simply, addition can be used to combine values of items bought in a shop to find a total.



For example: How much do the lollipop and the jelly bean cost altogether?

Basic addition skills can be used to solve this.

The language of the question can make it seem more difficult to the children. Finding the difference should be encouraged as it requires them to see the two values as a comparison rather than a total.

Darcey has 56p, Caleb has 69p.
How much more money does Caleb have than Darcey?



Caleb has 13p more than Darcey.

Giving Change

Change can be calculated in 2 different ways.

Jane has 50p. She spends 35p.
How much change does she get?

Firstly, this can be tackled as a subtraction calculation.

$$50 - 35$$

$$50 - 30 = 20,$$

$$20 - 5 = 15.$$

Alternatively, it can be approached by counting on:

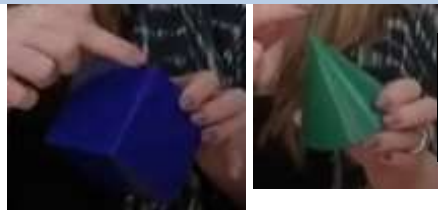


Jane gets 15p change.

NC Learning Objectives:

- 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.

Concrete



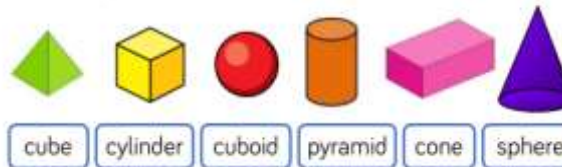
Examining actual 2D and 3D shapes to learn about their properties.

Folding paper shapes to find lines of symmetry.



Pictorial

Match the shape to its name.



Can you draw a line to divide these shapes in half evenly?
Some shapes can be divided two different ways.

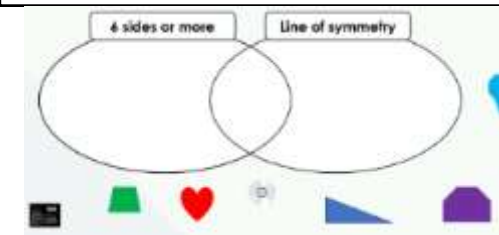


Drawing lines of symmetry on 2D shapes.

Abstract

	Has a line of symmetry	Has no lines of symmetry
Has four sides or more		
Has fewer than four sides		

Venn and Carroll diagrams to compare shapes.



Key Vocabulary:

Square, rectangle, triangle, circle, pentagon, hexagon, octagon, face, vertex, vertices, edge, line of symmetry, symmetrical, properties, 2 dimensional, 2D, 3 dimensional, 3D, curved, straight, cube, cuboid, sphere, pyramid, square based pyramid, triangular prism, cone, tetrahedron, cylinder, compare, similarities, differences, Venn diagram, Carroll diagram.

STEM Sentences:

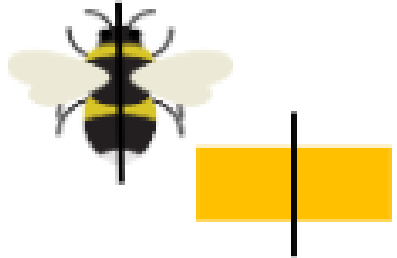

- _____ true or false?
- _____ prove it
- _____ Always, sometimes or never?

Additional Knowledge Covered in this area of Maths:

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Symmetry

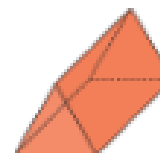
Children should be taught to recognise whether or not a shape has a line of symmetry. In Year 2, it is only necessary to identify a vertical line of symmetry. This can be done on everyday objects and shapes.

Vertical line of symmetry	No line of symmetry
	

Exploring different 3D shapes will help to reinforce the use of this language. Recording the properties supports this further. For example:



Shape	Vertices	Edges	Faces
Square based pyramid	5	8	5
Triangular based pyramid	4	6	4
Triangular prism	6	9	5
Cylinder	0	2	3
Cone	1	1	2
Cube	8	12	6
Cuboid	8	12	6



NC Learning Objectives:

- 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 anticlockwise).

Concrete

Pictorial

Abstract

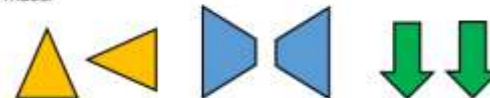
Moving our bodies a half/quarter/whole turn.

Draw what each shape will look like once it has turned a:

- quarter turn
- half turn
- three-quarter turn
- full turn



Complete the sentence to describe the turns these shapes have made.



The shape has turned a _____ turn.

Alex turns her number shape and it finishes facing this direction.



What direction could it have started facing?

What turn could it have made?

Key Vocabulary:

Opposite, order, apart, beside, between, centre, corner, edge, next to, middle, position, clockwise, anticlockwise, turn, left, right, half-turn, full-turn, quarter-turn, degrees, right-angle, rotate

STEM Sentences:

- _____ true or false?
- _____ prove it
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NC Learning Objectives/Key Skills

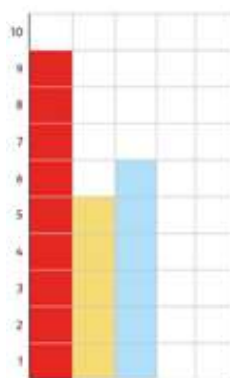
- interpret and construct simple pictograms, tally charts, block diagrams and simple tables
- ask and answer simple questions by counting the number of objects in each category and sorting the categories by quantity
- ask and answer questions about totalling and comparing categorical data.

Concrete



Using cubes to represent each square in a block graph.

Pictorial

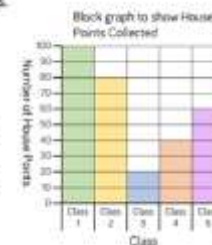


Creating our own block graphs on graph paper.

Item	Tally
pencils	IIII
rubbers	IIII IIII
rulers	IIII I

Abstract

5 classes collected their house points. Here are their results.
 Which class collected the most house points?
 Which class collected the fewest house points?
 How many more points did Class 2 get than Class 4?
 How many fewer points did Class 3 get than Class 5?
 How many points did Class 2 and Class 3 get altogether?



Complete the pictogram

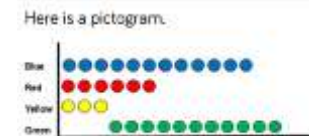
Activity	Score	Key
Swimming	10	1 person
Table Tennis	5	1 person
Badminton	3	1 person
Table Tennis	2	1 person

Use the tally chart to help you complete the pictogram

Fruit	Tally	Fruit	Key
Strawberry	IIII	Strawberry	1 strawberry
Apple	IIII	Apple	1 apple
Pineapple	IIII	Pineapple	1 pineapple
Orange	IIII	Orange	1 orange

Complete the pictogram using the data given

Name	Goals	Key
David	10	1 goal
Shane	5	1 goal
Ben	3	1 goal
William	2	1 goal



The most popular colour sweet is green.

Do you agree with Eva?
 Explain why and correct any mistakes.

Key Vocabulary:

Tally, tally chart, table, pictogram, block diagram, compare, count, label, list, more common, least common, sort, set, represent, total

STEM Sentences:

- _____ true or false?
- _____ prove it
- _____ Always, sometimes or never?

Additional Knowledge Covered in this area of Maths:

Place in here any additional Knowledge you think appropriate in each element having reviewed the knowledge organiser for your year group for each of the strands of maths.

Ask and Answer Questions

When the children have a good grasp of how to read the data, they can begin to ask and answer questions about the amounts. A simple example would be:



How many people have a dog?

8 people have a dog.



How to ask questions often needs modelling carefully to children so they know how to retrieve information that is in the data.

Other questions that develop language and understanding would include

Which is the least popular pet?



The fish is the least popular with 3 in the class.



Totalling and Comparing

Questions become more complex when totalling and comparing, with the language used often making it complex for the children.

How many children have a cat or a fish?



This requires the children to understand that if 6 children have a cat and 3 children have a fish, a simple addition shows that 9 children have a cat or a fish. A common misconception here is just to look at one category, for example, cat - 6.

Another challenging question is

How many more children have dogs than cats?



with children often jumping to the answer of 8. It is necessary to address this misconception quickly and this can be done by comparing a visual of the data.

To begin with, this is best to do with blocks representing 1 amount. For example:



There are 2 more dogs than cats.

