Pickhurst Academy — Year 5- Mathematics Knowledge Organiser

Key Vocabulary

- Add
- Total
- Make
- Plus
- Sum
- More
- Altogether
- Difference
- Subtract
- Less
- Minus
- Take away
- Column addition
- Column subtraction
- Estimate
- Inverse operation
- Number facts
- Place value
- Complex

Order and Compare Numbers with Three Decimal Places

Ones	Tenths	Hundredths	Thousandths
0 .	2	1	3
1 .	0	2	2
2 .	1	0	3

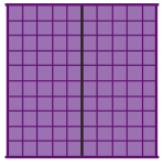
Decimal Numbers as Fractions

$0.71 = \frac{71}{100} = \frac{7}{10} + \frac{1}{100}$

$0.37 = \frac{37}{100} = \frac{3}{10} + \frac{7}{100}$

Equivalent Fractions

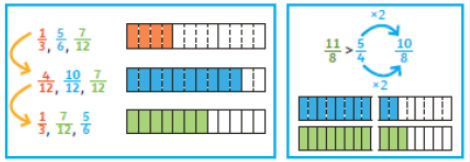
To find equivalent fractions, we multiply or divide the numerator and denominator by the same number.



$\frac{1}{2} = \frac{5}{10} = \frac{50}{100}$ (×5, ×10; ×5, ×10)

Compare and Order Fractions

We can compare and order fractions by using common denominators.



Mixed Numbers

Mixed numbers contain a whole number and a fraction.

whole → $2\frac{1}{4}$ ← fraction

Improper Fractions

An improper fraction has a numerator which is greater than or equal to the denominator. $\frac{5}{3}$

Convert an Improper Fraction to a Mixed Number

$\frac{9}{4}$ — $9 \div 4 = 2r1$ → $2\frac{1}{4}$

Divide the numerator by the denominator.

This shows you the whole number and the fraction.

Convert a Mixed Number to an Improper Fraction

Multiply the whole by the denominator to make an improper fraction.

$2\frac{5}{6} = \frac{12}{6} + \frac{5}{6} = \frac{17}{6}$

Add the fractions together.

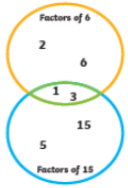
Factors

A factor is a number that divides into another number exactly, without leaving a remainder.

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

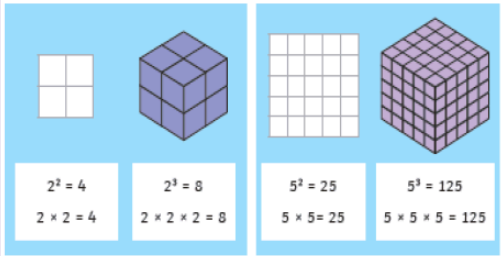
A common factor is a factor of 2 or more numbers.



Prime Numbers

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Squared² and Cubed³ Numbers



Related Calculations

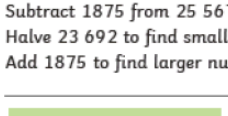
$8 \times 9 = 72$ $80 \times 9 = 720$	$9 \times 8 = 72$ $90 \times 8 = 720$
$72 \div 9 = 8$ $720 \div 9 = 80$	$72 \div 8 = 9$ $720 \div 8 = 90$

Multistep Problems

Using a Bar Model

The sum of two numbers is 25 567.
The difference is 1875.

Subtract 1875 from 25 567 = 23 692.
Halve 23 692 to find smaller number = 11 846.
Add 1875 to find larger number = 13 721.

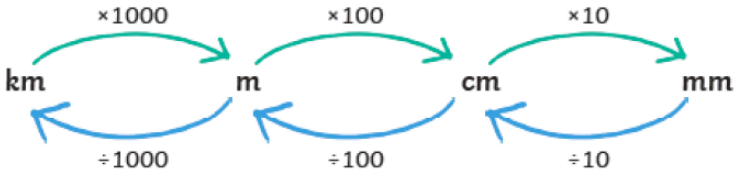


£20 is used to buy 2 books costing £3.75 and £8.49.

How much change is given?

£3.75 + £8.49 = £12.24
£20.00 - £12.24 = £7.76

Converting Length



1000 metres = 1 kilometre

100cm = 1m

10mm = 1cm

$\frac{1}{10}$km = 0.1km = 100m

$\frac{1}{4}$km = 0.25km = 250m

$\frac{1}{2}$km = 0.5km = 500m

$\frac{3}{4}$km = 0.75km = 750m

Reading and Understanding Tables

A table to show ticket prices at a local cinema.

Ticket Type	Weekday Price	Weekend Price
Adult	£6	£7.50
Child	£4	£4.50
Student	£5.50	£6

In order to understand the data presented in a table, you must read the table's title and the headings. Remember to always look at the heading that each piece of information falls under.

Addition and Subtraction

Knowledge Organiser

Key Vocabulary

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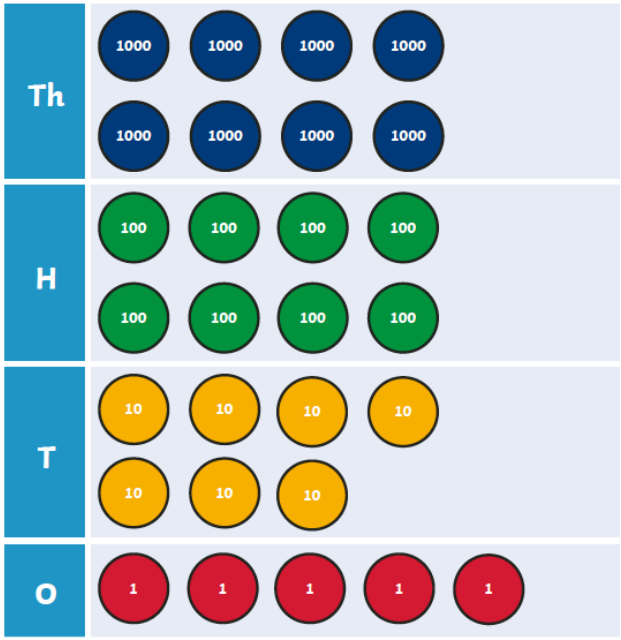
Addition

Place Value Grid: 3274 + 5601 = 8875



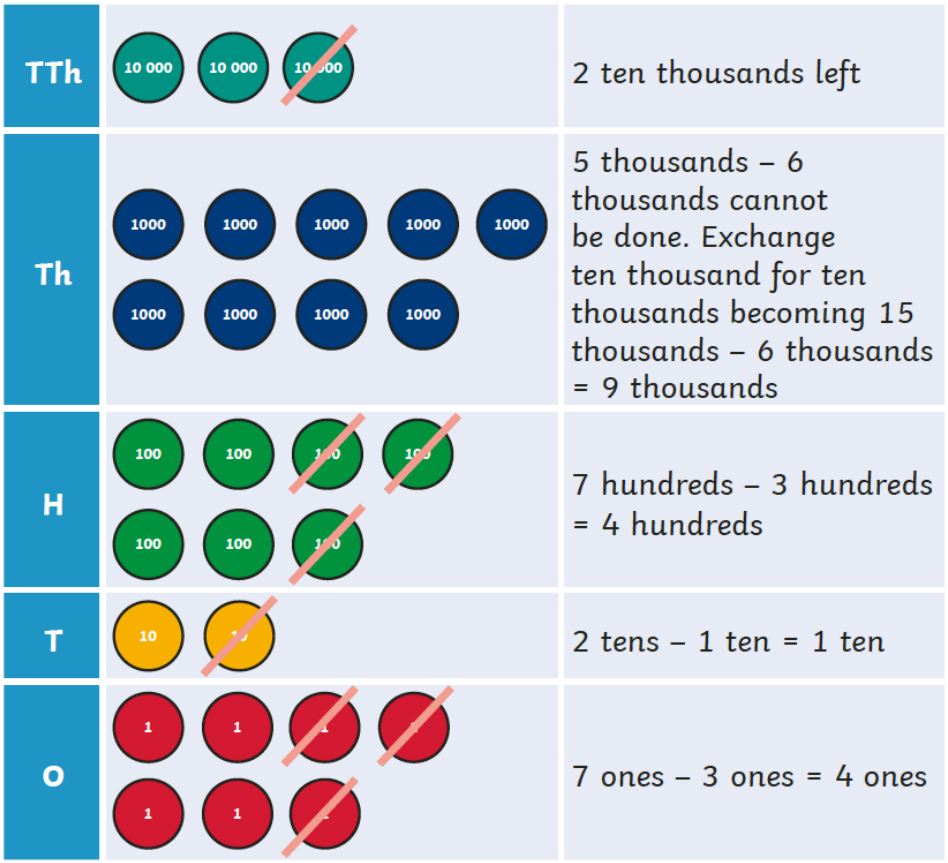
Column Method

Starting with the ones, add each column in turn. Regroup tens, hundreds, thousands, ten thousands and/or as required.

```
 45864
+23497
 69361
 111
```

Subtraction

Place Value Grid: 35 727 – 6313 = 29 414



Column Method

Starting with the ones, subtract each column in turn. Exchange tens, hundreds, thousands and/or ten thousands as required.

```
  6 13 1
 35742
-  3476
 32266
```

Addition and Subtraction

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Estimate and Approximate

Rounding to Estimate

41 635 + 7386 = 49 021

Round to ten:

41 630 + 7380 = 49 010

41 630 + 7390 = 49 020

41 640 + 7390 = 49 030

Rounding is not as accurate when both numbers are rounded up. A better estimate comes from "rounding" one down and one up.

Estimating on a Number Line

The arrow is about $\frac{3}{4}$ of the way across the line so it is 40 000.

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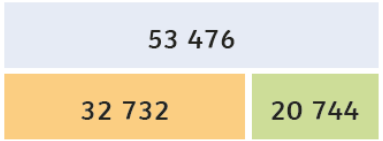
Inverse Operations

Use the inverse to check:



To check 53 476 – 32 732 = 20 744 use 32 732 + 20 744 = 53 476

Start with a number, subtract 409 and double. I end with 6264. To find the starting number use the inverse: halve, then add 409. Half of 6264 = 3132. 3132 + 409 = 3541. The starting number was 3541.

Multistep Problems

Using a Bar Model

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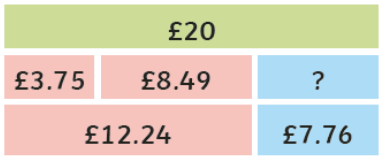

£20 is used to buy 2 books costing £3.75 and £8.49.

How much change is given?

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Converting Units

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Key Vocabulary

- mass
- gram
- kilogram
- capacity
- volume
- millilitre
- centilitre
- litre
- millimetre
- centimetre
- kilometre

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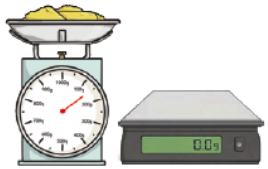
Converting Mass



kg $\xrightarrow{\times 1000}$ g

g $\xrightarrow{\div 1000}$ kg

1000g = 1kg

$\frac{1}{10}$kg = 0.1kg = 100g

$\frac{1}{4}$kg = 0.25kg = 250g

$\frac{1}{2}$kg = 0.5kg = 500g

$\frac{3}{4}$kg = 0.75kg = 750g

Converting Capacity

l $\xrightarrow{\times 1000}$ ml

ml $\xrightarrow{\div 1000}$ l

1000ml = 1 litre

$\frac{1}{10}$l = 0.1l = 100ml

$\frac{1}{4}$l = 0.25l = 250ml

$\frac{1}{2}$l = 0.5l = 500ml

$\frac{3}{4}$l = 0.75l = 750ml

$\frac{1}{100}$l = 0.01l = 10ml

Converting Length

km $\xrightarrow{\times 1000}$ m $\xrightarrow{\times 100}$ cm $\xrightarrow{\times 10}$ mm

mm $\xrightarrow{\div 10}$ cm $\xrightarrow{\div 100}$ m $\xrightarrow{\div 1000}$ km

1000 metres = 1 kilometre

100cm = 1m

10mm = 1cm

$\frac{1}{10}$km = 0.1km = 100m

$\frac{1}{4}$km = 0.25km = 250m

$\frac{1}{2}$km = 0.5km = 500m

$\frac{3}{4}$km = 0.75km = 750m

Converting Units

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Units of Time

Minute

1 minute = 60 seconds

Hour

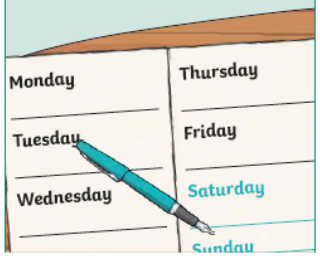
1 hour = 60 minutes

Day

1 day = 24 hours

Week

1 week = 7 days



Fortnight

1 fortnight = 2 weeks

Month

January - 31 days
February - 28 days (29 on a leap year)
March - 31 days
April - 30 days
May - 31 days
June - 30 days
July - 31 days
August - 31 days
September - 30 days
October - 31 days
November - 30 days
December - 31 days

Year

1 year =
12 months =
52 weeks =
365 days

Leap Year

1 leap year =
366 days

Decade

1 decade =
10 years

Century

1 century =
100 years

Millennium

1 millennium =
1000 years

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Decimals

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Key Vocabulary

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

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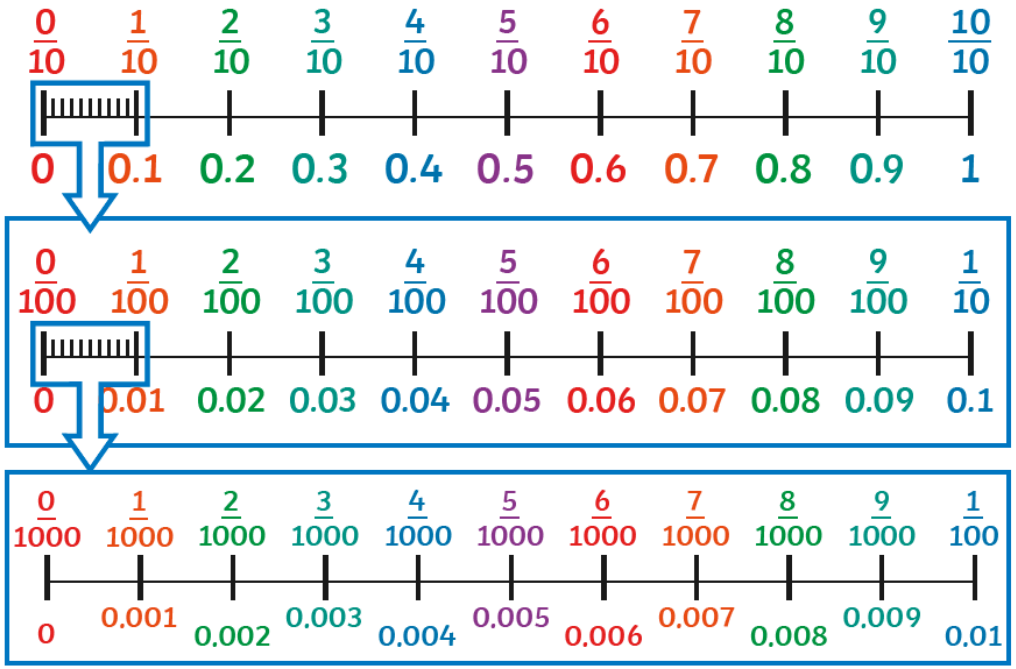
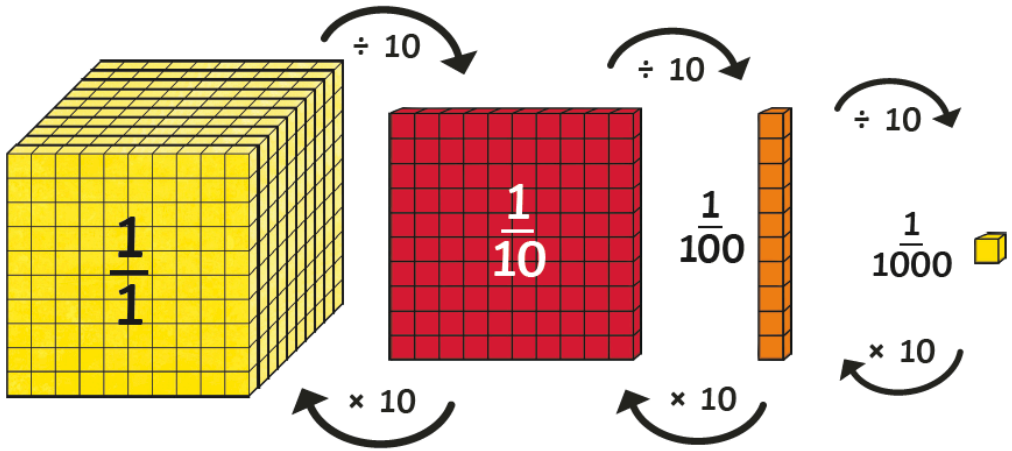
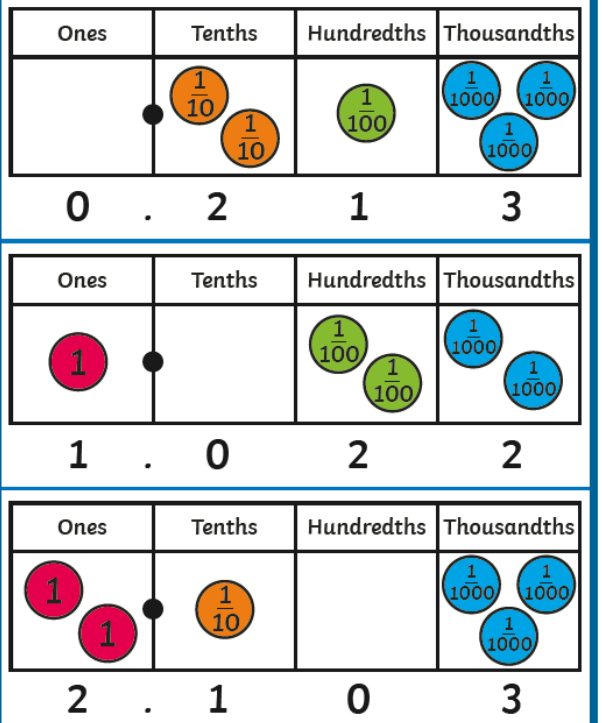
Tenths, Hundredths and Thousandths





Order and Compare Numbers with Three Decimal Places



Decimal Numbers as Fractions

$$0.71 = \frac{71}{100} = \frac{7}{10} + \frac{1}{100}$$

$$0.37 = \frac{37}{100} = \frac{3}{10} + \frac{7}{100}$$

Decimals

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Multiplying and Dividing by 10, 100 and 1000

Tens	Ones	Tenths	Hundredths	Thousandths
3	8			
	3	8		
3	8			

÷ 10

× 10

Tens	Ones	Tenths	Hundredths	Thousandths
3	8			
	0	3	8	
3	8			

÷ 100

× 100

Tens	Ones	Tenths	Hundredths	Thousandths
3	8			
	0	0	3	8
3	8			

÷ 1000

× 1000

Adding and Subtracting Decimals

0.8 + 0.001 = 0.801

1.031 - 0.23 = 0.801

0.4005 + 0.4005 = 0.801

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Rounding Decimals

1 ← 1.1 1.2 1.3 1.4 | 1.5 1.6 1.7 1.8 1.9 → 2

If the tenths digit is 1, 2, 3 or 4, we round down to the nearest whole number.

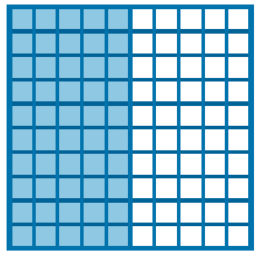
If the tenths digit is 5, 6, 7, 8 or 9, we round up to the nearest whole number.

1.1 ← 1.11 1.12 1.13 1.14 | 1.15 1.16 1.17 1.18 1.19 → 1.2

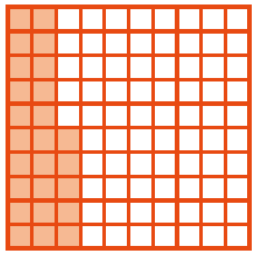
If the hundredths digit is 1, 2, 3 or 4, we round down to the nearest tenth.

If the hundredths digit is 5, 6, 7, 8 or 9, we round up to the nearest tenth.

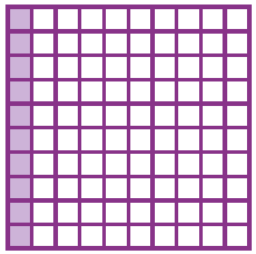
Percentage and Decimal Equivalents



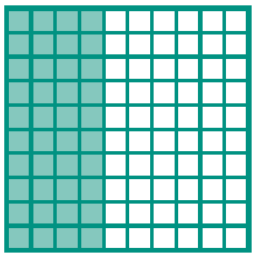
$50\% = \frac{50}{100} = \frac{1}{2} = 0.5$



$25\% = \frac{25}{100} = \frac{1}{4} = 0.25$



$10\% = \frac{10}{100} = \frac{1}{10} = 0.1$

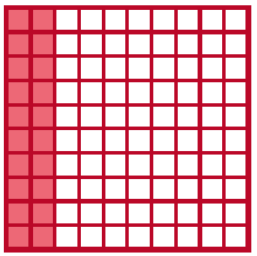


$40\% = \frac{40}{100} = \frac{2}{5} = 0.4$

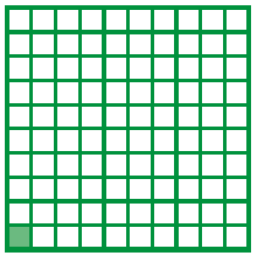
Crossing the Whole

0.82 + 0.63 = 1.45

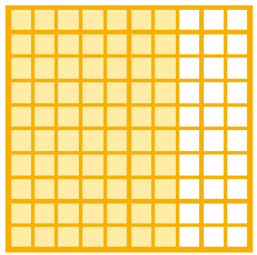
2.531 - 0.6 = 1.931



$20\% = \frac{20}{100} = \frac{1}{5} = 0.2$



$1\% = \frac{1}{100} = 0.01$



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

Fractions

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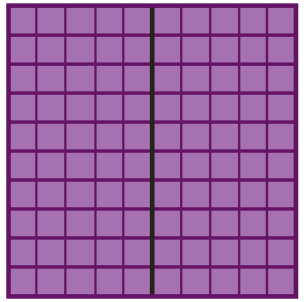
Key Vocabulary

- numerator
- denominator
- unit fraction
- non-unit fraction
- whole
- equivalent
- mixed number
- improper fraction
- simplest form
- multiple
- common denominator
- common numerator

Equivalent Fractions

To find equivalent fractions, we multiply or divide the numerator and denominator by the same number.



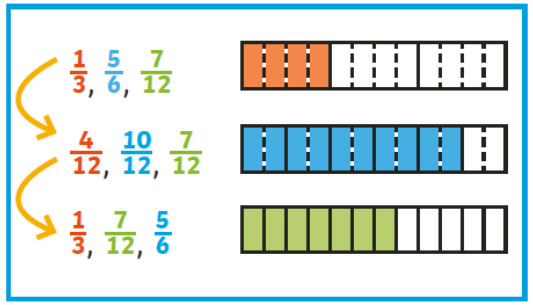
$\frac{1}{2} = \frac{5}{10} = \frac{50}{100}$

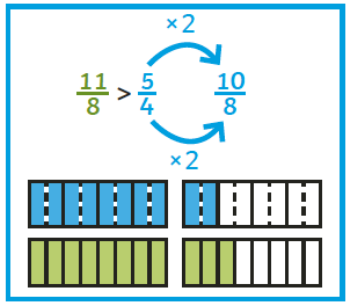
×5 ×10

×5 ×10

Compare and Order Fractions

We can compare and order fractions by using common denominators.





Mixed Numbers

Mixed numbers contain a whole number and a fraction.

whole → $2\frac{1}{4}$ ← fraction

Improper Fractions

An improper fraction has a numerator which is greater than or equal to the denominator.

$\frac{5}{3}$

Convert an Improper Fraction to a Mixed Number

$\frac{9}{4}$

$9 \div 4 = 2r1$ → $2\frac{1}{4}$

Divide the numerator by the denominator.

This shows you the whole number and the fraction.

Convert a Mixed Number to an Improper Fraction

Multiply the whole by the denominator to make an improper fraction.

$2\frac{5}{6} = \frac{12}{6} + \frac{5}{6} = \frac{17}{6}$

Add the fractions together.

Adding and Subtracting Fractions

To add or subtract fractions with denominators that are multiples of the same number, we must change one fraction to have the same denominator.

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

$\frac{4}{5} - \frac{3}{5} = \frac{1}{5}$

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

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

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Fractions

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Add Fractions Where the Total is Greater Than 1

$\frac{1}{2} + \frac{3}{4} + \frac{5}{8} = \frac{4}{8} + \frac{6}{8} + \frac{5}{8} = \frac{15}{8} = 1\frac{7}{8}$

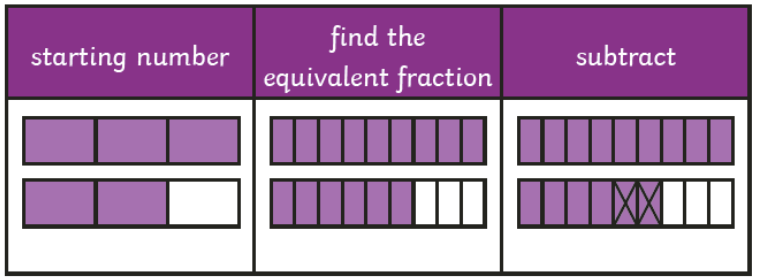
Add Mixed Numbers

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

$1\frac{1}{4} + \frac{3}{8} = \frac{5}{4} + \frac{3}{8} = \frac{10}{8} + \frac{3}{8} = \frac{13}{8} = 1\frac{5}{8}$

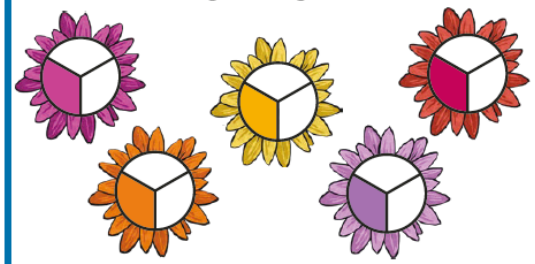
Subtract from a Mixed Number

$1\frac{2}{3} - \frac{2}{9} = 1\frac{6}{9} - \frac{2}{9} = 1\frac{4}{9}$



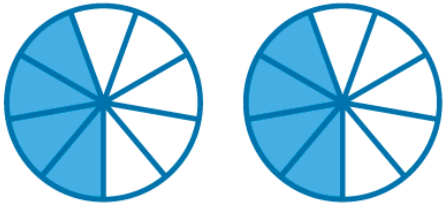
Multiply Unit Fractions by an Integer

$\frac{1}{3} \times 5 = \frac{5}{3}$



Multiply Non-Unit Fractions by an Integer

$2 \times \frac{4}{9} = \frac{8}{9}$



Subtract Two Mixed Numbers

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

$2 - 1 = 1$

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

Multiply Mixed Numbers by Integers

Convert to an improper fraction and multiply the numerator by the integer.

$2\frac{1}{4} \times 2 = \frac{9}{4} \times 2 = \frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$

Use repeated addition.

$2\frac{1}{4} \times 2 = 2\frac{1}{4} + 2\frac{1}{4} = 4\frac{2}{4} = 4\frac{1}{2}$

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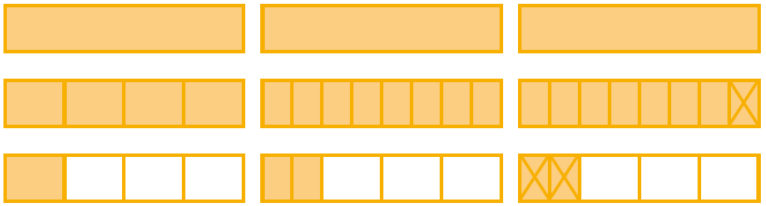
Subtract from a Mixed Number - Breaking the Whole

$2\frac{1}{4} - \frac{3}{8} = 2\frac{2}{8} - \frac{3}{8} = 1\frac{10}{8} - \frac{3}{8} = 1\frac{7}{8}$



Volume

Knowledge Organiser

Key Vocabulary

- cubed
- area
- cross-section
- prism
- cube
- cuboid
- face
- length
- height
- width
- depth

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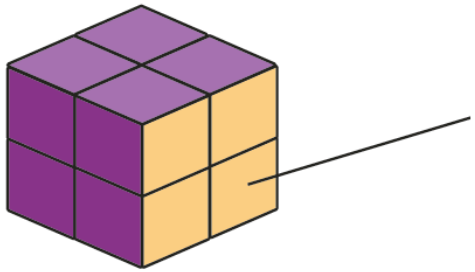
Volume of Cubes and Cuboids

Volume is measured in cubed units. For example, **cm³**, **m³** and **km³**.

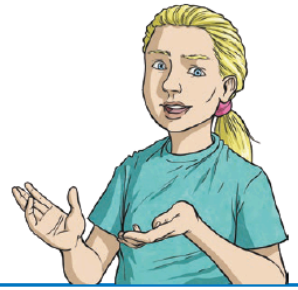
To calculate the volume of cubes and cuboids:

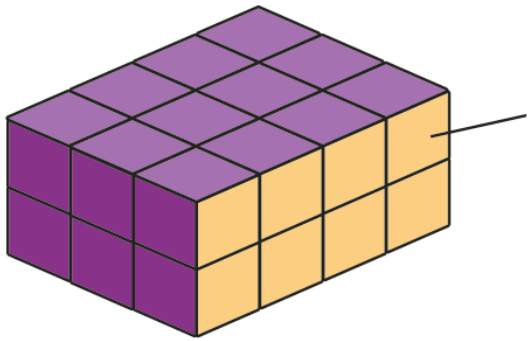
1. Calculate the area of the cross-section (one face).
2. Multiply the area of the cross-section (one face) by its depth.



Area of cross section (face) = 2cm × 2cm = $4cm^2$

$4cm^2$ × 2cm = Volume of $8cm^3$





Area of cross section (face) = 4cm × 2cm = $8cm^2$

$8cm^2$ × 3cm = Volume of $24cm^3$

Multiplication and Division

Knowledge Organiser

Key Vocabulary

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

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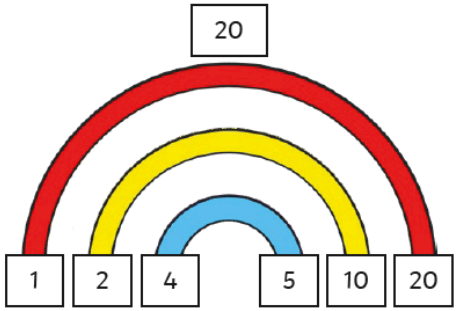
Factors

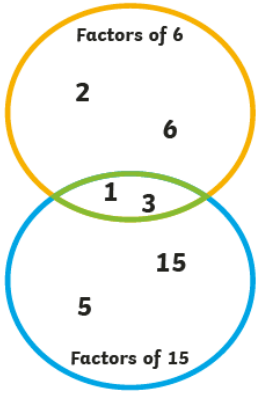
A factor is a number that divides into another number exactly, without leaving a remainder.



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

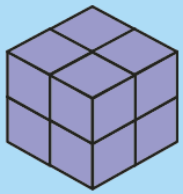
A common factor is a factor of 2 or more numbers.



Prime Numbers

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100

Squared² and Cubed³ Numbers

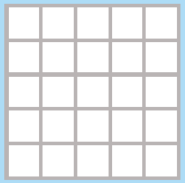


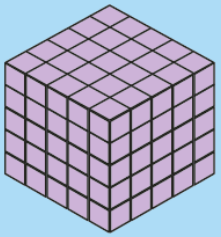
$2^2 = 4$

$2 \times 2 = 4$

$2^3 = 8$

$2 \times 2 \times 2 = 8$





$5^2 = 25$

$5 \times 5 = 25$

$5^3 = 125$

$5 \times 5 \times 5 = 125$

Related Calculations

$8 \times 9 = 72$ $80 \times 9 = 720$	$9 \times 8 = 72$ $90 \times 8 = 720$
$72 \div 9 = 8$ $720 \div 9 = 80$	$72 \div 8 = 9$ $720 \div 8 = 90$

Multiplication and Division

Knowledge Organiser

Short Multiplication

2543 × 7 = 17 801

	2	5	4	3
×				7
1	**7**	**8**	**0**	**1**
1	3	3	2	

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

Long Multiplication

2543 × 67 = 170 381

		2	5	4	3
	×			6	7
	1 (1)	7 (3)	8 (3)	0 (2)	1
1 (1)	5 (3)	2 (2)	5 (1)	8	0
1	**7**	**0**	**3**	**8**	**1**
	1	1			

Before multiplying by the number in the tens column, remember to use zero as a placeholder because the 6 in 67 is 6 tens (60).

Division

136 ÷ 4 = 34

		3	**4**	
4	1	3	6	
–	1	2	0	→ **30** × 4
		1	6	
	–	1	6	→ **4** × 4
			0	

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Short Division

		3	**8**
4	1	1 5	3 2

15 ÷ 4 = 3 remainder 3

Remember to regroup any remainders and move them into the next column.

		4	**5**	**5**	**r**	**3**
5	2	2	2 7	2 8		

28 ÷ 5 = 5 remainder 3

If your calculation has a remainder, remember to record it in the answer using the letter **r**.

Number and Place Value — Knowledge Organiser

Key Vocabulary

- millions
- thousands
- hundreds
- tens
- ones
- zero
- place value
- greater than
- less than
- order
- round
- rounded
- negative number
- partition
- digit
- interval
- sequence
- linear sequence

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Compare and Order

equals

26 + 38 = 8 × 8

Both calculations have the value 64.

greater than

23 873 > 8256

The number on the left has 2 ten thousands and the number on the right has 0 ten thousands.

less than

901 198 < 1 091 098

The number on the right has 1 million and the number on the left has 0 millions.

smallest | 898 | 6735 | 6835 | 7019 | 9002 | 11 235 | greatest

Negative Numbers

Counting in Powers of 10

Counting in 10s

365	375	385	395	405	415

The tens increase until 9 tens becomes one more hundred and 0 tens.

Counting in 100s

2841	2941	3041	3141	3241	3341

The hundreds increase until 9 hundreds becomes one more thousand and 0 hundreds.

Counting in 10 000s

276 109	286 109	296 109	306 109

The ten thousands increase until 9 ten thousands become one more hundred thousand and 0 ten thousands.

Counting in 100 000s

2 972 151	3 072 151	3 172 151	3 272 151

The hundred thousands increase until 9 hundred thousands becomes one more million and 0 hundred thousands.

Number and Place Value

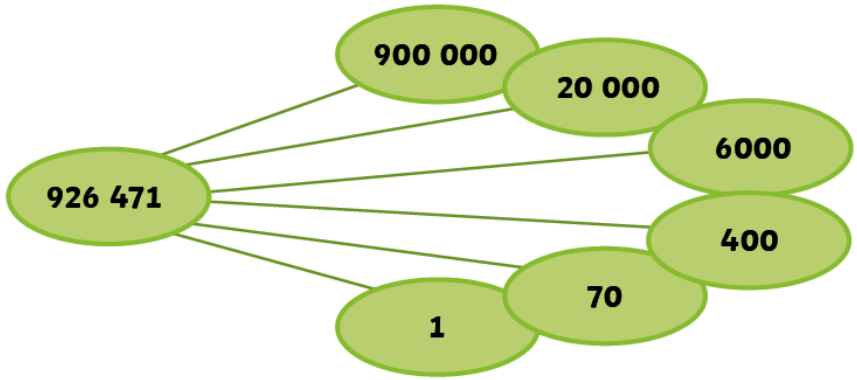
Knowledge Organiser

Numbers to One Million

926 471

Hundred Thousands	Ten Thousands	Thousands	Hundreds	Tens	Ones
9	2	6	4	7	1

nine hundred and twenty-six thousand, four hundred and seventy-one



Roman Numerals

	I = 1	II = 2	III = 3	
IV = 4	V = 5	VI = 6	VII = 7	VIII = 8
IX = 9	X = 10	XI = 11	XX = 20	XXX = 30
XL = 40	L = 50	LX = 60	LXX = 70	LXXX = 80
XC = 90	C = 100	CL = 150	CC = 200	CCC = 300
CD = 400	D = 500	DC = 600	DCC = 700	DCCC = 800
CM = 900	M = 1000	MC = 1100	MD = 1500	MM = 2000

CCXLVIII = 248 DCCLXXXIV = 784 MMXIX = 2019

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Rounding

Rounding to the nearest 10

20	21	22	23	24	25	26	27	28	29	30

round down round up

Rounding to the nearest 1000

2000 ← 2499	2500 → 3000
round down	round up

Rounding to the nearest 100 000

200 000 ← 249 999	250 000 → 300 000
round down	round up

Perimeter and Area

Knowledge Organiser

Key Vocabulary

- metre
- kilometre
- perimeter
- length
- width
- rectangle
- rectilinear
- dimensions

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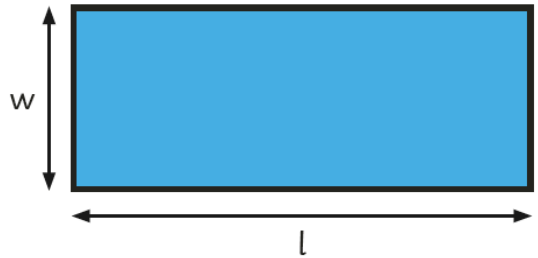
Measure Perimeter

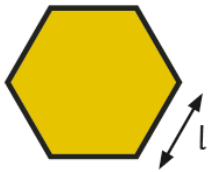
Measure the perimeter of a rectangle:



Measure the length (l) and width (w).

Perimeter = l + w + l + w or (l + w) × 2

Measure the perimeter of regular shapes:



Measure the length (l) and count the number of sides (s) on the shape.

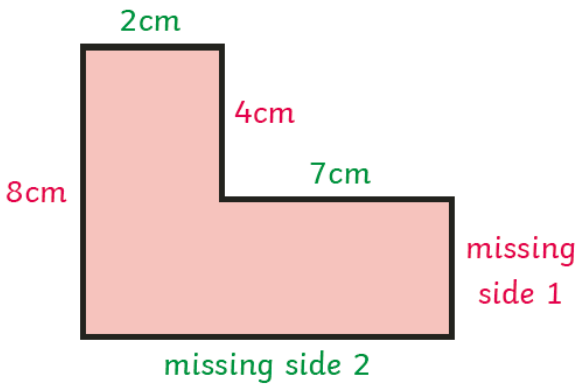
Perimeter = l × s

Measure the perimeter of irregular shapes:

Measure the length of each side and add them together.

Calculate Perimeter

Calculate the missing sides of this rectilinear shape to find the perimeter:



** This shape is not drawn to the dimensions specified.*

Missing side 1 + 4cm = 8cm, so missing side 1 = 4cm.

Missing side 2 = 2cm + 7cm = 9cm

Perimeter = sum of all sides =

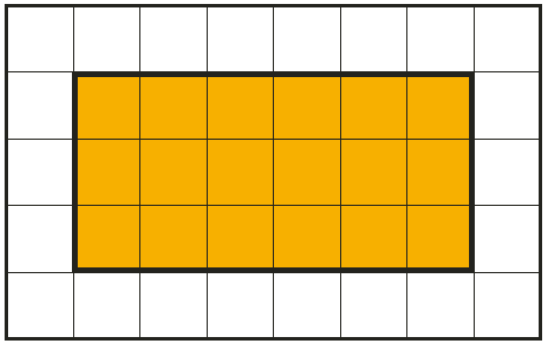
2cm + 4cm + 7cm + 4cm + 9cm + 8cm = 34cm

Length and Perimeter

Knowledge Organiser

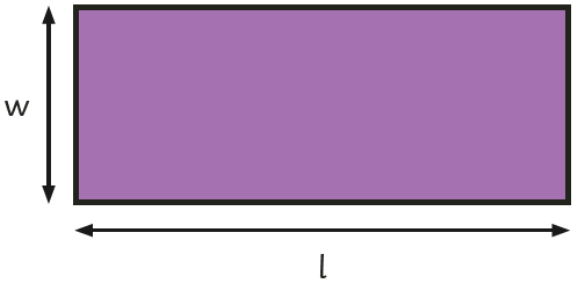
Area of Rectangles

The area of a rectangle on a grid:



Multiply the length × width
= 6 × 3 = 18 squares.

The area of a rectangle = length (l) × width (w).



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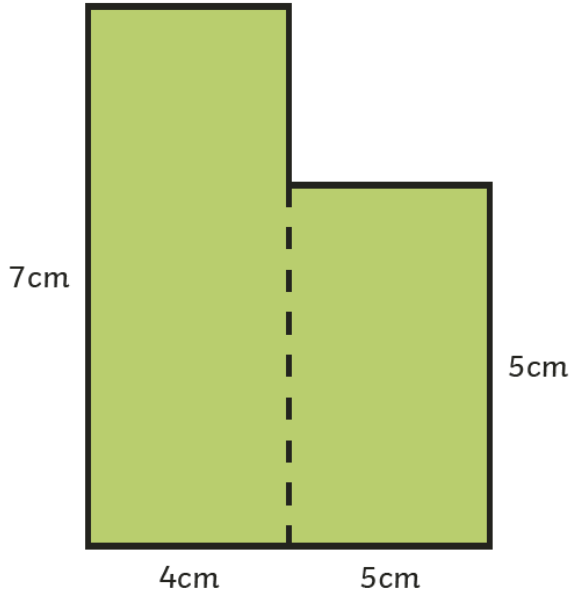
Area of Compound Shapes

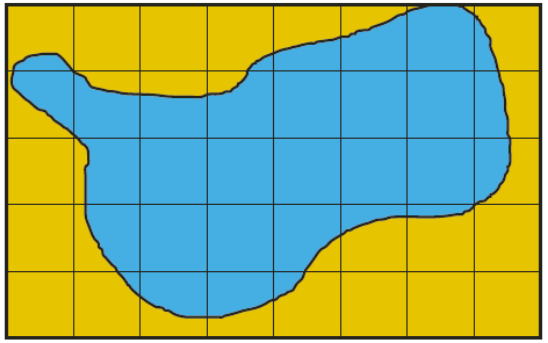
To find the area of a compound shape, divide the shape into rectangles with known dimensions:



Area = 7cm × 4cm + 5cm × 5cm
= $28cm^2$ + $25cm^2$
= $53cm^2$

Area of Irregular Shapes

To find the area of an irregular shape, find the number of whole squares and part squares.



Whole squares = 10
Part squares = 22

Estimate of area = whole squares + half part squares

= $10cm^2$ + $11cm^2$ = $21cm^2$

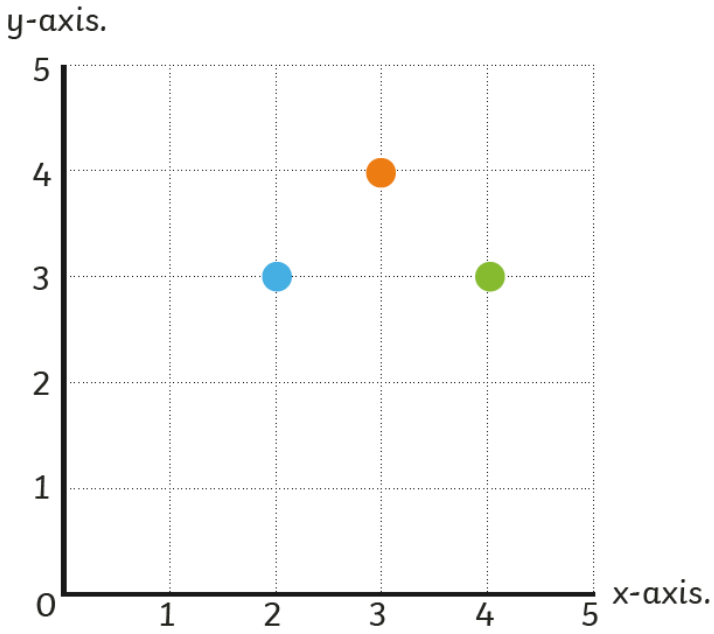
*There are other ways to estimate the area of irregular shapes.

Position and Direction

Knowledge Organiser

Key Vocabulary

- coordinate
- quadrant
- x-axis
- y-axis
- reflection
- mirror line
- translation
- horizontal
- vertical



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**.

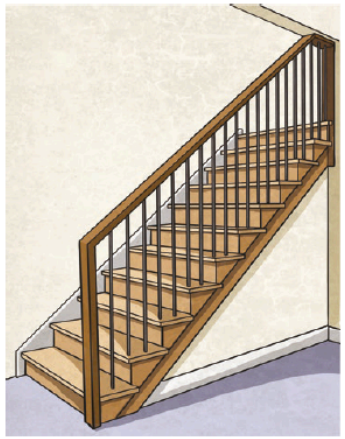
We always read or write the number on the x-axis before the y-axis.

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

The coordinate of the orange spot is **(3, 4)**.

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**.



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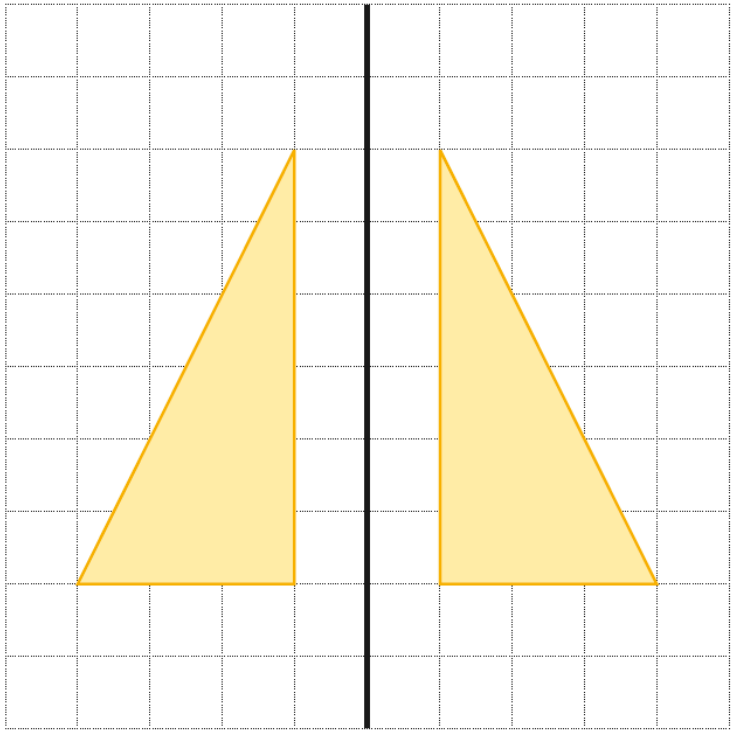
Position and Direction

Knowledge Organiser

Reflection

A shape is reflected when is flipped over a mirror line.

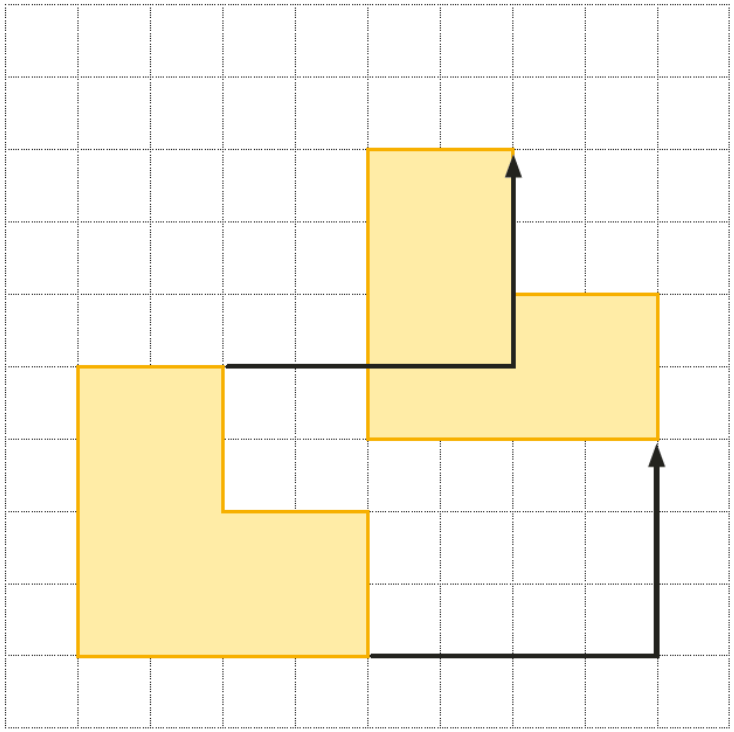
The reflected image is congruent to the original. This means that the measurements of the sides and angles have not changed. Each point of the reflected shape is the same distance from the mirror line as the original shape.



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.



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Properties of Shape

Knowledge Organiser

Key Vocabulary

- angle
- right angle
- acute
- obtuse
- reflex
- protractor
- horizontal
- vertical
- parallel
- perpendicular
- polygon
- regular
- irregular
- two-dimensional
- three-dimensional
- flat face
- curved surface
- edge
- curved edge
- vertex
- apex

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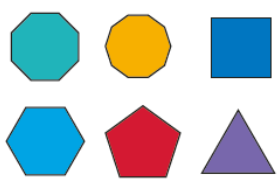
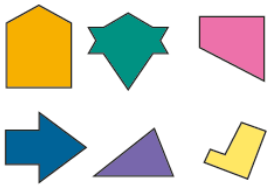
Regular and Irregular Polygons

Regular	Irregular
	

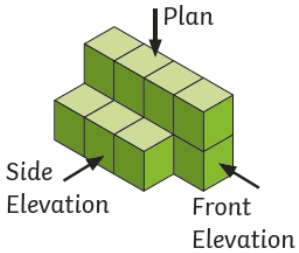
A polygon is any two-dimensional shape formed with straight lines.

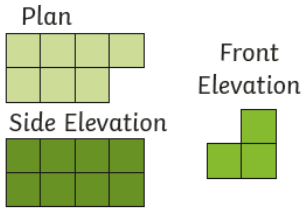
In a regular polygon, all the sides and angles are equal.

In an irregular polygon, the sides and angles are not equal.

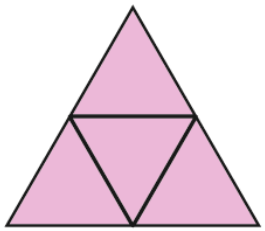
Representations

Cube models can be drawn as 2D representations using different elevations.





A shape net is a 2D drawing of an unfolded 3D shape. When you are drawing or reasoning about shape nets, think carefully about where the edges of the faces meet.



Shape net of a tetrahedron.

Properties of 3D Shapes

Name	Surfaces		Edges		Vertices	Picture
	Flat	Curved	Flat	Curved		
cube	6	0	12	0	8	
cuboid	6	0	12	0	8	
square-based pyramid	5	0	8	0	5	
tetrahedron	4	0	6	0	4	
triangular prism	5	0	9	0	6	
pentagonal prism	7	0	15	0	10	
hexagonal prism	8	0	18	0	12	
octagonal prism	10	0	24	0	16	
octahedron	8	0	12	0	6	

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A cone has an apex. This is because a vertex is the point where two straight edges meet and a cone has no straight edges.

Properties of Shape

Knowledge Organiser

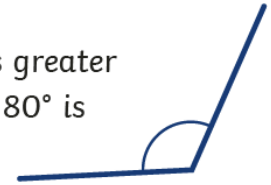
Identifying Angles

Acute Angles

Any angle that measures less than 90° is called an **acute** angle.

Obtuse Angles

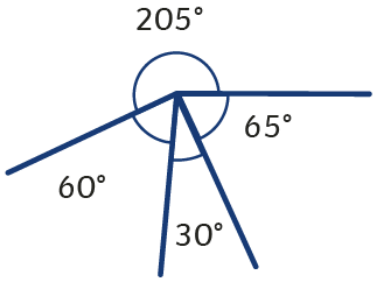
Any angle that measures greater than 90° and less than 180° is called an **obtuse** angle.



Reflex Angles

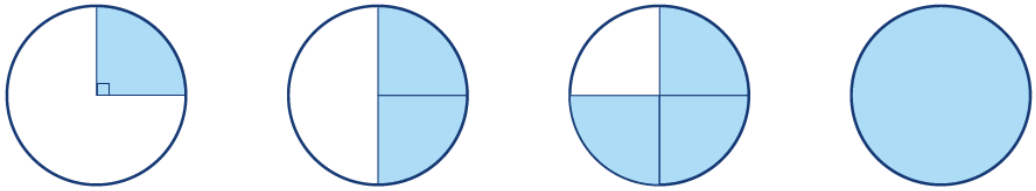
Any angle that measures greater than 180° is called a **reflex** angle.

Angles on a straight line always total 180°.



Angles around a point always total 360°.

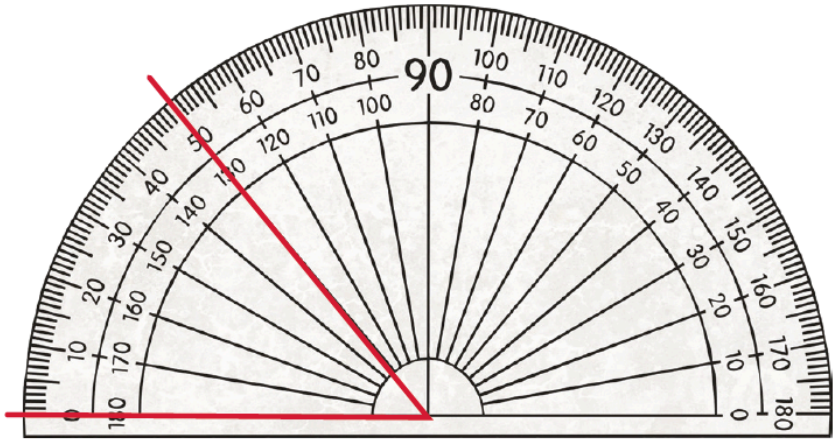
Multiples of 90° can be used as descriptions of a turn.



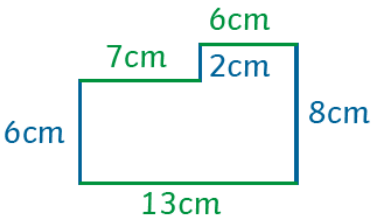
$\frac{1}{4}$ turn - 90° $\frac{1}{2}$ turn - 180° $\frac{3}{4}$ turn - 270° 1 turn - 360°

Measuring and Drawing Angles

To measure angles, we use a protractor. Look carefully at how the numbers on the scale count from 0° to 180° in both directions.



Using Properties of Rectangles



6cm + 2cm = 8cm

7cm + 6cm = 13cm

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