Winchburgh Academy

NUMERACY
ACROSS LEARNING

INTRODUCTION

WHAT IS NUMERACY?

The Broad General phase of Curriculum for Excellence aims to ensure that, in addition to knowledge about specific subjects, learners develop certain skills which will be of benefit to them throughout their life. These skills are known as **SKILLS FOR LEARNING, LIFE AND WORK**.

NUMERACY is one of the key **SKILLS FOR LEARNING, LIFE AND WORK** as it is about the ability to use numbers to solve and understand problems by counting, doing calculations, measuring, and understanding graphs and charts.

The key areas which make up the skill of numeracy are:

- *Estimation and rounding*
- *Number and number processes*
- *Fractions, decimal fractions and percentages*
- *Money*
- *Time*
- *Measurement*
- *Analysis and data*
- *Ideas of chance and uncertainty*

WHAT IS THE PURPOSE OF THE BOOKLET?

This booklet has been produced to give guidance on how certain key numeracy topics are taught in mathematics and across the curriculum. It is hoped that by providing this information to learners and their parents/carers that this booklet will do the following.

- *Allow learners to access an easy way to revise the basics of numeracy and Maths and so improve their skills from revision and practice.*

- *Provide parents/carers with clear information about what numeracy and Maths entail so that they can discuss and revise it with their child – e.g. asking learners for quick recall of number bonds to 20, place value, times tables, measurement, time and money.*

- *Provide parents/carers with clear information about how numeracy and Maths are being taught in school. This will hopefully allow them to support their young person when completing with homework by reinforcing the strategies from class rather than an alternative that may confuse them.*

- *Allow learners to experience success in dealing with numeracy and Maths and so develop their confidence in solving problems by exploring alternative solutions and working with numbers.*

Estimation: Rounding Whole Numbers

Numbers can be rounded to give an approximation.
IMPORTANT RULE
We always round up for 5 or above
78**6** rounded to the nearest 10 is 790.

Round Down ← | → Round up

0 1 2 3 4 | 5 6 7 8 9

We can round as follows –

- Round 2 digit whole numbers to the nearest 10
- Round 3 digit whole numbers to the nearest 10 or 100
- Round 4 digit whole numbers to the nearest 10, 100 or 1000

Example
65**2** rounded to the nearest 10 is 650
78**5** rounded to the nearest 10 is 790

26**5**2 rounded to the nearest 100 is 2700
78**4**5 rounded to the nearest 100 is 7800

2**6**52 rounded to the nearest 1000 is 3000
7**8**45 rounded to the nearest 1000 is 8000

The same principle applies to rounding decimal numbers.

3.6**4** to the nearest tenth is 3.6

In general, to round a number, we must first identify the place value to which we want to round. We must then look at the next digit to the right (the "check digit") - if it is 5 or more round up.

Estimation: Calculation

We can use rounded numbers to give us an approximate answer to a calculation. This allows us to check that our answer is sensible.

Example 1

Tickets for a P7 concert were sold over 4 days. The number of tickets sold each day was recorded in the table below. How many tickets were sold in total?

Monday	Tuesday	Wednesday	Thursday
48	23	18	36

Estimate = 50+20+20+40=130 therefore the exact answer should be about 130.

Calculate:

```
  48
  23
  18
 +36
 ---
 125
```

Answer = 125 tickets

Example 2

A bar of chocolate weighs 42g. There are 20 bars of chocolate in a box. What is the total weight of chocolate in the box?

Estimate = 40 x 20 = 800g

Calculate:

```
  42
 X20
 ---
   0
 840
 ---
 840
```

Answer = 840g

Addition

Mental strategies

There are a number of useful mental strategies for addition. Some examples are given below.

Example Calculate 64 + 27

Method 1 Add tens, then add units, then add together

60 + 20 = 80 4 + 7 = 11 80 + 11 = 91

Method 2 Split up number to be added (last number 27) into tens and units and add separately.

64 + 20 = 84 84 + 7 = 91

Method 3 Round up to nearest 10, then subtract

64 + 30 = 94 but 30 is 3 too much so subtract 3;
94 - 3 = 91

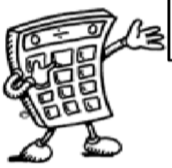
Written Method

When adding numbers, ensure that the numbers are lined up according to place value. Start at right hand side, write down units, carry tens under the line.

Example Add 3032 and 589

3032	→	3032	→	3032	→	3032
+589		+589		+589		+589
1		21		621		3621
1		1 1		1 1		1 1
2 + 9 = 11		3+8+1=12		0+5+1=6		3 + 0 = 3

Subtraction



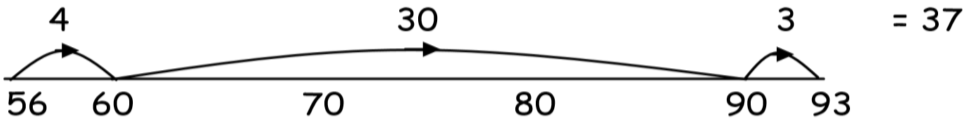
We use decomposition as a written method for subtraction (see below). Alternative methods may be used for mental calculations.

Mental Strategies

Example Calculate 93 - 56

Method 1 Count on

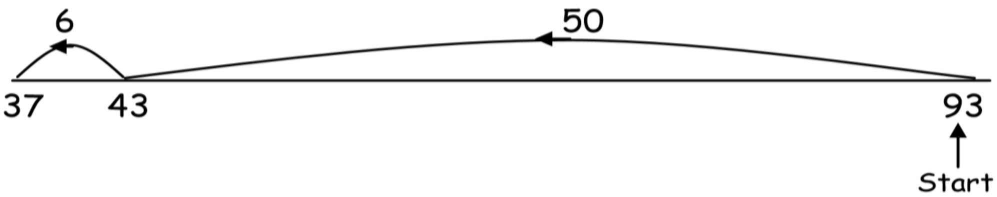
Count on from 56 until you reach 93. This can be done in several ways e.g.



Method 2 Break up the number being subtracted

e.g. subtract 50, then subtract 6

93 - 50 = 43
43 - 6 = 37



Written Method

Example 1 4590 – 386

```
   8 1
  4590
 - 386
  4204
```

We do not "borrow and pay back".

Example 2 Subtract 692 from 3000

```
 2 9 9 1
  3000
 - 692
  2308
```

Important steps for example 1

1. Say "zero subract 6, we cannot do "
2. Look to next column exchange one ten for ten units.
3. Then say "ten take away six equals four"
4. Normal subraction rules can be used to then complete the question.

Multiplication 1

It is essential that you know all of the multiplication tables from 1 to 10. These are shown in the tables square below.

×	1	2	3	4	5	6	7	8	9	10
1	1	2	3	4	5	6	7	8	9	10
2	2	4	6	8	10	12	14	16	18	20
3	3	6	9	12	15	18	21	24	27	30
4	4	8	12	16	20	24	28	32	36	40
5	5	10	15	20	25	30	35	40	45	50
6	6	12	18	24	30	36	42	48	54	60
7	7	14	21	28	35	42	49	56	63	70
8	8	16	24	32	40	48	56	64	72	80
9	9	18	27	36	45	54	63	72	81	90
10	10	20	30	40	50	60	70	80	90	100

Mental Strategies

Example Find 18 × 6

Method 1

10 × 6
= 60

8 × 6
= 48

60 + 48
= 108

Method 2

20 × 6
=120

20 is 2 too many
so take away 6x2

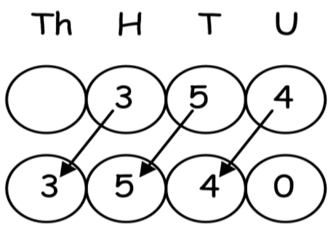
120 - 12
= 108

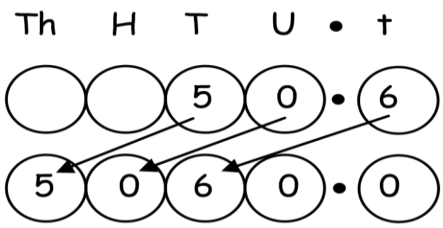
Multiplication 2

Multiplying by multiples of 10 and 100

To multiply by **10** you move every digit ***one*** place to the left.
To multiply by **100** you move every digit ***two*** places to the left.

Example 1 (a) Multiply 354 by 10 (b) Multiply 50.6 by 100





354 x 10 = 3540

50.6 x 100 = 5060

(c) 15 x 30

> To multiply by 30, multiply by 3, then by 10.

15 x 3 = 45
45 x 10 = 450

so 15 x 30 = 450

(d) 56 x 200

> To multiply by 200, multiply by 2, then by 100.

56 x 2 = 112
112 x 100 = 11200

so 56 x 200 = 11 200

We may also use these rules for multiplying decimal numbers. Decimal points do not move!

Example 2 (a) 2.3 x 20 (b) 1.12 x 40

(a)
2.3 x 2 = 4.6
4.6 x 10 = 46.0
2.3 x 20 = 46.0

(b)
1.12 x 4 = 4.48
4.48x 10 = 44.8

so 1.12 x 40 = 44.8

Multiplication 3

Multiplying by written methods

Example 1 Multiply 354 by 19

```
    354
  ×  19
  -----
   3186  ← 354 × 9
    4 3
  +3540  ← 354 × 10
  -----
   6726
  -----
     1
```

The 'zero' is placed in the units column so that we can hold the tens place, them multiply as normal by the 'ten', in this case '1'

Example 2 Multiply 456 by 32

```
     456
   ×  32
   -----
     912   ← 456 × 2
     1 1
  +13680   ← 456 × 30
   1 1 1
  ------
   14592
  ------
    1
```

The 'zero' is placed in the units column so that we can hold the tens place, then multiply as normal by the 'ten', in this case '3'

*Please note that carrying would be expected in the written calculation, but has been omitted for clarity.

** To multiply by a three digit number you simply add two zeros to hold the 'hundreds' place on the third line of the calculation and multiply by the 'hundred'

Multiplication 4

Partitioning

Example: 43 x 26

43 x 26 = (43 x 20) + (43 x 6)

```
  43        43       860
x 20       x 6      +258
 860       258      1118
```

Factor Pairs

Example: 28 x 72

28 x 72 = 7 x 4 x 72 or 28 x 72 = 28 x 8 x 9

```
  72     504                 28     224
 x 7    x  4                x 8     x 9
 504    2016                224    2016
```

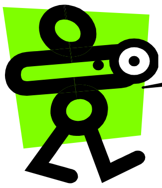
Arrays (The "Grid" method)

Example: 25 x 36

x	30	6
20	600	120
5	150	30

```
 600
 120
 150
+ 30
 900
```

Division



You should be able to divide by a single digit or by a multiple of 10 or 100 without a calculator.

Written Method

18 divided by 3 can be shown as…

18 ÷ 3 = or 3⟌18 or $\frac{18}{3}$ or $\frac{1}{3}$ of 18

Example 1 There are 56 pupils in P7, shared equally between 2 classes. How many pupils are in each class?

```
   2 8
2 ⟌5 ¹6
```

There are 28 pupils in each class

Example 2 Divide 4 74 by 3

```
   1  5  8
3 ⟌4 ¹7 ²4
```

Always carry the remainder to the next column.

Example 3 A jug contains 2.64 litres of juice. If it is poured evenly into 8 glasses, how much juice is in each glass?

```
   0 .  3  3
8 ⟌2 . ²6 ²4
```

Each glass contains 0.33 litres

The decimal points must stay in line.
If you have a remainder at the end of a calculation, add a zero onto the end of the decimal and continue with the calculation.

Division 2

Partitioning

Example: 87 ÷ 3

87 ÷ 3 = (60 ÷ 3) + (27 ÷ 3)

$$\begin{array}{r} 20 \\ 3\overline{)60} \end{array} \qquad \begin{array}{r} 9 \\ 3\overline{)27} \end{array} \qquad 20 + 9 = \underline{29}$$

Factor Pairs

Example: 624 ÷ 16

624 ÷ 16 = 624 ÷ 4 ÷4 or 624 ÷ 16 = 624 ÷ 8 ÷ 2

$$\begin{array}{r} 156 \\ 4\overline{)624} \end{array} \qquad \begin{array}{r} 39 \\ 4\overline{)156} \end{array} \qquad\qquad \begin{array}{r} 78 \\ 8\overline{)624} \end{array} \qquad \begin{array}{r} 39 \\ 2\overline{)78} \end{array}$$

Long Division

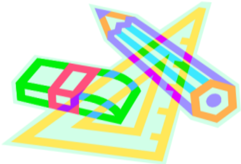
Example: 300 ÷ 25

$$\begin{array}{r} 12 \\ 25\overline{)300} \\ -\ 250 \\ \hline 50 \\ -\ 50 \\ \hline 0 \end{array}$$

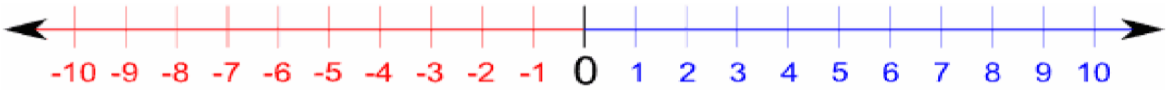
25 x 10

25 x 2

Integers - Adding and Subtracting



An integer is what is more commonly known as a whole number. It may be positive, negative, or the number zero, but it must be whole.



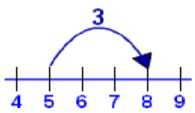
Negative Numbers (-) Positive Numbers (+)

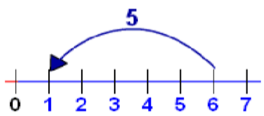
Remember: No sign in front of a number means it is positive

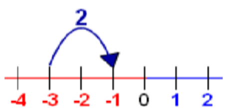
Adding and Subtracting positive numbers

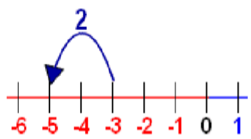
A number line may be used if pupils are finding questions difficult to do mentally

Examples 5+3 = 8 6-5 = 1









If you *add* a *positive number* you move to the *right* on a number line.
If you *subtract* a *positive number* you move to the *left* on a number line.
Always start from the position of the first number.

Adding or subtracting *negative* numbers.

Adding a negative number is the same as subtracting:

Example 7 + (–3) is the same as 7 – 3 = 4

General rule **a+(–b) = a – b**

Subtracting a negative number is the same as adding:

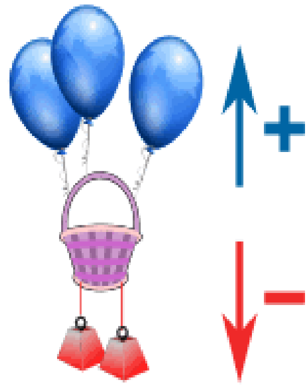
Example (–5) – (–2) is the same as (–5) + 2 = –3

General rule **a–(–b) = a + b**

Integers – Adding and Subtracting 2

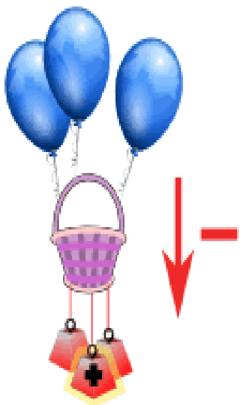
The following images can help you to visualise addition and subtraction of a negative:

Balloons and Weights



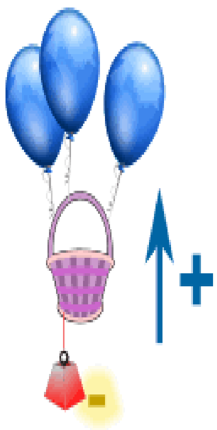
This basket has balloons and weights tied to it:

- The balloons pull up (**positive**)
- And the weights drag down (**negative**)



You can add weights (you are **adding negative** values)

➜ the basket gets pulled downwards (negative)



And you can take away weights (you are **subtracting negative** values)

➜ the basket gets pulled upwards (positive)

Integers – Multiplying and Dividing

The following rules apply when multiplying and dividing integers:

When You Multiply:

			Example
+ × +	two positives you get a positive:	+	$3 \times 2 = 6$
− × +	a positive and a negative you get a negative:	−	$(-3) \times 2 = -6$
+ × −	a negative and a positive you get a negative:	−	$3 \times (-2) = -6$
− × −	two negatives you get a positive:	+	$(-3) \times (-2) = 6$

When you Divide the same rules apply:

Examples

(-6) ÷ (-2) = 3

15 ÷ (-3) = -5

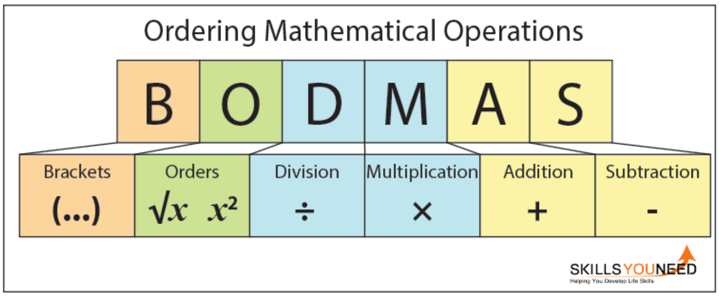
-20 ÷ 5 = -4

Quick Rule:

If the signs are the same, the answer is positive.

If the signs are different, the answer is negative.

Consider this: what is the answer to 2 + 4 x 5 ?



Is it (2+4) x 5 or 2 + (4 x 5)

= 6 x 5 = 2 + 20

= 30 = 22

The correct answer is 22.

The **BODMAS** rule tells us which operations should be carried out first.
BODMAS represents:

(B)rackets

(O)rder

(D)ivide

(M)ultiply

(A)dd

(S)ubract

Note:
Multiplication and division rank equally, so you go from left to right in the calculation, doing each operation in the order in which it appears.
Likewise, addition and subtraction rank equally, so, again, do the operations in the order in which they appear.

Therefore in the example above multiplication should be done before addition. (Note order means a number raised to a power such as 2^2 or $(-3)^3$)

Scientific calculators are programmed with these rules, however some basic calculators may not, so take care.

Example 1 15 – 12 ÷ 6 BODMAS tells us to divide first

= 15 – 2

= 13

Example 2 (9 + 5) x 6 BODMAS tells us to work out the brackets first

= 14 x 6

= 84

Example 3 18 + 6 ÷ (5-2) Brackets first

= 18 + 6 ÷ 3 Then divide

= 18 + 2 Now add

= 20

Multiples

When you multiply a number by any integer (not a fraction), the answer is called a **multiple.**

For example, 3 x 0 = **0** 3 x 1 = **3** 3 x 2 = **6** 3 x 3 = **9** ...

So the multiples of 3 are 0, 3, 6, 9, 12, 15, 18, 21, 24, . . .

Common Multiples and the L.C.M

Common multiples are multiples which two or more numbers have in common, for example:

The first 10 multiples of 3 are 0, 3, 6, 9, 12, 15, 18, 21, 24, 27, 30.

The first 10 multiples of 4 are: 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40.

Common multiples are the numbers which are multiples of **both** 3 **and** 4.

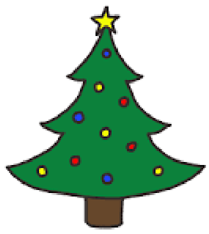
So some common multiples of 3 and 4 are **12 and 24**.
(Remember: there are more if you continue to list more multiples of each!)

The lowest common multiple (L.C.M.) is the smallest (lowest) multiple that numbers have in common.

The lowest common multiple (L.C.M.) of 3 and 4 is <u>**12**</u>

Solving Problems using multiples

On a Christmas tree the red lights flash every 4 seconds, the white lights flash every 5 seconds and the orange lights flash every 6 seconds.
How long will it take once switched on, for all the lights to flash at the same time?



To solve this problem, list the multiples of 4, 5 and 6.

Multiples of 6: 0, 6, 12, 18, 24, 30, 36, 42, 48, 54, <u>60</u>
Multiples of 5: 0, 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 55, <u>60</u>
Multiples of 4: 0, 4, 8, 12, 16, 20, 24, 28, 32, 36, 40, 44, 48, 52, 56, <u>60</u>

Common multiple of 4, 5 and 6 is 60, therefore it will take <u>**60 seconds**</u> until all the lights flash at the same time.

Factors

Factors are the numbers we can multiply together to get another number. Factors can also be thought of as numbers that divide into another number **exactly** (with no remainder!)

Example - What are the factors of 12?

1 x 12 = 12
2 x 6 = 12
3 x 4 = 12

- List your multiplication factor pairs
- Remember 3 x 4 is the same as 4 x 3 so you don't need to list it twice.

Therefore, the factors of 12 are 1,2,3,4, 6 and 12

Common Factors

Common factors are factors which two or more numbers have in common, for example:

List of factors of 12 : 1,2,3,4,6,12
List of factors of 18 : 1,2,3,6,9,18

Common factors of 12 and 18 are 1,2,3 and 6.

Highest Common Factor (H.C.F.)

The highest common factor (H.C.F.) is the highest factor that 2 or more numbers have in common. The highest common factor (H.C.F.) of 12 and 18 is **6.**

Solving Problems using factors

Amir has a bag of 36 orange-flavoured sweets and Amy has a bag of 44 grape-flavoured sweets. They have to divide up the sweets into small trays with an **equal** number of sweets. If there is no remainder, find the largest possible number of sweets in each tray.

To solve this problem, list the factors of 36 and 44.

Factors of 36: 1, 2, 3, **4**, 6, 9, 12, 18, 36
Factors of 44: 1, 2, **4**, 11, 22, 44

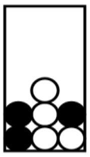
The HCF of 36 and 44 is 4 – so the largest number of sweets in a tray is **4**.

Fractions 1

Addition, subtraction, multiplication and division of fractions are studied in mathematics.
However, the examples below may be helpful in all subjects.

Understanding Fractions

Example
A jar contains black and white sweets.

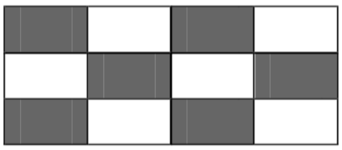


What fraction of the sweets are black?

There are 3 black sweets out of a total of 7, so $\frac{3}{7}$ of the sweets are black.

Equivalent Fractions

Example
What fraction of the flag is shaded?



6 out of 12 squares are shaded. So $\frac{6}{12}$ of the flag is shaded.

It could also be said that $\frac{1}{2}$ the flag is shaded.

$\frac{6}{12}$ and $\frac{1}{2}$ are **equivalent fractions**.

Fractions 2

Simplifying Fractions

The top of a fraction is called the **numerator**, the bottom is called the **denominator**.
To simplify a fraction, divide the **numerator** and **denominator** of the fraction by the same number.

Example 1

(a) $\frac{20}{25} = \frac{4}{5}$ (÷5 top and bottom)

(b) $\frac{16}{24} = \frac{2}{3}$ (÷8 top and bottom)

This can be done repeatedly until the numerator and denominator are the smallest possible numbers - the fraction is then said to be in it's **simplest form**.

Example 2 Simplify $\frac{72}{84}$ $\quad \frac{72}{84} = \frac{36}{42} = \frac{18}{21} = \frac{6}{7}$ (simplest form)

Calculating Fractions of a Quantity

To find the fraction of a quantity, divide by the denominator.
To find $\frac{1}{2}$ divide by 2, to find $\frac{1}{3}$ divide by 3, to find $\frac{1}{7}$ divide by 7 etc.

Example 1 Find $\frac{1}{5}$ of £80

$80 \div 5 = 16$ $\quad$ **£16**

Example 2 Find $\frac{3}{4}$ of £48

$48 \div 4 = 12$ $\quad$ $12 \times 3 =$ **£36**

To find $\frac{3}{4}$ of a quantity, start by finding $\frac{1}{4}$ then multiply by 3 (the numerator)

Percentages 1

Percent means out of 100.
A percentage can be converted to an equivalent fraction or decimal.

10% means $\frac{10}{100}$ simplified to $\frac{1}{10}$

10% is therefore equivalent to $\frac{1}{10}$ and 0.1

Common Percentages

Some percentages are used very frequently. It is useful to know these as fractions and decimals.

Percentage	Fraction	Decimal
1%	$\frac{1}{100}$	0.01
10%	1/10	0.1
12.5%	1/8	0.125
20%	1/5	0.2
25%	$\frac{1}{4}$	0.25
$33\frac{1}{3}\%$	1/3	0.333…
50%	1/2	0.5
$66\frac{2}{3}\%$	2/3	0.666…
75%	3/4	0.75
100%	1 whole	1.0

Percentages 2

There are many ways to calculate percentages of a quantity. Some of the common ways are shown below.

Non - Calculator Methods

Method 1 **Using Equivalent Fractions**

Example Find 25% of £160

$$25\% \text{ of } £160 = \frac{1}{4} \text{ of } £160 = £160 \div 4 = £40$$

Method 2 **Using 1%**

In this method, first find 1% of the quantity (by dividing by 100), then multiply to give the required value.

Example Find 9% of 200g

$$1\% \text{ of } 200g = \frac{1}{100} \text{ of } 200g = 200g \div 100 = 2g$$

so 9% of 200g = 9 x 2g = 18g

Method 3 **Using 10%**

This method is similar to the one above. First find 10% (by dividing by 10), then multiply to give the required value.

Example Find 70% of £35

$$10\% \text{ of } £35 = \frac{1}{10} \text{ of } £35 = £35 \div 10 = £3.50$$

so 70% of £35 = 7 x £3.50 = £24.50

Percentages 3

Calculator Method

To find the percentage of a quantity using a calculator, change the percentage to a decimal, then multiply.

Example 1 Find 23% of £15000

23% of £15000

= 23 ÷ 100 x 15000

= **£3450**

Remember! 23% = $\frac{23}{100}$ = 23 ÷ 100

This method does not use the % button on calculators. The methods usually taught in mathematics departments are all based on converting percentages to decimals.

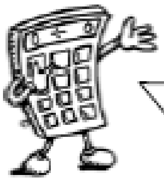
Example 2 House prices increased by 19% over a one year period. What is the new value of a house which was valued at £236000 at the start of the year?

19% = 0.19 so Increase = 0.19 x £236000
= £44840

Value at end of year = original value + increase
= £236000 + £44840
= £280840

The new value of the house is £280840

Ratios



When quantities are to be mixed together, the ratio, or proportion of each quantity is often given. The ratio can be used to calculate the amount of each quantity, or to share a total into parts.

Writing Ratios

Example 1

To make a fruit drink, 4 parts water is mixed with 1 part of cordial.
The ratio of water to cordial is 4:1
(said "4 to 1")
The ratio of cordial to water is 1:4.

Order is important when writing ratios.

Example 2

In a bag of balloons, there are 5 red, 7 blue and 8 green balloons.

The ratio of red : blue : green is 5 : 7 : 8

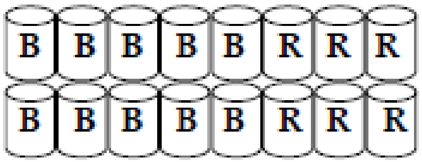
Simplifying Ratios

Ratios can be simplified in much the same way as fractions.

Example 1

Purple paint can be made by mixing 10 tins of blue paint with 6 tins of red. The ratio of blue to red can be written as 10 : 6

It can also be written as 5 : 3, as it is possible to split up the tins into 2 groups, each containing 5 tins of blue and 3 tins of red.



Blue : Red = 10 : 6
= 5 : 3

To simplify a ratio, divide each figure in the ratio by a common factor.

Simplifying Ratios (continued)

Example 2

Simplify each ratio:

(a) 4:6 (b) 24:36 (c) 6:3:12

(a) 4:6
= 2:3

Divide each figure by 2

(b) 24:36
= 2:3

Divide each figure by 12

(c) 6:3:12
= 2:1:4

Divide each figure by 3

Example 3

Concrete is made by mixing 20 kg of sand with 4 kg cement. Write the ratio of sand : cement in its simplest form

Sand : Cement = 20 : 4
= 5 : 1

Using ratios

The ratio of fruit to nuts in a chocolate bar is 3 : 2. If a bar contains 15g of fruit, what weight of nuts will it contain?

	Fruit	Nuts	
	3	2	
×5			×5
	15	**10**	

So the chocolate bar will contain 10g of nuts.

Sharing in a given ratio

Example

Lauren and Connor earn money by washing cars. By the end of the day they have made £90. As Lauren did more of the work, they decide to share the profits in the ratio 3:2. How much money did each receive?

Step 1 Add up the numbers to find the total number of parts

$3 + 2 = 5$

Step 2 Divide the total by this number to find the value of each part

$90 \div 5 =$ £18

Step 3 Multiply each figure by the value of each part

3 x £18 = £54
2 x £18 = £36

Step 4 Check that the total is correct

£54 + £36 = £90 √

Lauren received £54 and Connor received £36

Proportion

Two quantities are said to be in direct proportion if when one doubles the other doubles.
We can use proportion to solve problems.

It is often useful to make a table when solving problems involving proportion.

Example 1
A car factory produces 1500 cars in 30 days. How many cars would they produce in 90 days?

Days	Cars
30	1500
90	**4500**

(×3 on both sides)

The factory would produce 4500 cars in 90 days.

Example 2
5 adult tickets for the cinema cost £27.50. How much would 8 tickets cost?

Tickets	Cost
5	£27.50
1	£5.50
8	£44.00

Find the cost of 1 ticket →

Working:

£27.50 ÷ 5 = £5.50

£5.50 × 8 = £44.00

The cost of 8 tickets is £44

Time 1

Time may be expressed in 12 or 24 hour notation.

Time Facts – What you should already know!

60 seconds	=	1 minute
60 minutes	=	1 hour
24 hours	=	1 day
7 days	=	1 week
52 weeks	=	1 year
365 days	=	1 year
366 days	=	1 leap year

How many days are in each month? Learn this rhyme, it works!

Thirty days has September,
April June and November,
All the rest have 31 days clear,
Except February alone which has
28 days clear and
29 in a leap year.

12-hour clock Time can be displayed on a clock face, or digital clock.

05: 15

These clocks both show fifteen minutes past five, or quarter past five.

When writing times in 12 hour clock, we need to add am or pm after the time.
am is used for times between midnight and 12 noon (morning)
pm is used for times between 12 noon and midnight (afternoon / evening).

24-hour clock

In 24 hour format the hours are written as numbers between 00 and 24. Midnight is expressed as 00 00 or 24 00.
After 12 noon the hours are noted as 13, 14, 15...etc.

Hours → hh, Minutes → mm

	hh mm
Midnight	00 00
1.00am	01 00
5.00am	05 00
9.00am	09 00
10.00am	10 00
12 noon	12 00
1.00pm	13 00
4.00pm	16 00
7.00pm	19 00
9.15pm	21 15
10.30pm	22 30
11.45pm	23 45

Time 2

We can work out durations of time by "counting on". This is a simple method to learn and is useful for timetables or schedules

Time Calculations

Example 1 How long is it from 9.30am to 11.15 am

Method - Working

9.30 -> 10.00 -> 11.00 -> 11.15

(30mins) + (1hr) + (15mins) = 1hr 45 minutes

TIME SHOULD NOT BE CALCULATED USING SUBTRACTION

Example 2 How long is it from 13 55 to 16 30

13 55 -> 14 00 -> 16 00 -> 16 30

(5mins) + (2 hrs) + (30mins) = 2hrs 35 minutes

Reading timetables

	1st	2nd	3rd	4th	5th	6th
Depot	07:30	07:45	08:00	08:15	08:30	08:45
Green St	07:40	07:55	08:10	08:25	08:40	08:55
High St	07:45	08:00	08:15	08:30	08:45	?
Central Park	07:48	08:03	08:18	08:33	08:48	09:03

When reading timetables you often have to convert to and from 24 hour clock.

To convert from 24 hour time to 12 hour time:

A. If the hour is 13 or more, subtract 12 from the hours and call it **pm.** Otherwise it is **am.**

B. If the hour is 12, leave it unchanged, but call it **pm.**

C. If the hour is 00, make it 12 and call it **am**.

D. Otherwise, leave the hour unchanged and call it **am**.

To convert from 12-hour time to 24-hour time:

A. If the **pm** hour is from 1 to 11, add 12.

B. If the **pm** hour is 12, leave it as is.

C. If the **am** hour is a single digit, place a 0 before it (1.00am = 01 00)

D. Otherwise, leave the hour unchanged. Then drop the **am** or **pm**, of course.

Length

Length is a measurement of the distance between two points

Language

millimetre (mm) centimetre (cm) metre (m)
kilometre (km)

Units of Length

1 centimetre = 10 millimetres
1 metre = 100 centimetres
1 kilometre = 1000 metres

Estimate

Is your school tie shorter than one metre, longer than one metre or about the same length as one metre?

Is a door shorter than, longer than or about two and a half metres high?

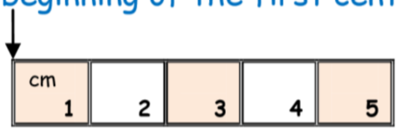
Which is longer - two thousand metres or one and a half kilometres?

Can you draw a line $8\frac{1}{2}$cm long.

How long is your pencil?

Which is shorter: seven and a half kilometres or six thousand metres?

HINT
When you are measuring the length of something look at your ruler or tape measure carefully. Make sure you start measuring from the beginning of the first centimetre.



Weight

We use balances or scales to find out how heavy something is. We use bathroom scales to weigh ourselves. In the post office they use scales to weigh letters and parcels.

Language

kilogram half-kilogram gram

weighs about / less than / more than

Units of Weight

1 kilogram - 1000 grams

1 tonne = 1000 kilograms

Common questions

Example 1

Converting grams to kilograms

5264 g = 5 kg 264g = 5.264kg

3600g = 3kg 600g = 3.6kg

Example 2

Convert kilograms to grams

9kg 42 g = 9042g

14.5kg = 14500g

9kg = 9000g

Example 3

Addition of mixed examples

780g + 4 kg 234g + 9.5kg (Convert to g)

780g + 4234g + 9500g = 14 514g

14 154g = 14kg 514g or 14.514kg (convert g to kg & g or kg)

Volume

The volume is the amount of space taken up by a 3D shape and this is sometimes called capacity.
Solid Volumes are measured in cubic centimetres and cubic metres (cm^3 and m^3)
Liquid volumes are measured in millilitres and litres. (ml and l)

Units of capacity (liquid)

1 litre (l) = 1000 millilitres (ml)

$\frac{1}{2}$litre (l) = 500 millilitres (ml)

Units of capacity (solid)

$1\ m^3 = 1000\ cm^3$

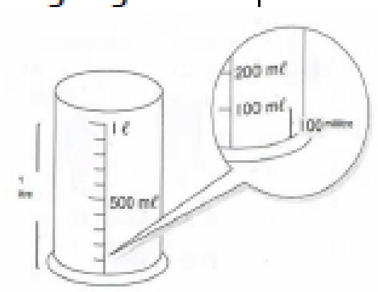
Common questions

Example 1
Change millilitres to litres

3 l = 3000ml	8500ml = 8.5l
6.2l = 6200ml	6254ml = 6.254l

Example 2
Write down the volume of liquid in the measuring tube?

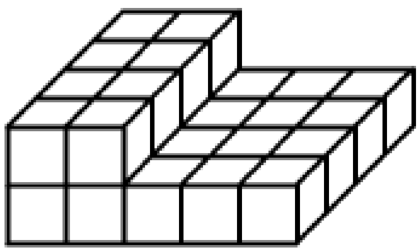
It is important to work out the scale, whether it is going up in 1ml, 2ml, 5ml, 10ml etc.



Example 3
Write down the volume of the shape in cm^3

Count all of the cubes, not forgetting the cubes under the first two rows.

Answer = $28cm^3$

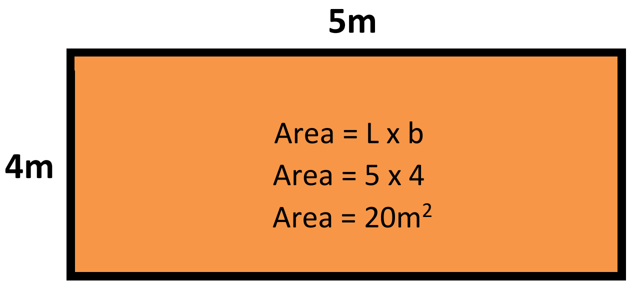


Area

The area of flat shape is defined as the amount of space it occupies and is generally measured in square centimetres (cm^2), square metres (m^2) and square kilometres (km^2)

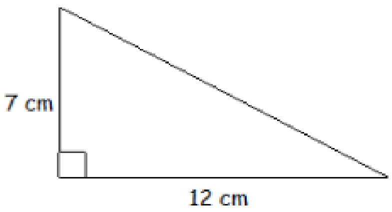
The area of a rectangle can be measured by multiplying the length and breadth

Area = Length x Breadth



The area of a triangle can be found in the following ways:

Example 1



$\text{Area} = \frac{1}{2}\text{Length} \times \text{Breadth}$

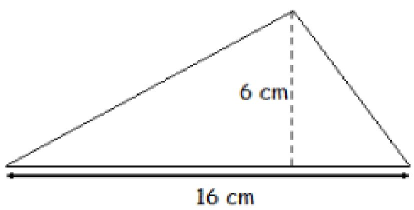
$= \frac{1}{2}(12 \times 7)$

$= \frac{1}{2}(84)$

$\text{Area} = \underline{\mathbf{42\ cm^2}}$

For the area of right-angled triangles we can use the formula $A = \frac{1}{2}\ L \times B$

Example 2



$\text{Area} = \frac{1}{2}\text{Base} \times \text{Height}$

$= \frac{1}{2}(16 \times 6)$

$= \frac{1}{2}(96)$

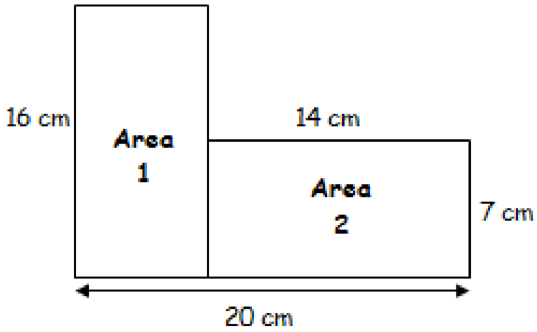
$\text{Area} = \underline{\mathbf{48\ cm^2}}$

For the area of other triangles we can use the formula $A = \frac{1}{2}\ b \times h$

Area 2

Areas of composite shapes can be found by separating the shape into regular shapes, finding the area of each regular shape and adding to find the total.

Example



Area 1 = Length x Breadth

= (20-14) x 16

= 6 x 16

Area 1 = 96 cm^2

Area 2 = Length x Breadth

= 14 x 7

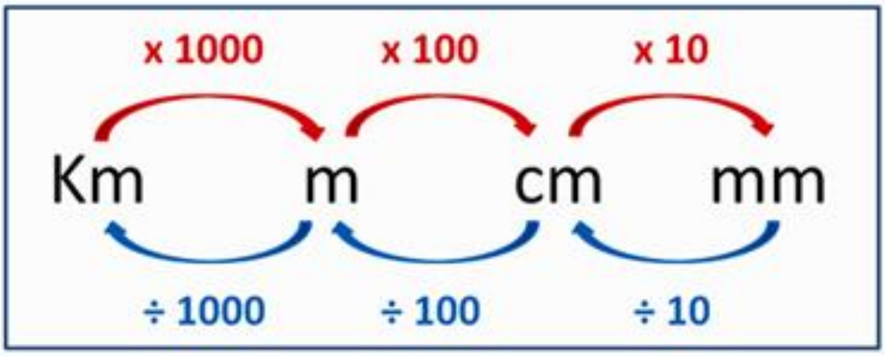
Area 2 = 98 cm^2

Total Area = 96 + 98

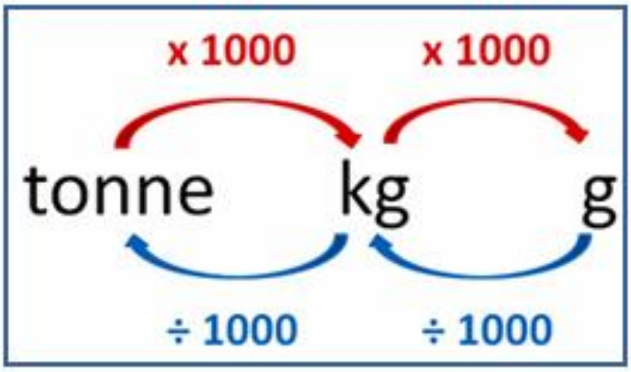
= **194** cm^2

Conversion Diagrams

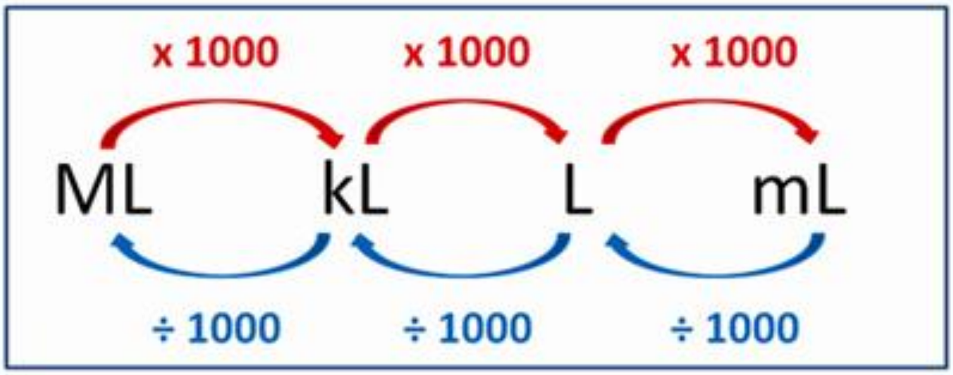
Length



Weight



Volume



Patterns

Patterns can be described as a repeated design or an ordered set of numbers arranged according to a given rule.

Examples of these in everyday life are as follows:

Repeating pattern of shapes

numbers going up in twos (odd numbers)

Continuing a pattern:

To continue a pattern you must first understand the rule of the pattern, e.g. is it going up/down and by how much?

<u>Examples</u>

Identify the rule and continue for three more terms:

(a) 2 11 20 29

+ + +

Rule: add nine

Next 3 terms: 38, 47, 56

(b) 78 72 66 60

- - -

Rule: subtract 6

Next 3 terms: 54, 48, 42

(c) 2 6 18 54

× × ×

Rule: multiply by 3

Next 3 terms: 162, 846, 2538

(d) 800 400 200 100

÷ ÷ ÷

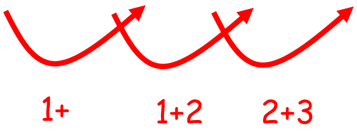
Rule: divide by 2

Next 3 terms: 50, 25, 12.5

Special number patterns: Fibonacci

Each term in the Fibonacci sequence is generated by adding the two previous terms together, for example:

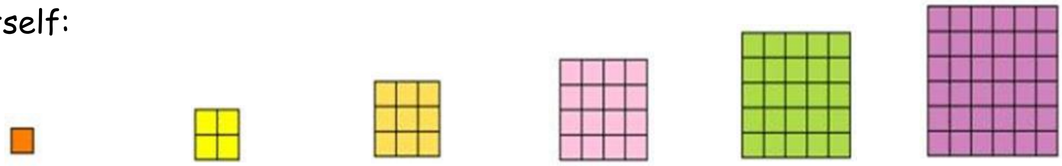
1 1 2 3 5 8 13....



When you divide any two numbers that are next to each other you will get a number very similar to the Golden Ratio which can be seen in nature:

Square numbers:

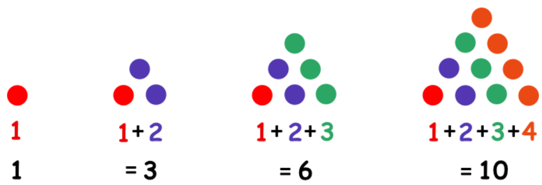
Square numbers are generated when you multiply an integer by itself.
Each term in the pattern is generated by multiplying the number of the term by itself:



Term 1 Term 2 Term 3 Term 4 Term 5 Term 6
= 1 x 1 = 2 x 2 = 3 x 3 = 4 x 4 = 5 x 5
= 6 x 6
= 1 = 4 = 9 = 16 = 25 = 36

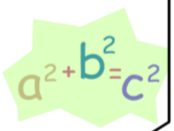
Triangular numbers:

Triangular numbers are generated when you create a pattern of dots to form triangles. The pattern can be drawn using equilateral triangle where the number of dots which make a side is equal to the number of the term:



You can generate each term in the pattern by finding the sum of the whole numbers from 1 to the number of the term, e.g. the 7th term is:
1 + 2 + 3 + 4 + 5 + 6 + 7 = 28

Equations



An equation is a statement or mathematical expression which says one side is equal to the other side.
Think of each side of the equation as one side of a set of scales which says one side is equal to the other.
This method is called Balancing.

RULES

Letters to the left, numbers to the right. If you change side you change sign

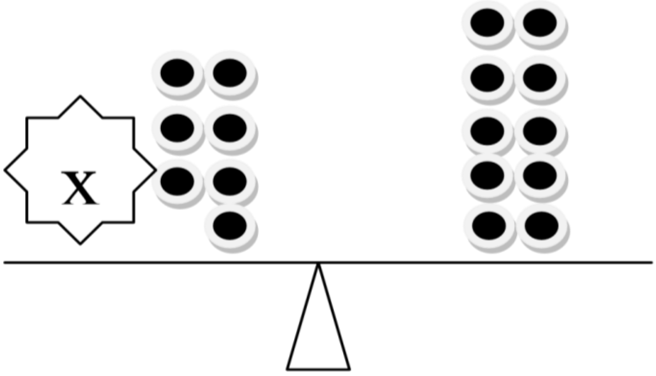
Example 1

Solve for x

$x + 7 = 10$

$x = 10-7$

$x = 3$



Example 2

$4x = 48$

$x = 48 \div 4$

$x = 12$

Example 3

$2x + 3 = 9$ identify the number +3 must change sides and sign

$2x = 9-3$ +3 changes to -3

$2x = 6$

$x = 6 \div 2$

$x = 3$

Important points to remember

The letter x should be written differently from a multiplication sign, but remember other letters may also be used. Only one equals sign per line. Equals signs should be kept beneath each other in line.

2D Shapes

A polygon is a two-dimensional (2D) shape formed using straight sides.
Polygons may have any number of sides.
Examples of polygons are triangles, quadrilaterals, pentagons, hexagons and more!

Triangles

Triangles have **3** sides, **3** angles and **3** vertices (points where the lines meet).

In a triangle, all 3 angles always total 180°.

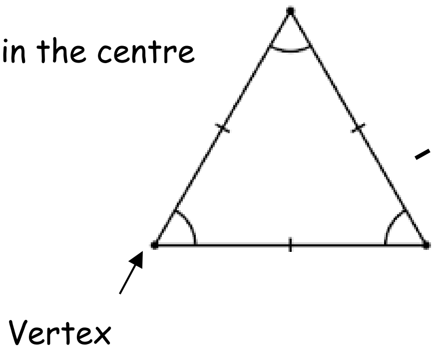
There are four types of triangle, each with their own properties:

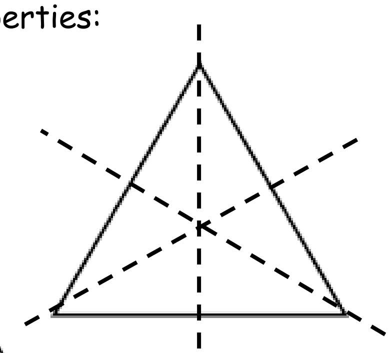
Equilateral triangle

3 equal sides (shown by the line in the centre of each side)

3 equal angles of 60 degrees

3 lines of symmetry



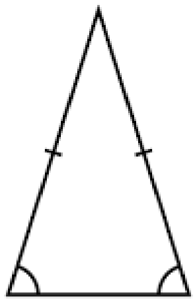


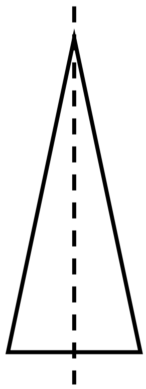
Isosceles Triangle

2 sides are equal

2 angles are equal

1 line of symmetry

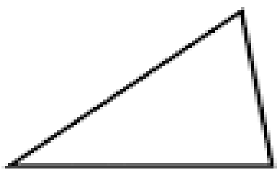




A scalene Triangle

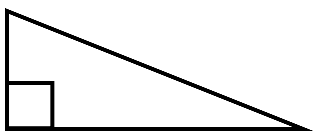
No equal sides or angles (all different sizes)

0 lines of symmetry



Right angle Triangle

It has one angle equal to 90 degrees



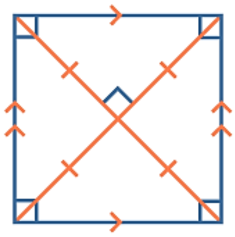
Quadrilaterals

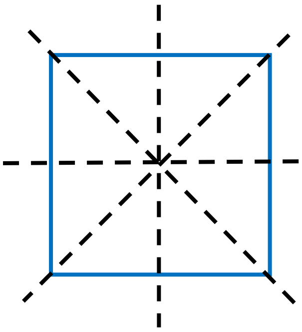
Quadrilaterals are 2D shapes which have **4** sides, **4** angles and **4** vertices.

In a quadrilateral, all 4 angles will total 360°.

Each quadrilateral has its own set of properties:

Square





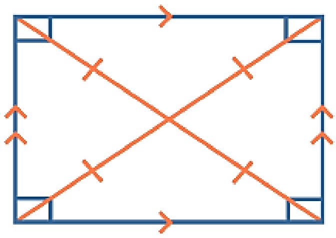
4 equal sides and 2 pairs of parallel sides (parallel sides are shown using matching arrow heads)

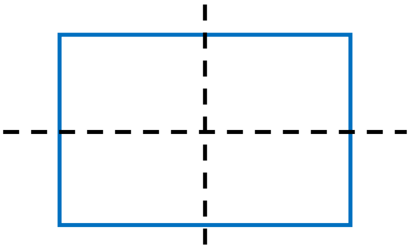
4 equal angles of 90 degrees (Right angles)

2 diagonals that bisect (cut each other in half) at 90 degrees

4 lines of symmetry

Rectangle





4 sides

Opposite (Parallel) sides are equal

4 Equal angles of 90 degrees (Right angles)

2 diagonals that bisect at 90 degrees

2 lines of symmetry

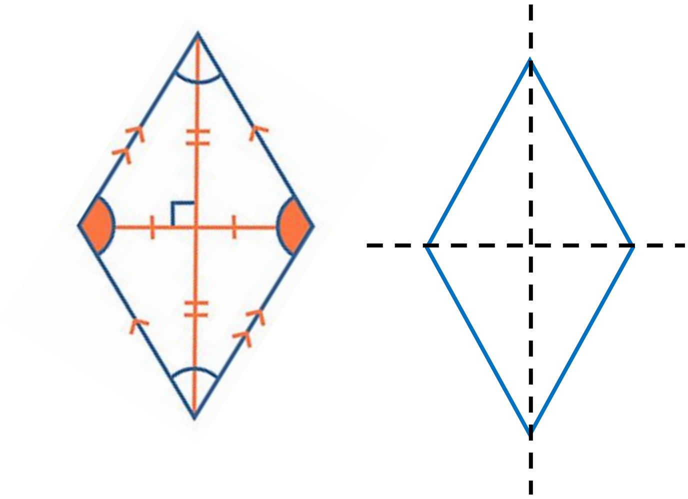
Rhombus

4 equal sides and 2 pairs of parallel sides

Opposite angles are equal
(pairs with matching colours are equal)

2 diagonals that bisect at 90 degrees

2 lines of symmetry



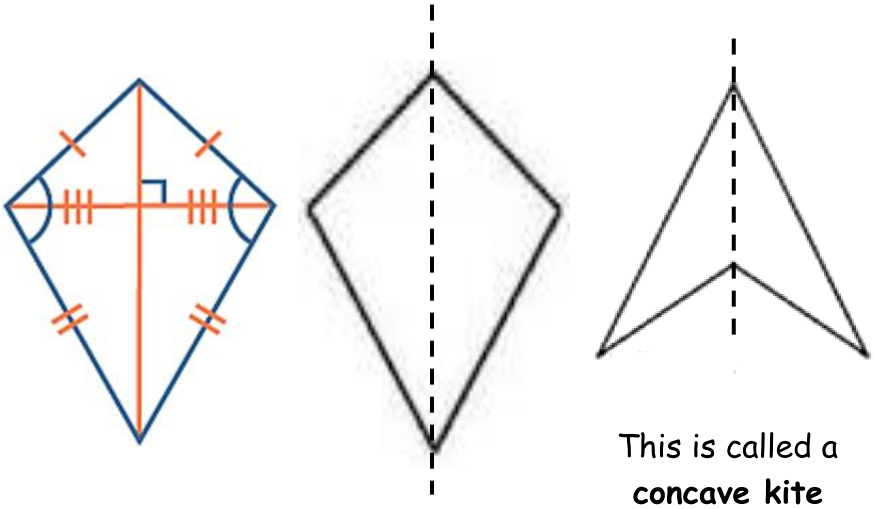
Kite

2 pairs of equal sides

1 pair of equal angles

2 diagonals that bisect at
90 degrees

1 line of symmetry



This is called a
concave kite

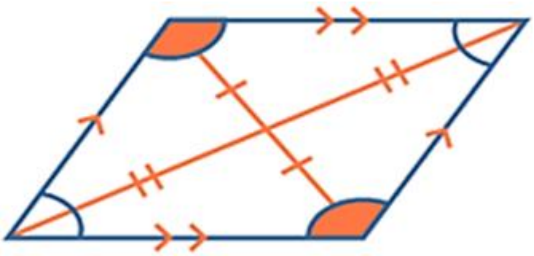
Parallelogram

Opposite (Parallel) sides are equal

2 pairs of equal angles

2 diagonals that bisect

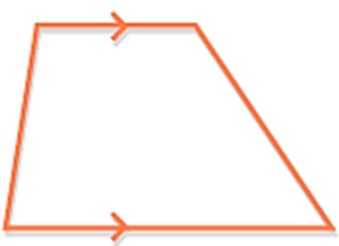
0 lines of symmetry



Trapezium

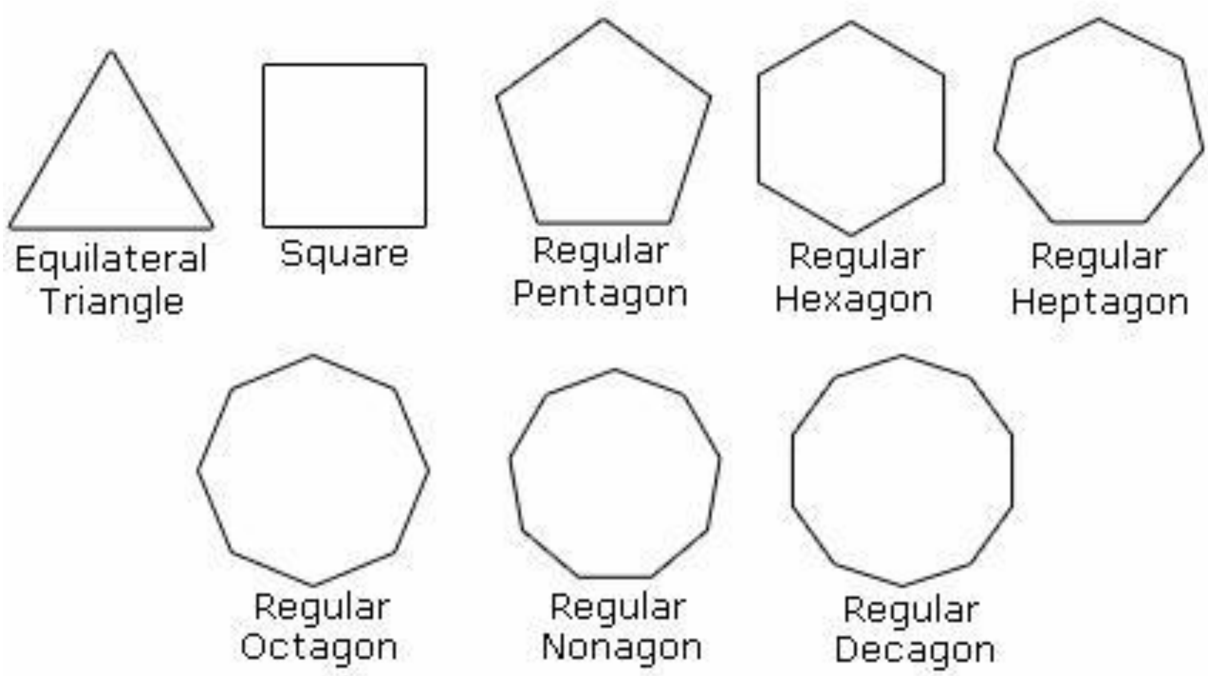
One pair of parallel sides

0 lines of symmetry



Regular Polygons

Regular polygons are those whose sides and angles are all equal:

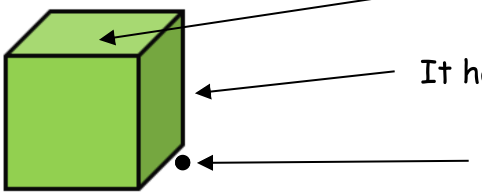


3D Shapes

Flat shapes, like those we can draw on paper, which have 2 dimensions are called 2D shapes. Examples of these include squares, circles, rectangles, triangles etc.

Shapes with 3 dimensions, like solid shapes, are called 3D shapes.
Examples of these, and their properties, are shown below:

Cube



A cube has **6** equal **faces**, all of which are squares.

It has **12** equal **edges**.

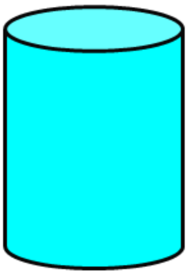
It has **8 vertices**.

Cuboid

A cuboid has **6 faces**, which are rectangles.

It has **12 edges**.

It has **8 vertices**.

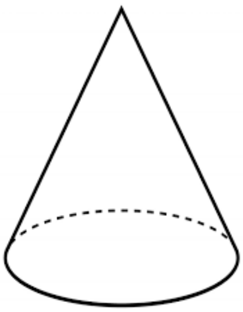


Cylinder

A cylinder has 3 faces.

It has **2 edges** (both curved).

It has **no vertices**.

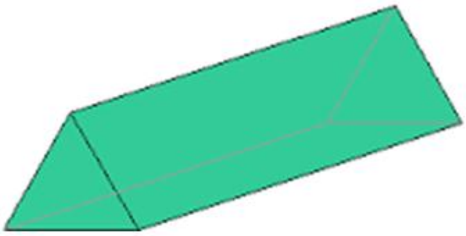


Cone

A cone has 2 faces.

It has **1 edge** (curved).

It has **1 vertex**.



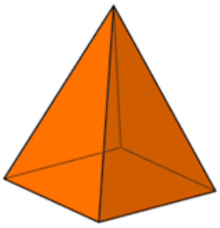
Triangular Prim

A triangular prism has **5 faces**.

It has **9 edges.**

It has **6 vertices**.

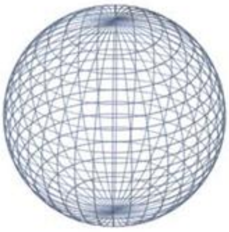
Square based Pyramid



A square based pyramid has **5 faces**.

It has **8 edges.**

It has **6 vertices**.



Sphere

A sphere has **no faces**, **no edges** and **no vertices**.

Recognising 3D Shapes in the Real World

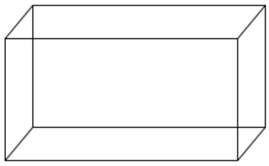
All of these shapes can be seen in the world around you, for example:

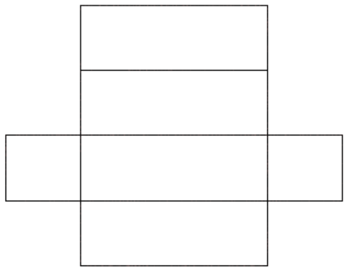
Nets

A net is a pattern that you can cut and fold to make a model of a solid shape.

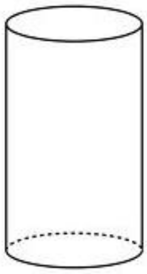
For example:

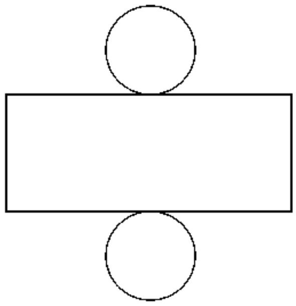
Cuboid



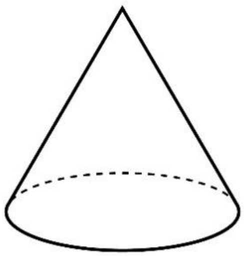


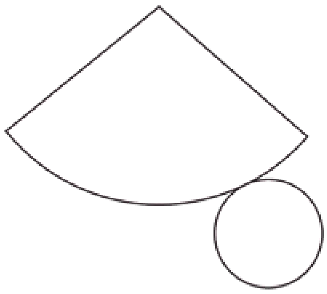
Cylinder



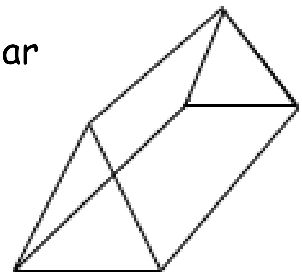


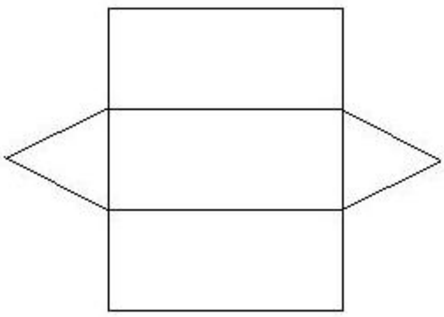
Cone



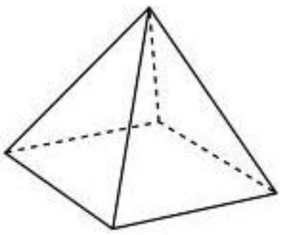


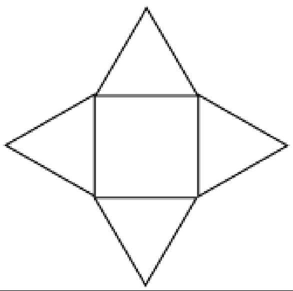
Triangular prism





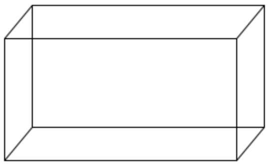
Pyramid

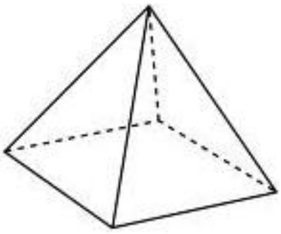




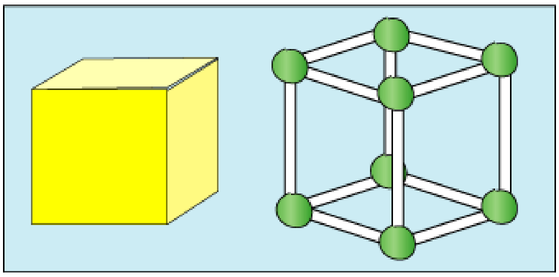
Skeletons of solids

A skeleton is a method of representing a 3D solid using straight line segments, for example:



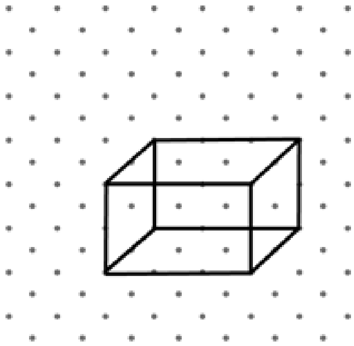


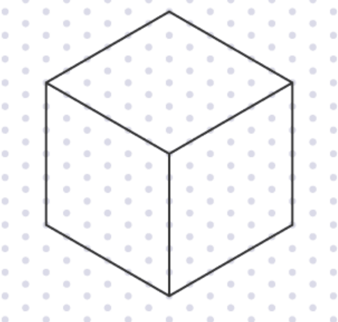
These can be made using straws and blue tack!



Drawing 3D Shapes

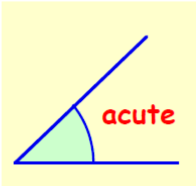
Accurate representations of 3D shapes can be drawn using isometric (triangular dotty) paper or computer programmes.



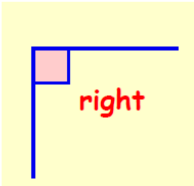


Types of angles

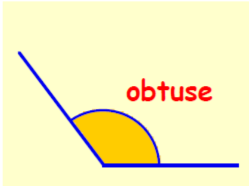
Angles are measured in **degrees**.
There are various names used to describe angles based on their sizes.



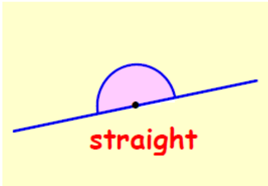
Less than 90°



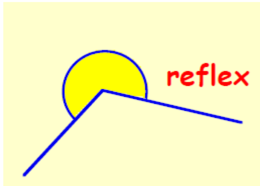
Exactly 90°



Greater than 90° but less than 180°



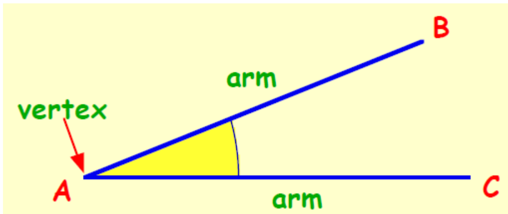
Exactly 180°



Greater than 180° but less than 360°

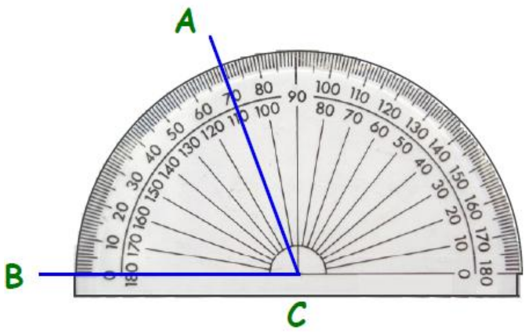
Naming Angles

When two lines meet an angle is formed.
We call the lines **arms** and the point where the meet is called the **vertex**.
An angle is named using three capital letters and the vertex is always the **middle** letter.



The diagram above shows an angle which can be called ∠ BAC or ∠CAB

Measuring Angles

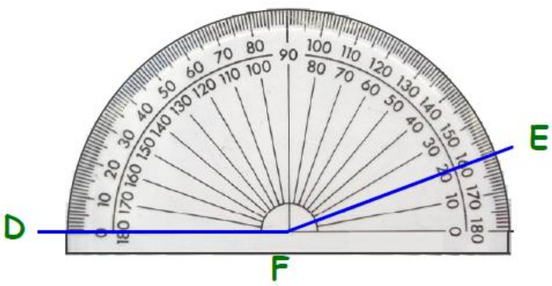


To measure an angle with a protractor:

Step 1: Place the centre of the protractor on the vertex C.

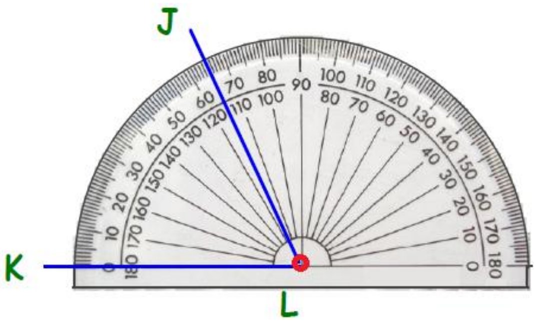
Step 2: Turn the protractor until the zero line lies along the arm BC.

Step 3: Count from the zero (inside or out) and read the value where the arm AC cuts the scale.



Using the inside scale, ∠ **ACB = 70°**
Using outside scale, ∠ **DFE = 160°**

Drawing Angles



Example: Draw angle KLJ = 65°

Step 1: Start with a line with a dot at one end. This dot will be your vertex.

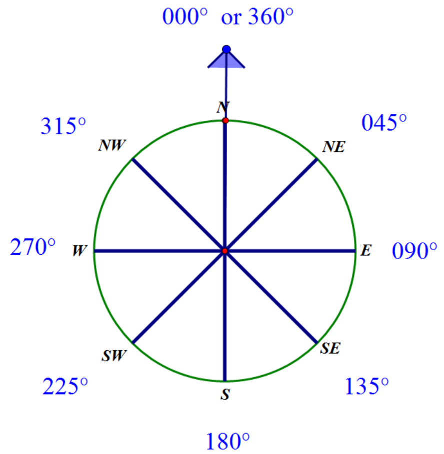
Step 2: Put the crossbar of the protractor on the dot and line up with line drawn.

Step 3: Count round from zero to the required number of degrees and mark with a dot.

Step 4: Join the dots and name the angle.

Compass Points

Shown are the eight compass points and their bearings.



The bearing is the angle measured from the **North Line** in a **clockwise** direction, and has 3-figures.

For example, SE means South-East which has a bearing of 135° from the North Line.

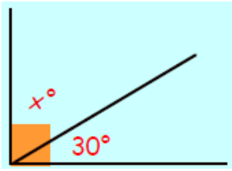
Remember: 360° = 1 full turn

180° = $\frac{1}{2}$ turn

90° = $\frac{1}{4}$ turn

Complementary and Supplementary Angles

Any two angles that, when added together come to 90°, are called **Complementary Angles**.

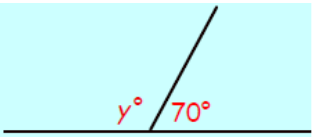


For example, in the diagram opposite $x + 30 = 90$

$x = 60$

The **complement** of 30° is 60°.

Any two angles that, when added together make 180°, are called **Supplementary Angles.**



For example, in the diagram opposite $y + 70 = 180$

$y = 110$

The **supplement** of 70° is 110°

To help you remember the difference, remember that C for Complementary comes before S in the alphabet and 90° also comes before 180°.
Therefore, Complementary is 90° and Supplementary is 180°!

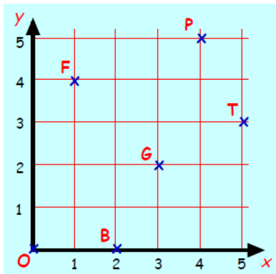
Coordinates

In Maths we use a **Cartesian coordinate grid** to plot points and describe their position.

Reading Coordinates from a grid

To find the coordinate of a point:

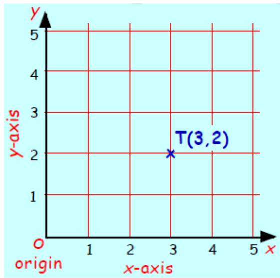
- Start at 0 (called the **origin**). The origin has coordinates (0,0).
- Count along the x-axis (horizontally). This gives the **x coordinate**.
- Count along the y-axis (vertically). This gives the **y coordinate**.
- Always use brackets round the two numbers, and a comma in between.



The coordinates of F are written as F(1,5), as we go **1 along and 5 up**.
The coordinates of G are written as G(3,2).
In the same way we write: B(2,0) P(4,5) T(5,3)

Plotting points on a Coordinate grid

To plot a point on a coordinate grid, we firstly go **along** the x-axis, then **up** the y-axis. To plot the point T(3,2):

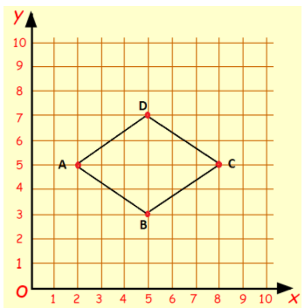


- count 3 along the **x-axis**
- count 2 up the **y-axis**
- mark the point with a **dot** or an **x**, and label it **T**.

*The **x-coordinate** of T is 3.*
*The **y-coordinate** of T is 2.*

Drawing a picture using coordinates

We can draw pictures and create shapes using coordinates.



Plot the points A(2,5), B(5,3), C(8,5) and D(5,7).

Join A to B to C to D to A.

We have formed a **rhombus** using a coordinate grid.

Symmetry

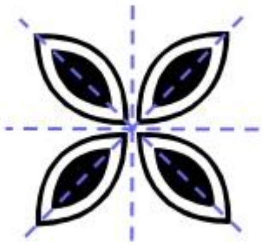
Line Symmetry

A shape has line symmetry when one half is a **mirror image** of the other half.

For example:

A shape may be divided by one or more lines of symmetry.

For example:



This shape has 4 lines of symmetry

This shape has 5 lines of symmetry

See the section on 2D shapes to learn about the line symmetry in regular polygons.

Completing and creating symmetrical patterns

When we know a line of symmetry exists, we can use these to complete symmetrical patterns:

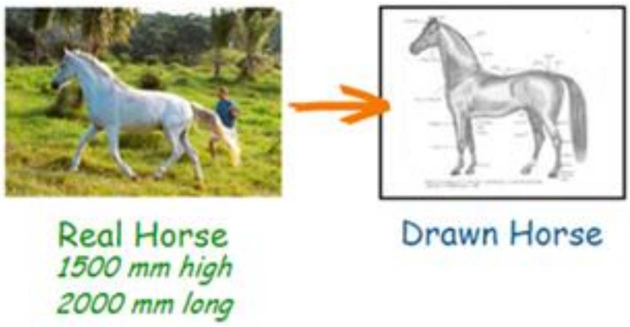
For example:

Computer software can be used to complete more complex symmetrical patterns.

Scales

Scale is the ratio of the size of a drawing/representation to the actual size of the object being represented.

For example:



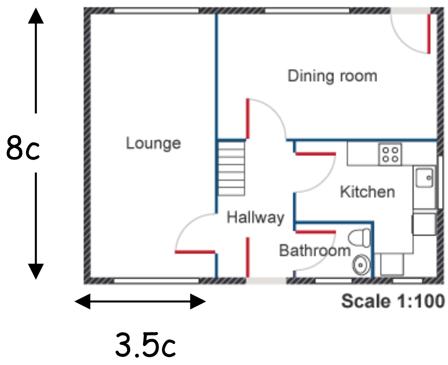
In the **scale drawing**, every 1mm represents 10mm.
This means that the scale is **1:10**

As we have the scale and the real measurements, we can calculate the size of the scale drawing as follows:

	Drawing	Real
Scale	1	10
Height	1500 ÷ 10 = 150mm	1500mm
Length	2000 ÷ 10 = 200mm	2000mm

This would allow us to create a scale drawing ourselves.

If we had the scale and the scale drawing measurements we could calculate the size of the real object as follows:



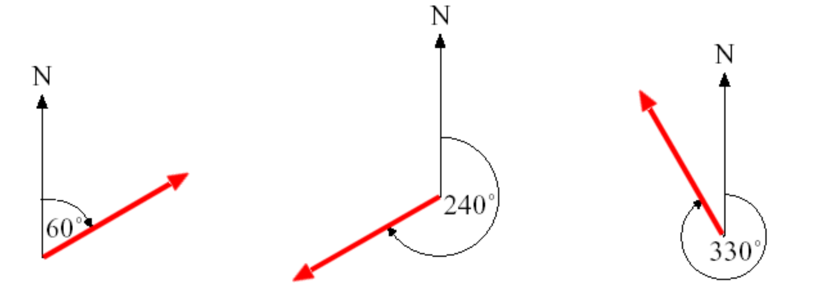
	Drawing	Real
Scale	1	100
Length	4cm	4 x 100 = 400cm or 4m
Breadth	8cm	8 x 100 = 800cm or 8m

Scales and Bearings

Bearings are always:

- Measured from a North line
- Given using 3 figures

For example:



Bearing 060 °   Bearing 240 °   Bearing 330 °

They can be used to describe and record or follow directions.

For example, in the picture below, starting at the airport travel to the campsite on bearings as follows:

Airport to accommodation: 030°

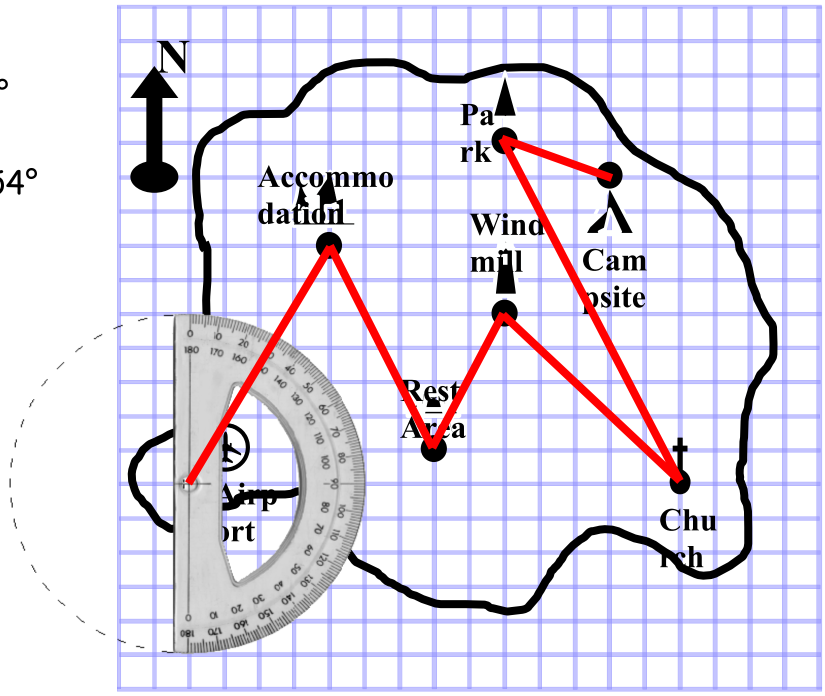
Accommodation to rest area: 154°

Rest area to windmill: 025°

Windmill to church: 133°

Church to park: 332°

Park to campsite: 070°



Information Handling: Tables

It is sometimes useful to display information in graphs, charts or tables.

Example 1 The table below shows the average maximum temperatures (in degrees Celsius) in Barcelona and Edinburgh.

	J	F	M	A	M	J	J	A	S	O	N	D
Barcelona	13	14	15	17	20	**24**	27	27	25	21	16	14
Edinburgh	6	6	8	11	14	17	18	18	16	13	8	6

The average temperature in June in Barcelona is 24°C

Frequency Tables are used to present information. Often data is grouped in intervals.

Example 2 Homework marks for Class 4B

27 30 23 24 22 35 24 33 38 43 18 29 28 28 27
33 36 30 43 50 30 25 26 37 35 20 22 24 31 48

Mark	Tally	Frequency
16 - 20	II	2
21 - 25	~~IIII~~ II	7
26 - 30	~~IIII~~ IIII	9
31 - 35	~~IIII~~	5
36 - 40	III	3
41 - 45	II	2
46 - 50	II	2

Each mark is recorded in the table by a tally mark.
Tally marks are grouped in 5's to make them easier to read and count.

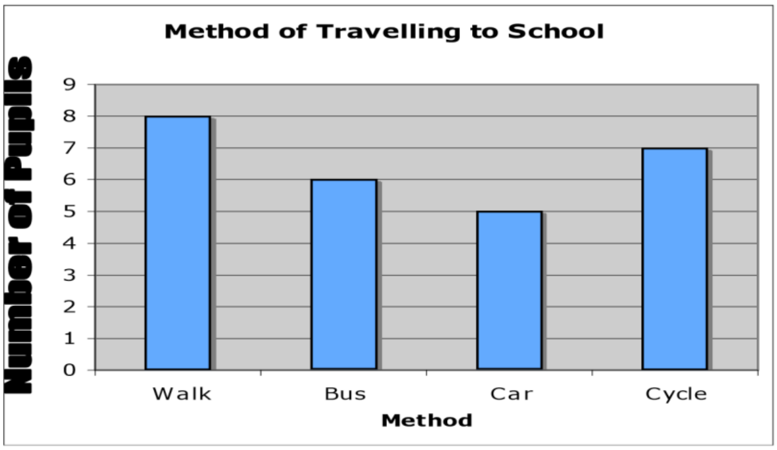
Information Handling: Bar Graphs/Histograms

Bar graphs and Histograms are often used to display data. <u>They must not be confused as being the same</u>. Bar graphs are used to present discrete* or non numerical data* whereas histograms are used to present continuous data*. See key words for explanation of these terms

All graphs should have a title, and each axis must be labelled.

Example 1 Example of a Bar Graph

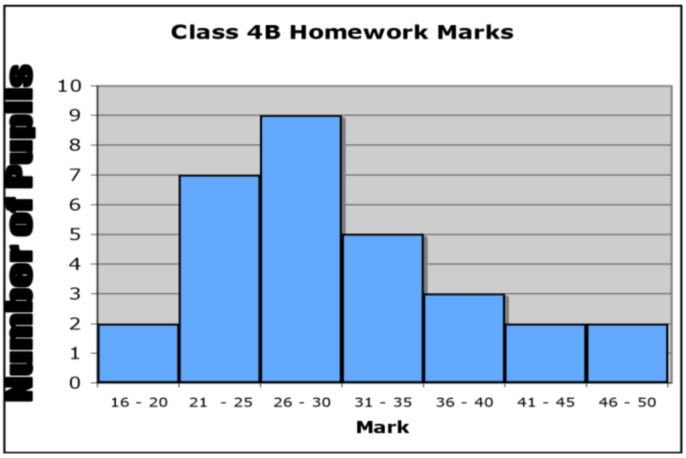
How do pupils travel to school?



An even space should be between each bar and each bar should be of an equal width. (also leave a space between vertical axis and the first bar.)

Example 2 Example of a histogram

The graph below shows the homework marks for Class 4B.

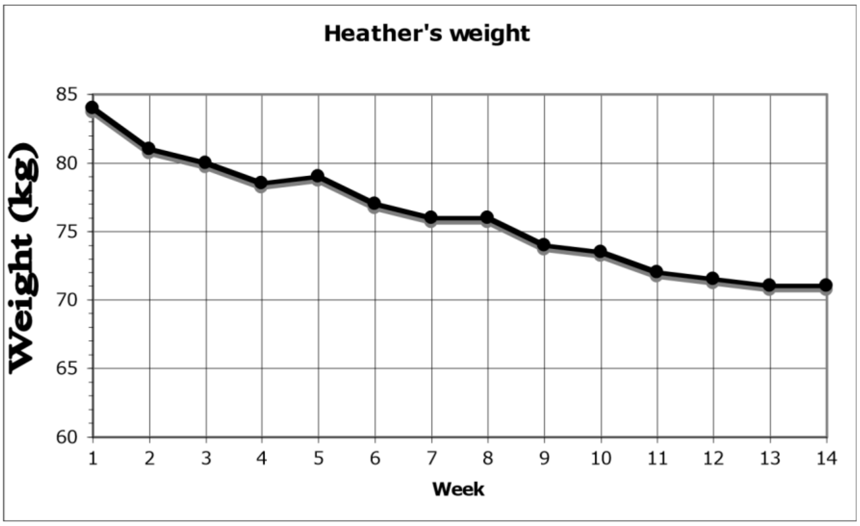


Important – there should be no space between each bar

Information Handling: Line Graphs

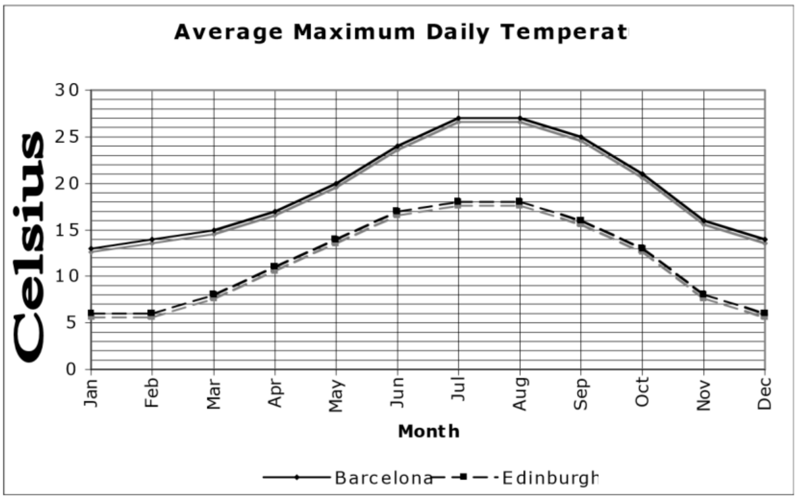
Line graphs consist of a series of points which are plotted, then joined by a line. All graphs should have a title, and each axis must be labelled. The trend of a graph is a general description of it.

Example 1 The graph below shows Heather's weight over 14 weeks as she follows an exercise programme.

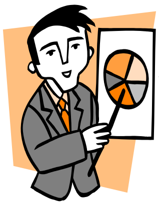


The trend of the graph is that her weight is decreasing.

Example 2 Graph of temperatures in Edinburgh and Barcelona.

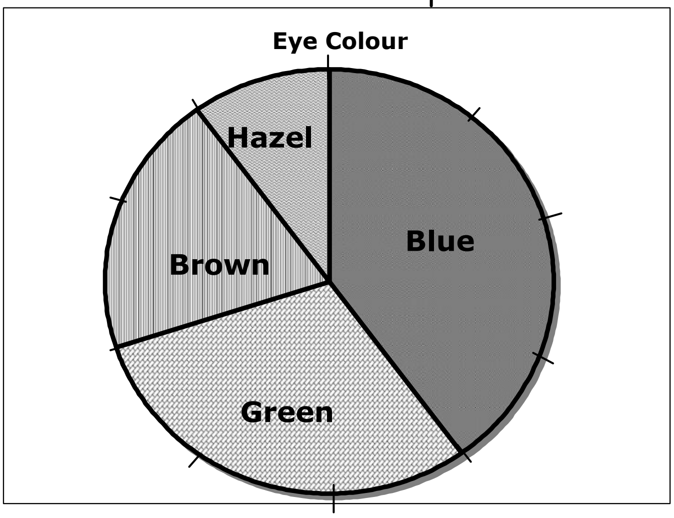


Information Handling: Pie Charts



A pie chart can be used to display information. Each sector (slice) of the chart represents a different category. The size of each category can be worked out as a fraction of the total using the number of divisions or by measuring angles.

Example 30 pupils were asked the colour of their eyes. The results are shown in the pie chart below.



How many pupils had brown eyes?

The pie chart is divided up into ten parts, so pupils with brown eyes represent $\frac{2}{10}$ of the total.

$\frac{2}{10}$ of 30 = 6 so 6 pupils had brown eyes.

If no divisions are marked, we can work out the fraction by measuring the angle of each sector.

The angle in the brown sector is 72°.
so the number of pupils with brown eyes

$= \frac{72}{360} \times 30 = 6$ pupils.

If finding all of the values, you can check your answers - the total should be 30 pupils.

Information Handling: Pie Charts 2

Drawing Pie Charts

On a pie chart, the size of the angle for each sector is calculated as a fraction of 360°.

Example: In a survey about school, a group of pupils were asked what was their favourite subject. Their answers are given in the table below. Draw a pie chart to illustrate the information. This would be done using a protractor.

Subject	**Number of people**
Mathematics	28
Home Economics	24
Music	10
Physics	12
PE	6

Total number of people = 80

Mathematics = $\frac{28}{80} \rightarrow \frac{28}{80} \times 360° = 126°$

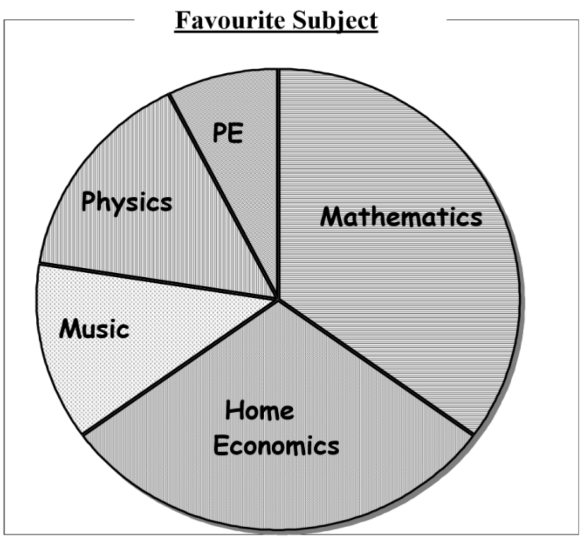
Home Economics = $\frac{24}{80} \rightarrow \frac{24}{80} \times 360° = 108°$

Music = $\frac{10}{80} \rightarrow \frac{10}{80} \times 360° = 45°$

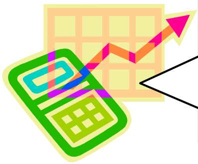
Physics = $\frac{12}{80} \rightarrow \frac{12}{80} \times 360° = 54°$

PE = $\frac{6}{80} \rightarrow \frac{6}{80} \times 360° = 27°$

Check that the total = 360°



Information Handling: Averages



To provide information about a set of data, the average value may be given. There are 3 useful statistical measures – the mean, the median and the mode.

Mean

The mean is found by adding all the data together and dividing by the number of values.

Median

The median is the middle value when all the data is written in numerical order (if there are two middle values, the median is half-way between these values).

Mode

The mode is the value that occurs most often.

Range

The range of a set of data is a measure of spread.

Range = Highest value – Lowest value

Example *Class 1A scored the following marks for their homework assignment. Find the mean, median, mode and range of the results.*

6, 9, 7, 5, 6, 6, 10, 9, 8, 4, 8, 5, 7

$$\text{Mean} = \frac{6+9+7+5+6+6+10+9+8+4+8+5+7}{13}$$

$$= \frac{90}{13} = 6.923...$$

Mean = 6.9 to 1 decimal place

Ordered values: 4, 5, 5, 6, 6, 6, 7 7, 8, 8, 9, 9, 10

Median = 7

6 is the most frequent mark, so Mode = 6

Range = 10 - 4 = 6

Information Handling: Statistical Measures

Finding the median of an unordered data set with an odd number of values:

Example

Find the median of the following:

10, 5, 7, 6, 9, 6, 8, 10

Step 1: order the values from smallest to biggest

5, 6, 6, 7, 8, 9, 10, 10

Step 2: cross numbers off from each end until you reach the middle value(s)

~~5~~, ~~6~~, ~~6~~, 7, 8, ~~9~~, ~~10~~, ~~10~~

Step 3: find the mean (half-way between) the middle values

~~5~~, ~~6~~, ~~6~~, 7, 8, ~~9~~, ~~10~~, ~~10~~

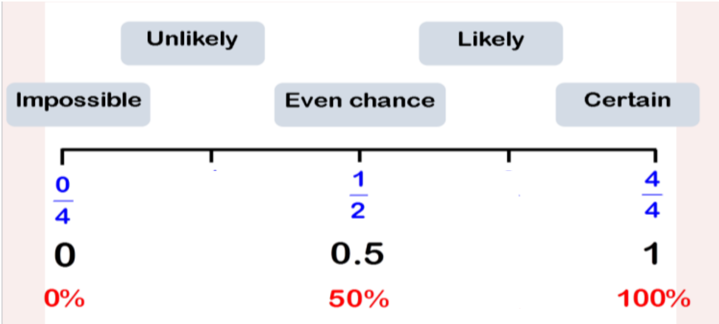
↑

Median = $\frac{7+8}{2}$

= **<u>7.5</u>**

Ideas of Chance and Uncertainty (Probability)

Pupils will be expected to use the vocabulary to describe the likelihood of events happening and by applying understanding of probability be able to make predictions. The Probability Scale is between and including 0 and 1 as follows:

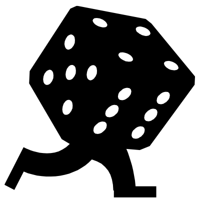


Probability is calculated using the formula below:

$$P\text{ (event)} = \frac{\text{number of favourable events}}{\text{number of possible events}}$$

Example 1

If I throw a die, what would the probability of it being an even number?

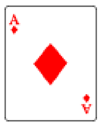


Probability of even number = $\frac{3}{6} = \frac{1}{2}$

This means I have 50% chance of throwing an even number if I throw a die.

Example 2

From a pack of cards, what is the probability of picking an ace of diamonds?



Probability of ace of diamonds = $\frac{1}{52}$

This means that I would have to pick out 52 cards before I could expect an ace of diamonds.

Example 3

If I throw a 20p coin 100 times, how many times will a head appear?

Probability of 1 head = $\frac{1}{2}$ Number of heads = $\frac{1}{2}$ x 100 = 50

This means if I threw a 20p coin 100 times, I ***could*** expect 50 heads.

Note: All of the answers above are probable not certain.

REFERENCE

Mathematical Literacy (Key Words)

Add; Addition (+)	To combine 2 or more numbers to get one number (called the sum or the total) Example: 12+76 = 88
a.m.	(ante meridiem) Any time in the morning (between midnight and 12 noon).
Approximate	An estimated answer, often obtained by rounding to nearest 10, 100 or decimal place.
Calculate	Find the answer to a problem. It doesn't mean that you must use a calculator!
Continuous Data	Has an infinite number of possible values within a selected range e.g. temperature, height, length
Data	A collection of information (may include facts, numbers or measurements).
Discrete	Can only have a finite or limited number of possible values. Shoe sizes are an example of discrete data because sizes 6 and 7 mean something, but size 6.3 for example does not.
Denominator	The bottom number in a fraction (the number of parts into which the whole is split).
Difference (-)	The amount between two numbers (subtraction). Example: The difference between 50 and 36 is 14 50 – 36 = 14
Division (÷)	Sharing a number into equal parts. 24 ÷ 6 = 4
Double	Multiply by 2.
Equals (=)	Makes or has the same amount as.
Equivalent fractions	Fractions which have the same value. Example $\frac{6}{12}$ and $\frac{1}{2}$ are equivalent fractions
Estimate	To make an approximate or rough answer, often by rounding.
Evaluate	To work out the answer.

Even	A number that is divisible by 2. Even numbers end with 0, 2, 4, 6 or 8.
Factor	A number which divides exactly into another number, leaving no remainder. Example: The factors of 15 are 1, 3, 5, 15.
Frequency	How often something happens. In a set of data, the number of times a number or category occurs.
Greater than (>)	Is bigger or more than. Example: 10 is greater than 6. 10 > 6
Least	The lowest number in a group (minimum).
Less than (<)	Is smaller or lower than. Example: 15 is less than 21. 15 < 21.
Maximum	The largest or highest number in a group.
Mean	The arithmetic average of a set of numbers
Median	The middle number of an ordered set of data
Minimum	The smallest or lowest number in a group.
Minus (-)	To subtract or in the negative direction.
Mode	The most frequent number or category
Most	The largest or highest number in a group (maximum).
Multiple	A number which can be divided by a particular number, leaving no remainder. Example Some of the multiples of 4 are 8, 16, 48, 72
Multiply (x)	To combine an amount a particular number of times. Example 6 x 4 = 24
Negative Number	A number less than zero. Shown by a minus sign. Example -5 is a negative number.

Numerator	The top number in a fraction.
Non Numerical data	Data which is non numerical e.g. favourite football team, favourite sweet etc.
Odd Number	A number which is not divisible by 2. Odd numbers end in 1 ,3 ,5 ,7 or 9.
Operations	The four basic operations are addition, subtraction, multiplication and division.
Order of operations	The order in which calculations should be done. BODMAS
Place value	The value of a digit dependent on its place in the number. Example: in the number 1573.4, the 5 has a place value of 5 hundreds (500).
p.m.	(post meridiem) Any time in the afternoon or evening (between 12 noon and midnight).
Prime Number	A number that has exactly 2 factors (can only be divided by itself and 1). Note that 1 is not a prime number as it only has 1 factor.
Product	The answer when two numbers are multiplied together. Example: The product of 5 and 4 is 20.
Quotient	The answer after you divide one number by another. Dividend ÷ Divisor = quotient, e.g.in 12 ÷ 3 = 4, 4 is the **quotient**.
Remainder	The amount left over when dividing a number.
Share	To divide into equal groups.
Sum	The total of a group of numbers (found by adding).
Total	The sum of a group of numbers (found by adding).