Purbrook Junior School

MATHS
KNOWLEDGE ORGANISERS
YEAR 4

Number and Place Value

Knowledge Organiser

Key Vocabulary
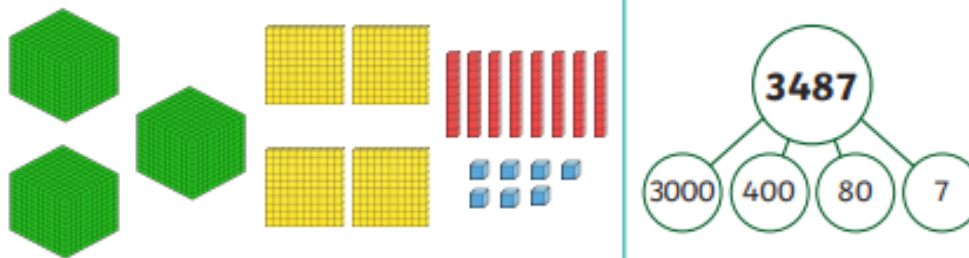
- thousands
- hundreds
- tens
- ones
- zero
- place value
- greater than
- less than
- order
- round
- rounded to
- negative number
- partition
- digit
- Roman numeral

Counting

Counting in 6s

0	6	12	18	24	30	36	42	48	54	60

Counting in 7s

0	7	14	21	28	35	42	49	56	63	70

Counting in 9s

0	9	18	27	36	45	54	63	72	81	90

Counting in 25s

0	25	50	75	100	125	150	175	200	225	250

Counting in 1000s

0	1000	2000	3000	4000	5000	6000	7000	8000	9000	10 000

Compare and Order

4324 > 3243 greater than

879 < 2126 less than

2497	2508	3012	3521	3530	4002

smallest — greatest

1000 More or 1000 Less

1000 Less — 1212

2212

1000 More — 3212

Number and Place Value — Knowledge Organiser

Negative Numbers

-10 -9 -8 -7 -6 -5 -4 -3 -2 -1 0 1 2 3 4 5 6 7 8 9 10

Represent 4-Digit Numbers

3487

three thousand, four hundred and eighty-seven

1000s	100s	10s	1s
|||	||||	‖‖‖ |||	‖‖‖ ||

Thousands	Hundreds	Tens	Ones
1000 1000 1000	100 100 100 100 100	10 10 10 10 10 10 10 10	1 1 1 1 1 1 1

3487 → 3000, 400, 80, 7

Roman Numerals

one	1	I
five	5	V
ten	10	X
fifty	50	L
one hundred	100	C

XVIII = 18

XXIX = 29

LXXXIV = 84

Rounding

Look at the place value column to the right of the value you are rounding to. If this digit is a 4 or less, round down. If the digit is a 5 or more, round up.

Rounding to nearest 10
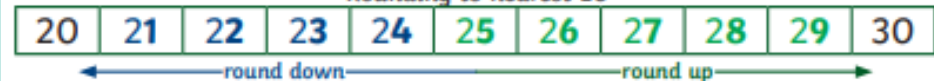
20	21	22	23	24	25	26	27	28	29	30

←———round down——— ———round up———→

Rounding to the nearest 100

200	249	250	300

←———round down——— ———round up———→

Rounding to the nearest 1000

2000	2499	2500	3000

←———round down——— ———round up———→

0   1000   2000   3000   4000   5000   6000   7000   8000   9000   10 000

Addition and Subtraction — Knowledge Organiser

Key Vocabulary

- Add
- Total
- Plus
- Sum
- More
- Altogether
- Difference
- Subtract
- Less
- Minus
- Take away
- Mentally, Orally
- Column Addition
- Column Subtraction
- Exchange
- Estimate
- Inverse operation
- Solve problems
- Number facts

Addition and Subtraction Methods

Add 4-digit numbers

No exchange

```
  5162
+ 3427
------
  8589
```
Starting with the ones, add each column in turn.

One exchange

```
  5162
+ 3497
------
  8659
  1
```
Starting with the ones, add each column in turn. When adding 6 tens + 9 tens = 15 tens = 1 hundred + 5 tens. Place 1 hundred under the hundreds answer and 5 tens in the answer.

Multiple exchanges

```
  5864
+ 3497
------
  9361
  111
```
Starting with the ones, add each column in turn. Exchange tens, hundreds and/ or thousands as required.

Subtract 4-digit numbers

No exchange

```
  5789
- 3421
------
  2368
```
Starting with the ones, subtract each column in turn.

One exchange

```
   6 1
  5⁷49
- 3471
------
  2278
```
Starting with the ones, subtract each column in turn. When subtracting 4 tens -7 tens, exchange 1 hundred to make: 14 tens – 7 tens = 7 tens

Multiple exchanges

```
  6 13 1
  5⁷42
- 3476
------
  2266
```
Starting with the ones, subtract each column in turn. Exchange tens, hundreds and/ or thousands as required.

Efficient subtraction

Calculate 6000 – 3617 = 2383

```
         3  80  300          2000
     ↶   ↶   ↶
  3617 3620  3700  4000              6000
```

Addition and Subtraction   Knowledge Organiser

Add and Subtract 1s, 10s, 100s, 1000s

Here is the number 3124

Add 2 thousands = 5124

Add 5 hundreds = 5624

Subtract 2 tens = 5604

Add 5 ones = 5609

Here is the number 6708

Thousands	Hundreds	Tens	Ones
6	7	0	8

Add 3 thousands = 9708

Subtract 4 hundreds = 9308

Add 5 tens = 9358

Subtract 7 ones = 9351

Crossing ones, tens or hundreds

5392 + 4 tens = 5432   crossing tens

5126 – 600 = 4526   crossing hundreds

When crossing ones, tens or hundreds, more than one digit will change.

Round to Estimate

1635 + 386 = 2021

Round to the nearest ten

1640 + 390 = 2030

Round to the nearest hundred

1600 + 400 = 2000

Both give a reasonable estimate, but rounding the nearest ten is more accurate.

9362 – 5729 = 3622

Round to the nearest hundred

9400 – 5700 = 3700

Round to the nearest thousand

9000 – 6000 = 3000

Rounding to the nearest hundred is much more accurate in this case.

Checking Strategies

Using Inverse
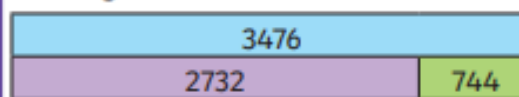
3476	
2732	744

3476 – 744 = 2732 can be checked using

2732 + 744 = 3476

This part whole shows the inverse calculations using these three numbers.

1549 + 2688 = 4237	2688 + 1549 = 4237
4237 – 1549 = 2688	4237 – 2688 = 1549

Adding in a different order

420 + 372 + 280 =

Change to

420 + 280 + 372 =

As 420 + 280 = 700
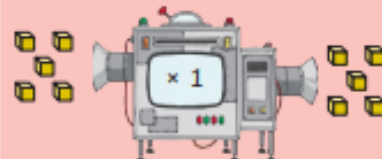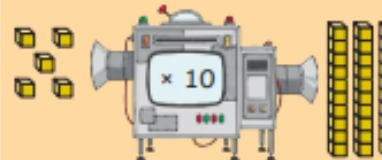
(because 42 + 28 = 70)

420 + 280 + 372 = 700 + 372 = 1072

Multiplication and Division

Key Vocabulary

- multiply
- groups of
- lots of
- times
- divide
- share
- remainder
- factor
- multiple
- product

Multiplication and Division Facts

x	1	2	3	4	5	6	7	8	9	10	11	12
1	1	2	3	4	5	6	7	8	9	10	11	12
2	2	4	6	8	10	12	14	16	18	20	22	24
3	3	6	9	12	15	18	21	24	27	30	33	36
4	4	8	12	16	20	24	28	32	36	40	44	48
5	5	10	15	20	25	30	35	40	45	50	55	60
6	6	12	18	24	30	36	42	48	54	60	66	72
7	7	14	21	28	35	42	49	56	63	70	77	84
8	8	16	24	32	40	48	56	64	72	80	88	96
9	9	18	27	36	45	54	63	72	81	90	99	108
10	10	20	30	40	50	60	70	80	90	100	110	120
11	11	22	33	44	55	66	77	88	99	110	121	132
12	12	24	36	48	60	72	84	96	108	120	132	144

Use Place Value to Multiply and Divide Mentally

× 1

$5 \times 1 = 5$
$5 \div 1 = 5$

× 10

$5 \times 10 = 50$
$50 \div 10 = 5$

× 100

$5 \times 100 = 500$
$500 \div 100 = 5$

Factor pairs and Commutativity

20

1 2 4 5 10 20

The factors of 20 are 1, 2, 4, 5, 10 and 20.

The factor pairs are:

1 and 20	2 and 10	4 and 5

$5 \times 4 = 20$

$4 \times 5 = 20$

Multiply Using Formal Written Methods

Th	H	T	O	
	5	4	3	
×			4	
		1	2	(4×3)
	1	6	0	(4×40)
2	0	0	0	(4×500)
2	1	7	2	

Th	H	T	O
	5	4	3
×			4
2	1	7	2
	1	1	

Remember to move any regrouped numbers into the next column. After the next multiplication, add the regrouped number to the answer.

Multiplication and Division

Written Multiplication Methods - No Regrouping

Tens	Ones

23 × 3 = 69

	T	O
	2	3
×		3
	6	9

X	20	3
3	60	9

60 + 9 = 69

Written Multiplication Methods - With Regrouping

Tens	Ones

24 × 4 = 96

	T	O
	2	4
×		4
	9	6
	1	

Written Division Methods - No Regrouping

Tens	Ones

136 ÷ 4 = 34

		3	4
4	1	3	6
−	1	2	0	→ 30 × 4
		1	6
−		1	6	→ 4 × 4
			0

Written Division Methods - With Regrouping

Tens	Ones

		3	3 r 1
4	1	3	3
−	1	2	0
		1	3
−		1	2
			1

Decimals — Knowledge Organiser

Key Vocabulary

- tenths
- hundredths
- decimal tenths
- decimal hundredths
- decimal equivalents
- part-whole model
- rounding
- decimal point
- place value
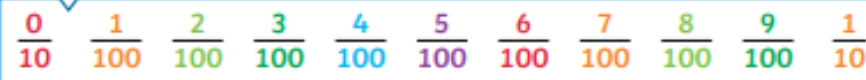
Tenths and Hundredths

Tenths

$\frac{0}{10}$ $\frac{1}{10}$ $\frac{2}{10}$ $\frac{3}{10}$ $\frac{4}{10}$ $\frac{5}{10}$ $\frac{6}{10}$ $\frac{7}{10}$ $\frac{8}{10}$ $\frac{9}{10}$ $\frac{10}{10}$

0   0.1   0.2   0.3   0.4   0.5   0.6   0.7   0.8   0.9   1

Hundredths

$\frac{0}{10}$ $\frac{1}{100}$ $\frac{2}{100}$ $\frac{3}{100}$ $\frac{4}{100}$ $\frac{5}{100}$ $\frac{6}{100}$ $\frac{7}{100}$ $\frac{8}{100}$ $\frac{9}{100}$ $\frac{1}{10}$

0   0.01   0.02   0.03   0.04   0.05   0.06   0.07   0.08   0.09   0.1

Fraction and Decimal Equivalents

$= \frac{1}{2} = 0.5$

$= \frac{1}{4} = 0.25$

$= \frac{3}{4} = 0.75$

$= \frac{1}{10} = 0.1$

Tenth and Hundredth Decimal Equivalents
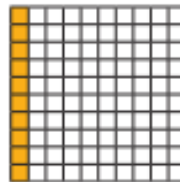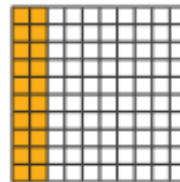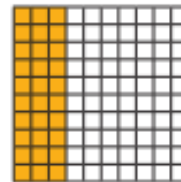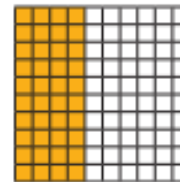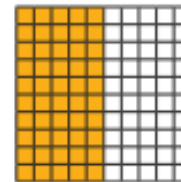
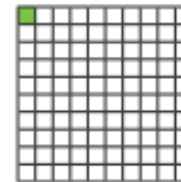$\frac{1}{10} = \frac{10}{100} = 0.1$

$\frac{2}{10} = \frac{20}{100} = 0.2$

$\frac{3}{10} = \frac{30}{100} = 0.3$
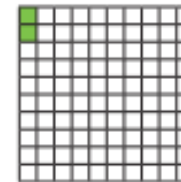
$\frac{4}{10} = \frac{40}{100} = 0.4$

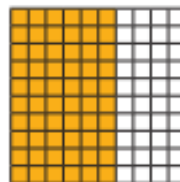$\frac{5}{10} = \frac{50}{100} = 0.5$
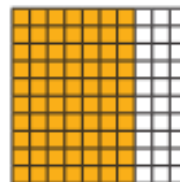
$\frac{1}{100} = 0.01$

$\frac{2}{100} = 0.02$
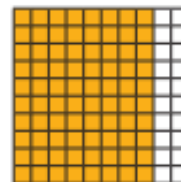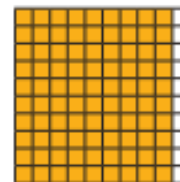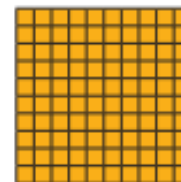
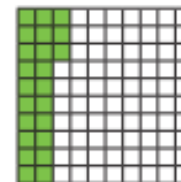$\frac{6}{10} = \frac{60}{100} = 0.6$

$\frac{7}{10} = \frac{70}{100} = 0.7$

$\frac{8}{10} = \frac{80}{100} = 0.8$
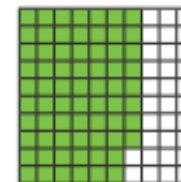
$\frac{9}{10} = \frac{90}{100} = 0.9$

$\frac{10}{10} = \frac{100}{100} = 1$

$\frac{23}{100} = 0.23$

$\frac{68}{100} = 0.68$

Decimals

Dividing by 10

Tens	Ones
8	5

$8\ 5 \div 10$

÷ 10

Tens	Ones	Tenths
	8	5

8 . 5

÷ 10

Dividing by 100

Tens	Ones
8	5

$8\ 5 \div 100$

÷ 100

Tens	Ones	Tenths	Hundredths
	0	8	5

0 . 8 5

÷ 100

Rounding Decimals

0 ← 0.1 0.2 0.3 0.4 | 0.5 0.6 0.7 0.8 0.9 → 1
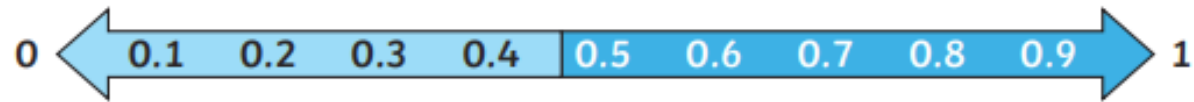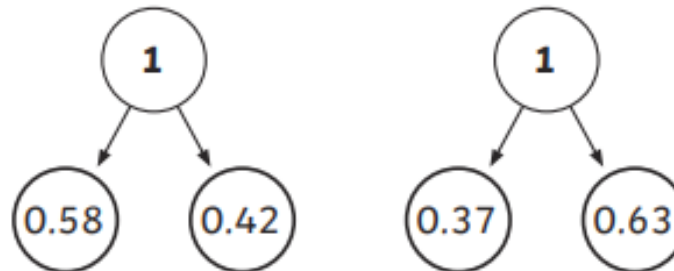
If the tenths digit is **1, 2, 3 or 4**, we round **down** to the nearest whole number.

If the tenths digit is **5, 6, 7, 8 or 9**, we round **up** to the nearest whole number.

Make a Whole

1 → 0.58 , 0.42

1 → 0.37 , 0.63

Partitioning Tenths and Hundredths

0.65 → 0.6 , 0.05

0.65 → 0.5 , 0.15

Comparing Numbers with Two Decimal Places

Ones	Tenths	Hundredths
	$\frac{1}{10}$ $\frac{1}{10}$	$\frac{1}{100}$ $\frac{1}{100}$
	$\frac{1}{10}$	$\frac{1}{100}$ $\frac{1}{100}$

0 . 3 4

Ones	Tenths	Hundredths
1		$\frac{1}{100}$
		$\frac{1}{100}$

1 . 0 2

Ones	Tenths	Hundredths
1	$\frac{1}{10}$	$\frac{1}{100}$
1		$\frac{1}{100}$ $\frac{1}{100}$

2 . 1 3
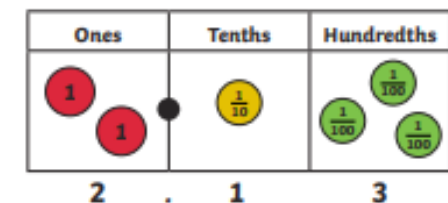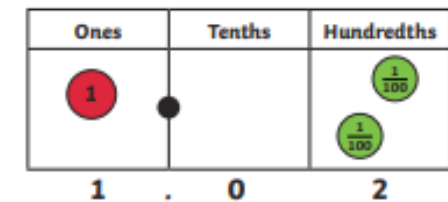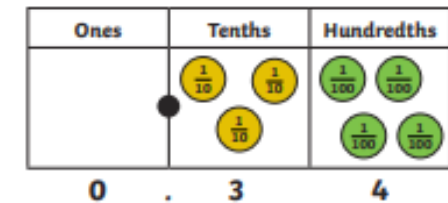
Key Vocabulary

- numerator
- denominator
- unit fraction
- non-unit fraction
- equivalent
- quantities
- whole
- halves
- thirds
- quarters
- fifths
- sixths
- sevenths
- eighths
- ninths
- tenths
- elevenths
- twelfths
- quantities
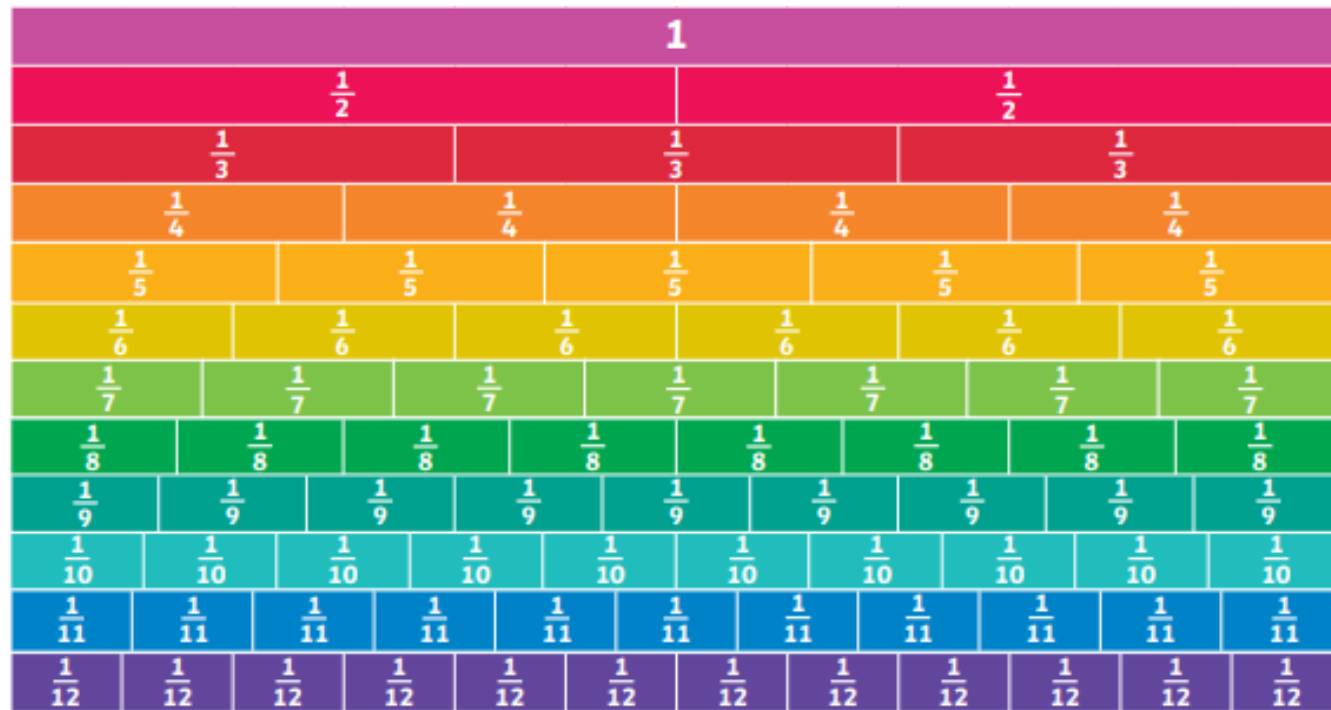
Fraction Families

1											
$\frac{1}{2}$						$\frac{1}{2}$					
$\frac{1}{3}$				$\frac{1}{3}$				$\frac{1}{3}$			
$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$			$\frac{1}{4}$		
$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$		$\frac{1}{5}$			$\frac{1}{5}$		
$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$		$\frac{1}{6}$	
$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$	$\frac{1}{7}$					
$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$	$\frac{1}{8}$				
$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$	$\frac{1}{9}$			
$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$		
$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	$\frac{1}{11}$	
$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$	$\frac{1}{12}$

Fractions of Quantities

To find a fraction of a number, divide by the denominator and multiply by numerator.

To find quarters of 20:

20			
5	5	5	5

$\frac{1}{4}$ of 20 = 5 $\frac{2}{4}$ of 20 = 10 $\frac{3}{4}$ of 20 = 15 $\frac{4}{4}$ of 20 = 20

To find eighths of 56:

56							
7	7	7	7	7	7	7	7
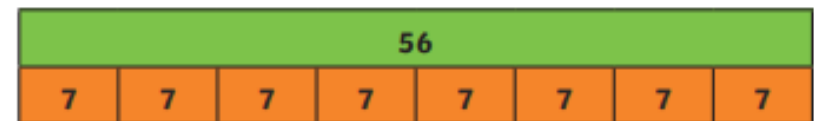
$\frac{1}{8}$ of 56 = 7 $\frac{2}{8}$ of 56 = 14 $\frac{3}{8}$ of 56 = 21 $\frac{4}{8}$ of 56 = 28

$\frac{5}{8}$ of 56 = 35 $\frac{6}{8}$ of 56 = 42 $\frac{7}{8}$ of 56 = 49 $\frac{8}{8}$ of 56 = 56
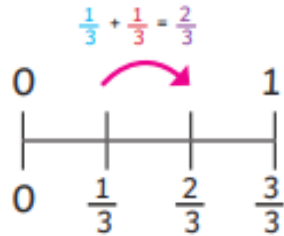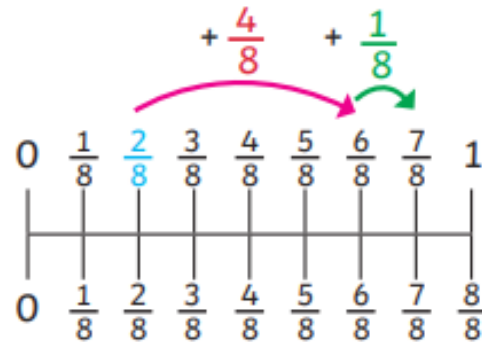
Adding Fractions

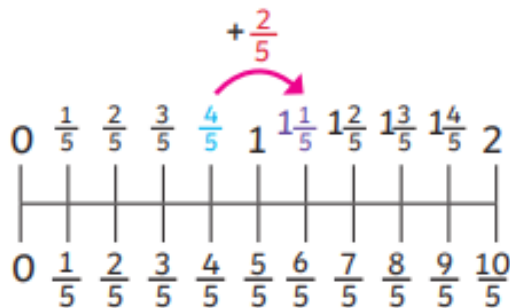Fractions can be added when the denominators are the same.

$$\frac{1}{3} + \frac{1}{3} = \frac{2}{3}$$

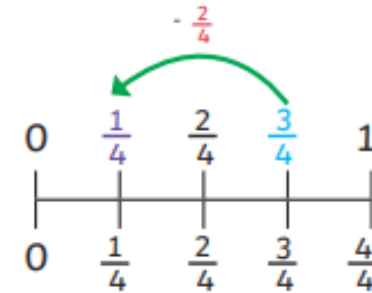$$\frac{2}{8} + \frac{4}{8} + \frac{1}{8} = \frac{7}{8}$$

$$\frac{4}{5} + \frac{2}{5} = \frac{6}{5} \text{ or } 1\frac{1}{5}$$
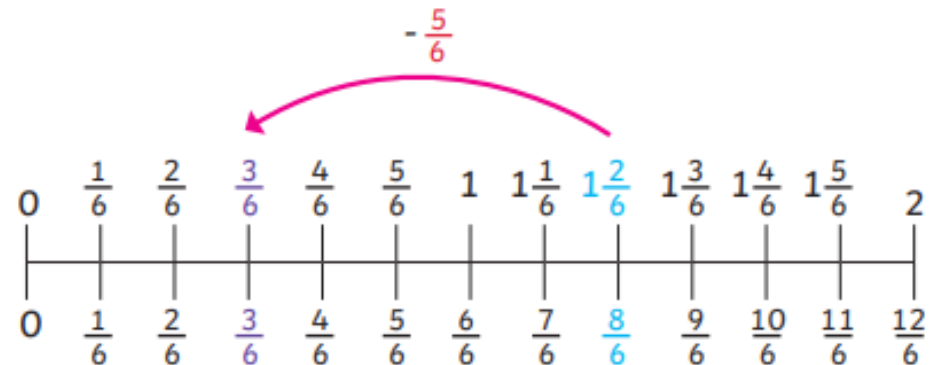
Subtracting fractions

Fractions can be subtracted when the denominators are the same.

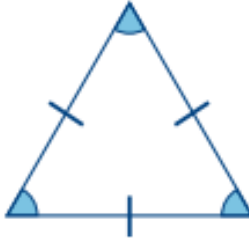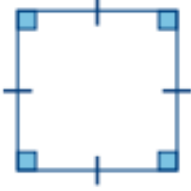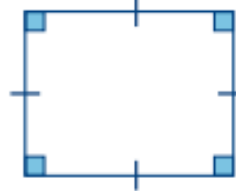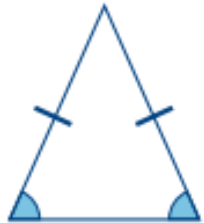$$\frac{3}{4} - \frac{2}{4} = \frac{1}{4}$$
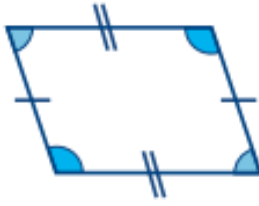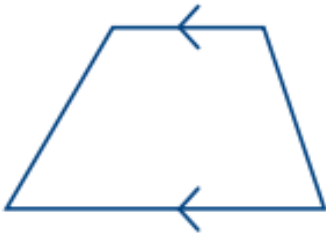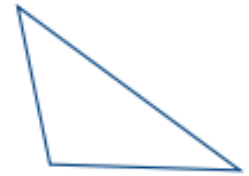
$$\frac{8}{6} - \frac{5}{6} = \frac{3}{6}$$

Properties of Shape — Knowledge Organiser

Key Vocabulary
angle
right angle
acute
obtuse
horizontal
vertical
diagonal
parallel
perpendicular
two-dimensional
polygon
line of symmetry
reflection
mirror line
isosceles
equilateral
scalene
quadrilateral
rhombus
parallelogram
trapezium

Triangles

Triangles have 3 sides and 3 vertices. The total of the angles in a triangle is 180°.

An equilateral triangle is a regular polygon. It has sides of equal length and each angle is 60°.

An isosceles triangle has two sides of equal length and two angles of equal size.

A right-angled triangle always has one 90° angle.

It can be isosceles or scalene.

A scalene triangle has no equal sides or angles.

Quadrilaterals

A quadrilateral is a polygon with four sides.

A square has four sides of equal length and four right angles (90°). A square is also a rectangle, a rhombus and a parallelogram.

A rectangle has two pairs of parallel, equal sides and four right angles. A rectangle is also a parallelogram.

A parallelogram has two pairs of parallel, equal sides and opposite equal angles.

A rhombus has four sides of equal length and opposite equal angles. A rhombus is also a parallelogram.

A trapezium only has one pair of opposite parallel sides.

A kite has two pairs of adjacent equal sides and one pair of opposite equal angles.

Properties of Shape

Knowledge Organiser

Angles

An angle is created when two straight lines meet at a point or intersect.

Right angle
The intersection of perpendicular lines creates a right angle.

90°   90°

Acute angle
Any angle measuring more than 0 degrees and less than 90 degrees is acute.
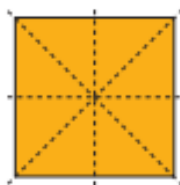
65°   30°

Obtuse angle
Any angle measuring more than 90 degrees but less than 180 degrees is obtuse.

120°

Lines of Symmetry

Lines of symmetry may be horizontal, vertical or diagonal. Some 2D shapes will have no lines of symmetry and some 2D shapes will have multiple lines of symmetry.
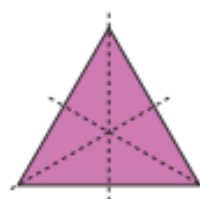
A square has four lines of symmetry.

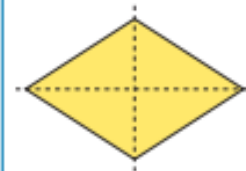A rectangle has two lines of symmetry.

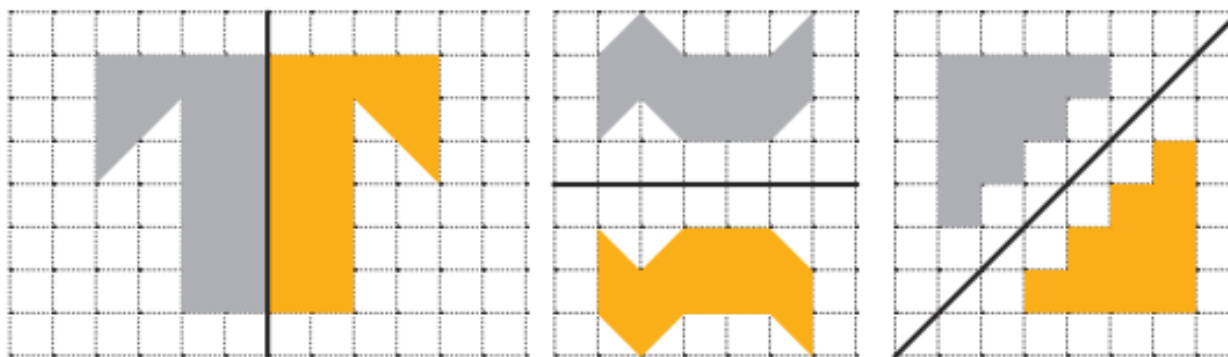An equilateral triangle has three lines of symmetry.

An isosceles triangle has one line of symmetry.
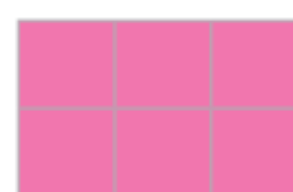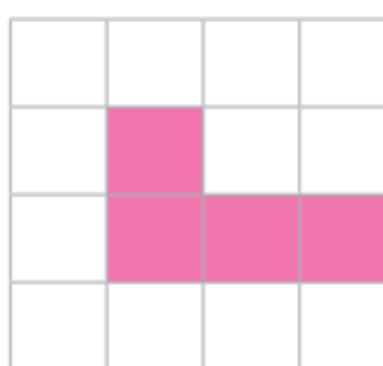
A rhombus has two lines of symmetry.

Symmetric Figures

Patterns and shapes can be reflected in a mirror line. Mirror lines can be vertical, horizontal or diagonal.

Area and Perimeter — Knowledge Organiser

Keywords

- area
- perimeter
- centimetres
- metres
- squares
- distance
- millimetres
- kilometres
- length
- width
- rectilinear
- right angle

Area and Perimeter

Area is the amount of space inside a 2D shape.

Perimeter is the total **distance** around the outside of a 2D shape.

Perimeter

Perimeter — **Area** — Perimeter

Perimeter

Measuring Area

We can count **squares** to find the **area** of a **rectilinear** shape.

Area = 1 square

Area = 6 squares

Area = 4 squares

Units of Measure for Perimeter

| km |
| m |
| cm |
| mm |

1 **kilometre** = 1000 **metres**

1 **metre** = 100 **centimetres**

1 **centimetre** = 10 **millimetres**

Rectilinear Figures

A **rectilinear** figure is a 2D shape whose sides all meet at **right angles** (90°).

Time

Key Vocabulary

- 12-hour time
- 24-hour time
- Roman numerals
- analogue
- digital
- hours
- minutes
- seconds
- o'clock
- half past
- quarter past
- quarter to
- midday
- midnight
- noon
- a.m.
- p.m.

Analogue and Digital Clocks

Minute Hand
The long hand points to the minutes past the hour.

Hour Hand
The short hand points to the hour. If this hand is pointing between the hours, it is the earlier hour of the two.

12:00 — twelve o'clock

12:15 — quarter past twelve

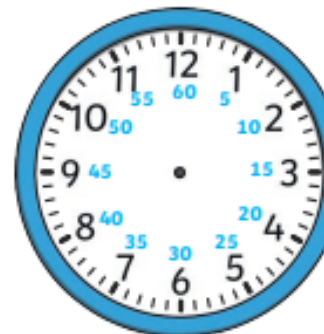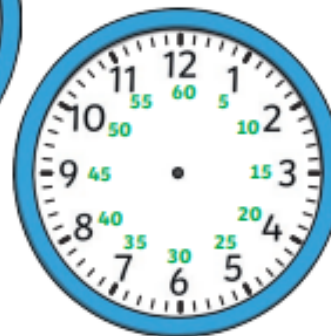12:30 — half past twelve

12:45 — quarter to one

Durations of Time

There are **60 minutes** in an hour.

There are **60 seconds** in an minute.

There are **24 hours** in a day

There are **7 days** in a week.

There are **12 months** in a year.

Time

24-Hour Time

There are 24 hours in a day.

midnight

12:00 a.m.

morning

a.m.

evening/night time

p.m.

12:00 p.m.

midday

Clock	Time	a.m./p.m.	o'clock	Icon
	01:00	1 a.m.	1 o'clock	
	02:00	2 a.m.	2 o'clock	
	03:00	3 a.m.	3 o'clock	
	04:00	4 a.m.	4 o'clock	
	05:00	5 a.m.	5 o'clock	
	06:00	6 a.m.	6 o'clock	
	07:00	7 a.m.	7 o'clock	
	08:00	8 a.m.	8 o'clock	
	09:00	9 a.m.	9 o'clock	
	10:00	10 a.m.	10 o'clock	
	11:00	11 a.m.	11 o'clock	
	12:00	12 p.m.	12 o'clock	

Clock	Time	a.m./p.m.	o'clock	Icon
	13:00	1 p.m.	1 o'clock	
	14:00	2 p.m.	2 o'clock	
	15:00	3 p.m.	3 o'clock	
	16:00	4 p.m.	4 o'clock	
	17:00	5 p.m.	5 o'clock	
	18:00	6 p.m.	6 o'clock	
	19:00	7 p.m.	7 o'clock	
	20:00	8 p.m.	8 o'clock	
	21:00	9 p.m.	9 o'clock	
	22:00	10 p.m.	10 o'clock	
	23:00	11 p.m.	11 o'clock	
	00:00	12 a.m.	12 o'clock	

Key Vocabulary

- bar chart
- pictogram
- frequency table
- tally chart
- discrete data
- continuous data
- time graph
- sum
- difference
- comparison
- interpret

Discrete and Continuous Data

Data that is counted in whole numbers is discrete. In **discrete data**, values between whole numbers cannot be counted.

Data that is measured and therefore can take on infinite values is continuous. In **continuous data**, values between whole numbers can be counted.

Frequency Tables

Tally marks are used to help count things. Each vertical line represents one unit. The fifth tally mark goes down across the first four to make it easier to count.

The frequency column is completed after all the data has been collected.

Eye Colour	Tally	Frequency
brown	IIII I	6
blue	IIII III	8
green	III	3
grey	IIII	4
hazel	IIII	5

Bar Charts

A bar chart has a horizontal axis and a vertical axis. Bars are used to show the data of each category. There must be a gap between each bar.

The scale of the bar chart is based on the range of data.

The scale on this bar chart counts in fives.

Favourite Flavour of Crisps
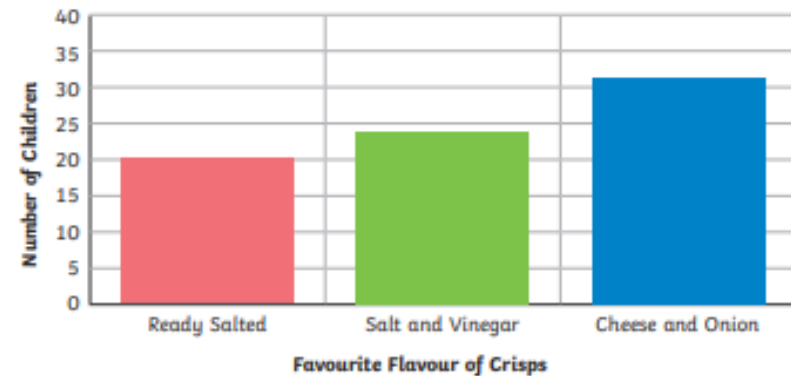
The bars are horizontal on this bar chart.
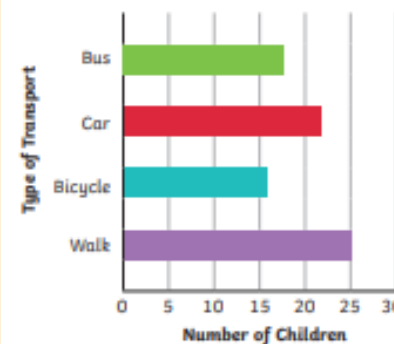
Two sets of data are shown on this stacked bar chart.
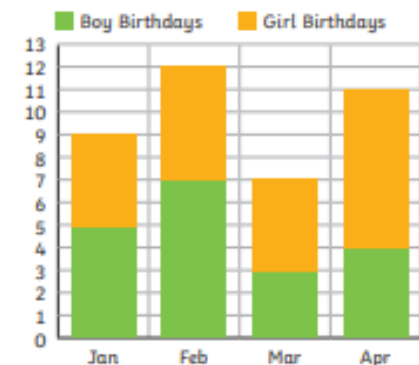
Time Graphs

Time graphs show how data changes over time.

A Bar Chart to Show the Temperature at Lunchtimes
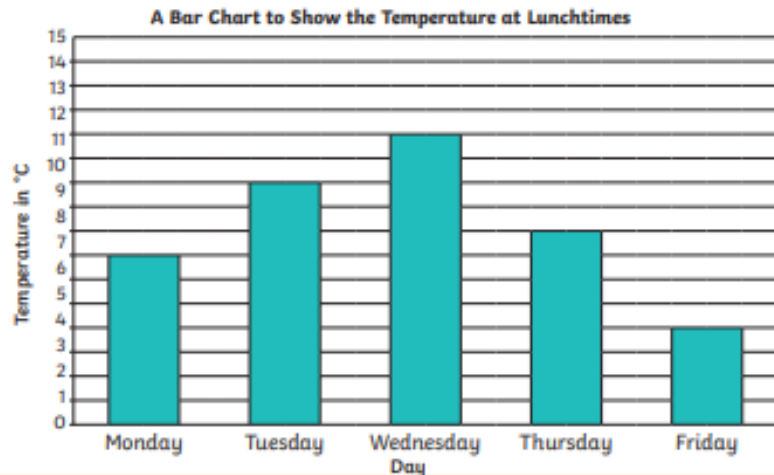
A Line Graph to Show the Average Monthly Temperature in the Borneo Rainforest
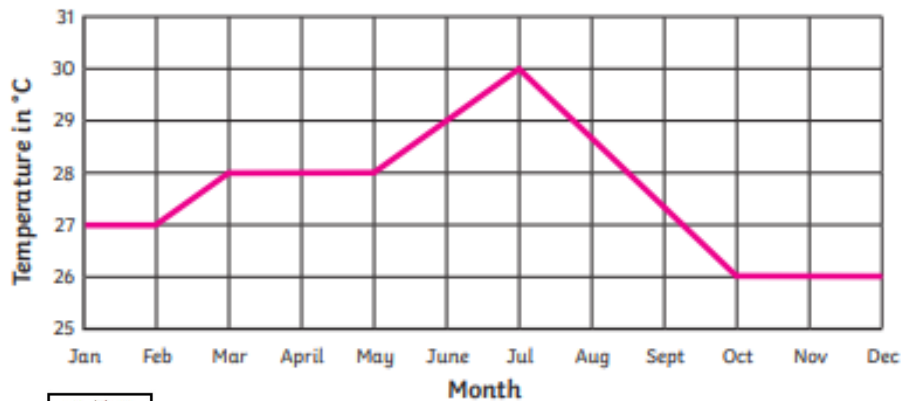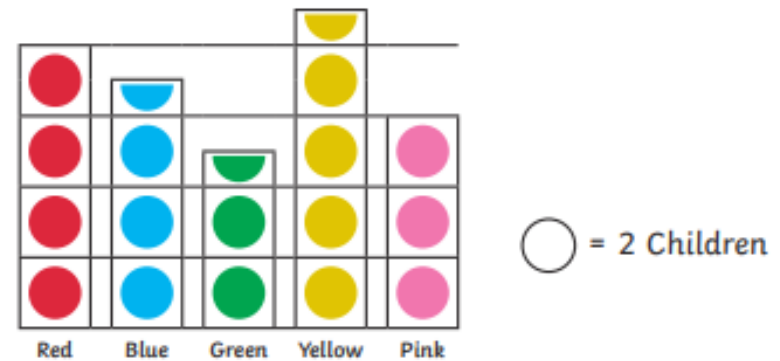

Pictograms

Pictograms use symbols or pictures to represent data.

This pictogram uses one symbol to represent two children.

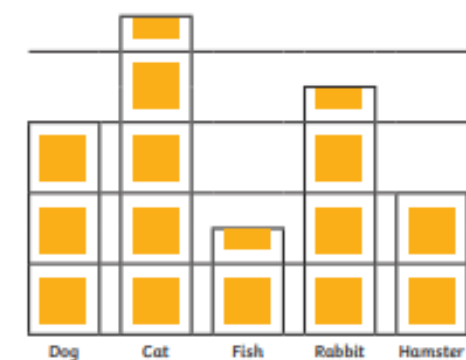Using this key, we can see that seven children prefer the colour blue.

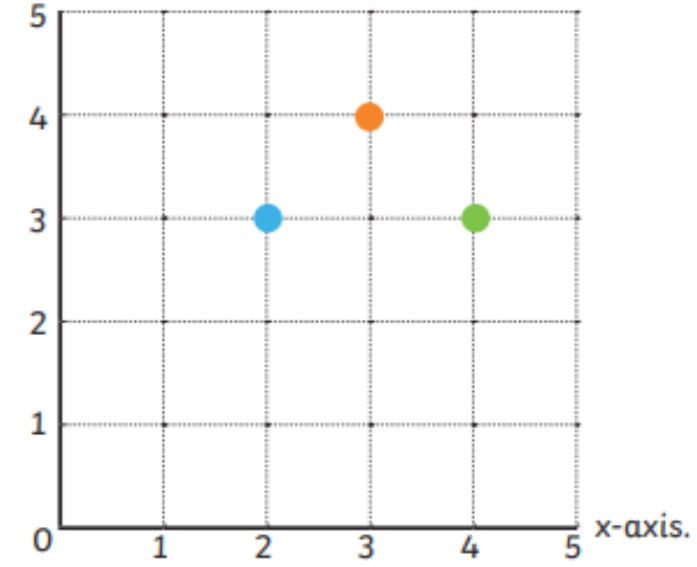**Class 10's Favourite Colours**

◯ = 2 Children

This pictogram uses one picture to represent four children. Using this key, we can see that six children have a pet fish.

Class 10's Pets

▇ = 4 Children

Key Vocabulary	Position in the First Quadrant
coordinate	
quadrant	
x-axis	
y-axis	
translation	
vertex	
vertices	

Coordinates are a useful way to locate a position on a map or grid.

The numbers across the horizontal line of the grid are on the **x-axis**.

The numbers on the vertical line of the grid are on the **y-axis**.

We always read or write the number on the x-axis before the **y-axis**.

The x and y position are written in brackets with a comma.

The coordinate of the blue spot is **(2, 3)**.

To help you remember which point to read or write first, simply remember to move 'along the corridor and up the stairs'.

In other words, move on the x-axis and then move on the y-axis.

Position and Direction

Translation

In maths, translation means moving an object on a grid. The object is moved without changing the size, turning or reflecting it.

When translating an object on a grid, it can move up or down, left or right.
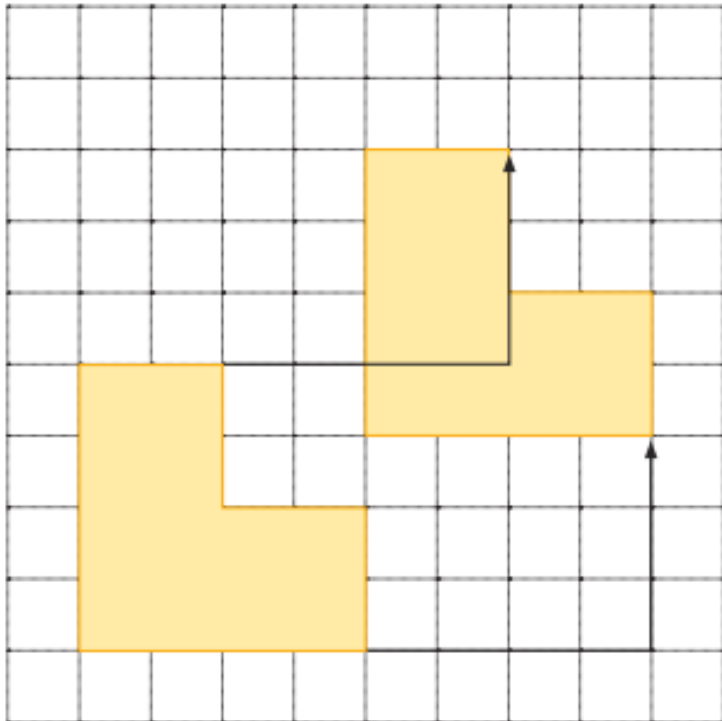
Plotting 2D Shapes

Each vertex (corner) of a 2D polygon can be represented as a coordinate on a 2D grid.

(5,3)

(3,1)