Balerno High School

Numeracy Across Learning

A Guide as to how the various Numeracy topics are approached within the school.

Introduction

This booklet has been designed to help non mathematicians support Numeracy across Learning.

The aim is to inform all teachers in the school how each topic is taught within the Mathematics department at Balerno High School.

All the Level 3 Numeracy outcomes have been included and at the end there are some maths outcomes which were thought to be useful.

Contents

Whole Numbers

I can use addition, subtraction, multiplication and division when solving problems,

making best use of the mental strategies and written skills I have developed.

MNU 1-03a

Having determined which calculations are needed, I can solve problems involving

whole numbers using a range of methods, sharing my approaches and solutions with others.

MNU 2-03a

I can use a variety of methods to solve number problems in familiar contexts,

clearly communicating my processes and solutions.

MNU 3-03a

I can continue to recall number facts quickly and use them accurately when making calculations.

MNU 3-03b

Whole Numbers - Adding

In Mathematics pupils are expected to,

- from **level 1** onwards - add one whole number to another.

e.g. Find the sum of 856, 9 and 48.

$$\begin{array}{cccc} & 8 & 5 & 6 \\ & & & 9 \\ + & & 4 & 8 \\ \hline & & & 3 \\ \hline & & 2 & \end{array} \quad \longrightarrow \quad \begin{array}{cccc} & 8 & 5 & 6 \\ & & & 9 \\ + & & 4 & 8 \\ \hline & & 1 & 3 \\ \hline & 1 & 2 & \end{array} \quad \longrightarrow \quad \begin{array}{cccc} & 8 & 5 & 6 \\ & & & 9 \\ + & & 4 & 8 \\ \hline & 9 & 1 & 3 \\ \hline & 1 & 2 & \end{array}$$

6 + 9 = 15
15 + 8 = 23

5 + 4 = 9
9 + 2 = 11

8 + 1 = 9

Good Practice

We put the carrying at the bottom of the sum.

Whole Numbers - Subtracting

In Mathematics pupils are expected to,

- from **level 1** onwards - subtract one whole number from another.

e.g. Subtract 257 from 623.

$$\begin{array}{rccc} & 6 & \overset{1}{\cancel{2}} & {}^{1}3 \\ - & 2 & 5 & 7 \\ \hline & & & 6 \\ \hline \end{array} \longrightarrow \begin{array}{rccc} & {}^{5}\cancel{6} & {}^{1}\overset{1}{\cancel{2}} & {}^{1}3 \\ - & 2 & 5 & 7 \\ \hline & & 6 & 6 \\ \hline \end{array} \longrightarrow \begin{array}{rccc} & {}^{5}\cancel{6} & {}^{1}\overset{1}{\cancel{2}} & {}^{1}3 \\ - & 2 & 5 & 7 \\ \hline & 3 & 6 & 6 \\ \hline \end{array}$$

We cannot do 3 – 7
So we go to the 2
and cross it out.
It drops to 1 and the
3 becomes 13.
13 – 7 = 6

We cannot do 1 – 5
So we go to the 6
and cross it out.
It drops to 5 and the
1 becomes 11.
11 – 5 = 6

Finally 5 - 2 = 3

We also can count on (mental Maths)
e.g. to solve 51 – 36 we count on from 36 until we reach 51 and get 15.

We also can break up the number being subtracted (mental Maths)
e.g. to solve 51 – 36 we take away 30 then take away 6 to get 15.

Whole Numbers - Subtracting

e.g. Find the difference between 163 and 800.

$$\begin{array}{r} 8\;0\;0 \\ -\;1\;6\;3 \\ \hline \\ \hline \end{array} \rightarrow \begin{array}{r} 8\;0 \\ -\;1\;6 \\ \hline \\ \hline \end{array} \rightarrow \begin{array}{r} {}^{7}\cancel{8}\;{}^{1}0 \\ -\;1\;6 \\ \hline \\ \hline \end{array} \rightarrow \begin{array}{r} {}^{7}\cancel{8}\;{}^{9}\cancel{{}^{1}0}\;{}^{1}0 \\ -\;1\;6\;3 \\ \hline \\ \hline \end{array}$$

We can only borrow From our neighbour. The zero above the 6 will borrow from the 8.

The 8 drops to 7 and the zero above the six becomes 10.

The 10 drops to 9 and the zero above the three becomes 10.

$$\rightarrow \begin{array}{r} {}^{7}\cancel{8}\;{}^{9}\cancel{{}^{1}0}\;{}^{1}0 \\ -\;1\;6\;3 \\ \hline 6\;3\;7 \\ \hline \end{array}$$

Now 10 - 3 = 7
9 - 6 = 3
and 7 = 1 = 6

Good Practice

We only borrow from our "next door neighbour".

WE DO NOT …

borrow and pay pack.

borrow from "two doors along".

Whole Numbers-Multiplying 1

It is essential that you know all of the multiplication tables from 1 to 10.

These are shown in the times tables square below.

X	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	89	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 39 x 6

Method 1	30 x 6 = 180	9 x 6 = 54	180 + 54 = 234
Method 2	40 x 6 = 240	40 is 1 too many so take away 6x1	240 – 6 = 234

Whole Numbers – Multiplying 2

In Mathematics pupils are expected to,

- from **level 1** onwards - multiply a whole number by a whole number from 1 to 10.

e.g. Multiply 468 by 6.

$$\begin{array}{r} 4\ 6\ 8 \\ \times\quad 6 \\ \hline \\ \hline \end{array} \rightarrow \begin{array}{r} 4\ 6\ 8 \\ \times\quad 6 \\ \hline 8 \\ \hline 4\ \ \end{array} \rightarrow \begin{array}{r} 4\ 6\ 8 \\ \times\quad 6 \\ \hline 0\ 8 \\ \hline 4\ 4\ \ \end{array} \rightarrow \begin{array}{r} 4\ 6\ 8 \\ \times\quad 6 \\ \hline 2\ 8\ 0\ 8 \\ \hline 4\ 4\ \ \end{array}$$

8 x 6 = 48

6 x 6 = 36
36 + 4 = 40

6 x 4 = 24
24 + 4 = 28

Good Practice

If pupils find they do not know the 6 times table, they can write out the multiples to help them.

6, 12, 18, 24, 30, 36, 42, 48, 54, 60

e.g. Multiply 374 by 10.

$$\begin{array}{r} 3\ 7\ 4 \quad \times\ 10 \\ =\ 3\ 7\ 4\ 0 \qquad\quad \end{array}$$

Good Practice

When multiplying by 10, the digits move one place to the left.

WE DO NOT ...

simply add a zero to get the answer.

<u>Whole Numbers – Multiplying 3</u>

In Mathematics pupils are expected to,

- from **level 1/2** onwards - multiply a whole number by 10, 100 or 1000.

  e.g. Multiply 284 by 1000.

$$
\begin{array}{r}
284 \times 1000 \\
= 284000
\end{array}
$$

<u>Good Practice</u>

When multiplying by 100, the digits move two places to the left.
When multiplying by 1000, the digits move three places to the left.

<u>WE DO NOT ...</u>

simply add two zeros to get the answer when multiplying by 100.
simply add three zeros to get the answer when multiplying by 1000.

Whole Numbers – Multiplying 4

In Mathematics pupils are expected to,

- from **level 2** onwards - multiply a whole number by a multiple of 10, 100 or 1000.

  e.g. Multiply 487 by 30.

$$\begin{aligned} & 487 \times 10 \times 3 \\ = \ & 4870 \times 3 \end{aligned}$$

$$\begin{array}{r} 4870 \\ \times \quad\ 3 \\ \hline 14610 \\ \hline {\scriptstyle 2\ 2\ \ \ } \end{array}$$

Whole Numbers – Dividing 1

In Mathematics pupils are expected to,

- from **level 1** onwards - divide a whole number by a whole number from 1 to 10.

  e.g. Divide 2632 by 7.

$$7\overline{)2\;\;6\;\;3\;\;2} \rightarrow 7\overline{)\cancel{2}\;\;{}^{2}6\;\;3\;\;2} \rightarrow \begin{array}{r}3\\ 7\overline{)\cancel{2}\;\;{}^{2}6\;\;{}^{5}3\;\;2}\end{array} \rightarrow$$

7 will not go into 2 so cross out the 2 and move it over to join the 6. This makes 26.

26 ÷ 7 = 3 remainder 5.

$$\begin{array}{r}3\;\;7\\ 7\overline{)\cancel{2}\;\;{}^{2}6\;\;{}^{5}3\;\;{}^{4}2}\end{array} \rightarrow \begin{array}{r}3\;\;7\;\;6\\ 7\overline{)\cancel{2}\;\;{}^{2}6\;\;{}^{5}3\;\;{}^{4}2}\end{array}$$

53 ÷ 7 = 7 remainder 4.

42 ÷ 7 = 6.

Good Practice

If pupils find they do not know the 7 times table, they can write out the multiples to help them.

7, 14, 21, 28, 35, 42, 49, 56, 63, 70

Whole Numbers – Dividing 2

e.g. Divide 4800 by 10.

$$4\ 8\ 0\ 0 \div 10$$

$$= 4\ 8\ 0$$

Good Practice

When dividing by 10, the digits move one place to the right.

WE DO NOT …

simply remove a zero to get the answer.

In Mathematics pupils are expected to,

- from **level 1/2** onwards - divide a whole number by 10, 100 or 1000 to give a whole number answer.

e.g. Divide 156 000 by 100.

$$1\ 5\ 6\ 0\ 0\ 0 \div 100$$

$$= 1\ 5\ 6\ 0$$

Good Practice

When dividing by 100, the digits move two places to the right.
When dividing by 1000, the digits move three places to the right.

WE DO NOT …

simply remove two zeros to get the answer when dividing by 100.
simply remove three zeros to get the answer when dividing by 1000.

Whole Numbers – Dividing 3

In Mathematics pupils are expected to,

- from **level 2** onwards - divide a whole number by a multiple of 10, 100 or 1000.

 e.g. Divide 62800 by 400.

$$62800 \div 100 \div 4$$
$$= 628 \div 4$$

$$\begin{array}{r|l} & \;\;1\;\;\;5\;\;\;7 \\ \hline 4 & \;\;6\;\;{}^{2}2\;\;{}^{2}8 \end{array}$$

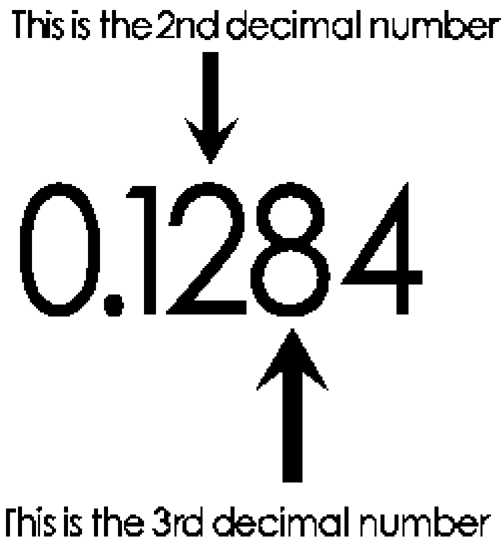
Decimals

***I have explored the contexts in which problems involving decimal fractions occur and can solve related problems using a variety of methods*.**

MNU 2-03b

I have extended the range of whole numbers I can work with and having explored how decimal fractions are constructed, can explain the link between a digit, its place and its value.

MNU 2-02a



Decimals – Adding & Subtracting

In Mathematics pupils are expected to,

- from **level 2** onwards - add and subtract decimal numbers

e.g. Find 78·8 + 9·68

$$\begin{array}{rr}
 & 78\cdot80 \\
+ & 9\cdot68 \\
\hline
 & 88\cdot48 \\
\hline
 & \scriptstyle 1\ 1\ \ \ \ \ \
\end{array}$$

e.g. Find 91·3 - 24·72

$$\begin{array}{rr}
 & {}^{8}\cancel{9}\,{}^{1}0\!\!\!\cancel{1}\cdot{}^{1}2\!\!\!\cancel{3}\,{}^{1}0 \\
+ & 24\cdot72 \\
\hline
 & 66\cdot58 \\
\hline
\end{array}$$

Good Practice

We write the numbers in columns and the decimal point remains in the same column.
We will fill the spaces to the right of the decimal point with zeros where appropriate.

Decimals – Multiplying

In Mathematics pupils are expected to,

- from **level 2** onwards – multiply decimal numbers by 10, 100 and 1000

  e.g. Find 3·427 x 100

$$
\begin{aligned}
& \quad 3\cdot427 \times 100 \\
&= 342\cdot700 \\
&= 342\cdot7
\end{aligned}
$$

Good Practice

The decimal point always stays in the same column.
When multiplying by 10, the digits move one place to the left.
When multiplying by 100, the digits move two places to the left.
When multiplying by 1000, the digits move three places to the left.

WE DO NOT …

move the decimal point to the right.

Decimals – Dividing

In Mathematics pupils are expected to,

- from **level 2** onwards – divide decimal numbers by 10, 100 and 1000

e.g. Find 47·35 ÷ 1000

= 4 7·3 5 ÷ 1000

= 0·4 7 3 5

Good Practice

The decimal point always stays in the same column.
When dividing by 10, the digits move one place to the right.
When dividing by 100, the digits move two places to the right.
When multiplying by 1000, the digits move three places to the right.

WE DO NOT …

move the decimal point to the left.

Estimation and Rounding

I can use my knowledge of rounding to routinely estimate the answer to a problem then, after calculating, decide if my answer is reasonable, sharing my solution with others.

MNU 2-01a

I can round a number using an appropriate degree of accuracy, having taken into account the context of the problem.

MNU 3-01a

Estimation - calculation

In Mathematics pupils are expected to,

•from **level 1** onwards - estimate to check answers

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 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
486	205	197	321

Estimate = 500 + 200 + 200 + 300 = 1200

Calculate

$$\begin{array}{r} 486 \\ 205 \\ 197 \\ \underline{+321} \\ 1209 \end{array}$$

Answer = 1209 tickets

Example 2

A bar of chocolate weighs 42g. There are 48 bars of chocolate in a box. What is the total weight of chocolate in the box?

Estimate = 50 x 40 = 2000g

Calculate

$$\begin{array}{r} 42 \\ \underline{\times 48} \\ 336 \\ \underline{1680} \\ 2016 \end{array}$$

Answer = 2016g

Estimating

In Mathematics pupils are expected to,

- from **level 1** onwards – estimate heights and lengths in centimetres, metres as well as $\frac{1}{2}$ m and $\frac{1}{10}$ m

  e.g. the length of a pencil is roughly 10 cm

  the width of a desk is roughly $\frac{1}{2}$ m

- from **level 1** onwards – estimate small weights, small areas and small volumes

  e.g. The weight of a bag of sugar is roughly 1 kg

- from **level 2** onwards – estimate areas in square metres, lengths in millimetres and lengths in metres

  e.g. the area of the SMART board is roughly 2 m^2
  the diameter of a 1p coin is roughly 15 mm

Good Practice
When pupils encounter "weight" in Science they will discover that weight is a force that is measured in Newtons. This could be potentially be very confusing for them.
The word "mass" is used in science when referring to something that is measured in grams or kilograms.

Rounding

In Mathematics pupils are expected to,

- from **level 1** onwards – round 3 digit numbers to the nearest 10

e.g. Round 563 to the nearest 10.
563
between → 560 or 570
→ 560

- from **level 2** onwards – round to the nearest whole number
  round to the nearest 10
  round to the nearest 100

e.g. Round 24·68 to the nearest whole number
24·68
between → 24 or 25
→ 25

e.g. Round 597·08 to the nearest ten
597·08
between → 590 or 600
→ 600

e.g. Round 7624·34 to the nearest hundred
7624·34
between → 7600 or 7700
→ 7600

- from **level 2** onwards – round to one decimal place

e.g. Round 5·976 to one decimal place
5·976
between → 5·9 or 6·0
→ 6·0

Good Practice

The decimal point and the zero are a vital part of the answer to the previous example. Although 6 has the same value as the answer it does not have the same accuracy as the correct answer (6·0).

Rounding

In Mathematics pupils are expected to,

- from **level 3** onwards – round to two and three decimal places

e.g. Round 45·248 26 to three decimal places

45·24826

between → 45·248 or 45·249

→ 45·248

e.g. Round 157 329 · 51 to three significant figures

157 329 · 51

between → 157 000 or 158 000

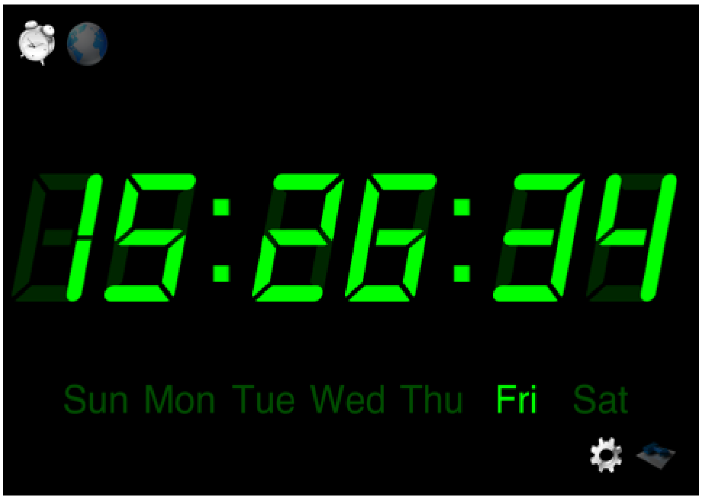
→ 157 000

Time

I can use and interpret electronic and paper-based timetables and schedules
to plan events and activities, and make time calculations as part of my planning.
MNU 2-10a

I can carry out practical tasks and investigations involving timed events and
can explain which unit of time would be most appropriate to use.
MNU 2-10b

Using simple time periods, I can give a good estimate of how long a journey
should take, based on my knowledge of the link between time, speed and distance.
MNU 2-10c

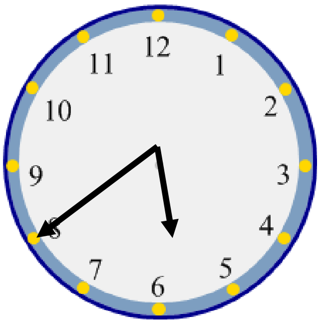


Time Calculations

In Mathematics pupils are expected to,

- from **level 1** onwards – be able to convert between a clock face and an analogue time and vice versa

e.g. Give this time in words and in figures.



Twenty to six = 5 : 40

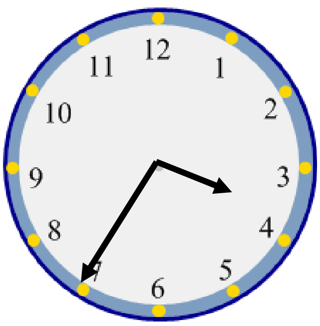
- from **level 1** onwards – be able to use a.m. and p.m. to determine either morning or afternoon times

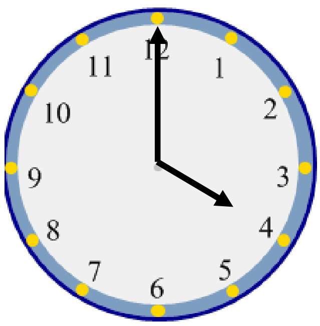
e.g. A train departs at ten to nine in the morning.
Give this time in figures.

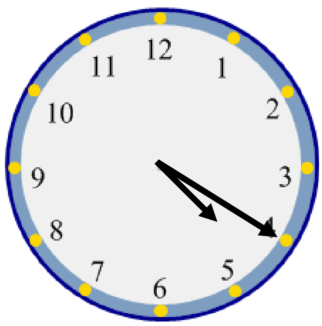
8 : 50 am

- from **level 2** onwards – be able to solve time interval problems (under one hour)

e.g. How long is it from 3:35pm to 4:20 pm?







25 mins 20 mins

= 45 minutes

Time Calculations

In Mathematics pupils are expected to,

- from **level 1** onwards – be able to convert a date in words to six digits and vice versa

  e.g. Write this date using 6 digits.

  24 August 2009

  = 24/08/09

- from **level 2** onwards – be able to convert a 12 hour time to a 24 hour time and vice versa

  e.g. 12:40am = 0040 1240 = 12:40pm

- from **level 2** onwards – be able to solve time interval problems

  e.g. A train leaves at 6:40pm and the journey lasts for 3 hours 35 minutes. What time will it arrive.

  $$6{:}40\text{pm} \xrightarrow[\text{3 hours}]{} 9{:}40\text{pm} \xrightarrow[\text{35 minutes}]{} 10{:}15\text{pm}$$

- from **level 3** onwards – be able to convert minutes into their hours equivalent and vice versa

  e.g. $$33 \text{ minutes} = \frac{33}{60} = \frac{11}{20} = 0{\cdot}55 \text{ hours}$$

  $$4{\cdot}2 \text{ hours} = 4 \text{ hours } (0{\cdot}2 \times 60) \text{ minutes} = 4 \text{ hours } 12 \text{ minutes}$$

Good Practice

We use a timeline for time interval problems.

WE DO NOT …

teach time as a subtraction.

Data and Analysis

(I can display data in a clear way using a suitable scale, by choosing appropriately from an extended range of tables, charts, diagrams and graphs, making effective use of technology.

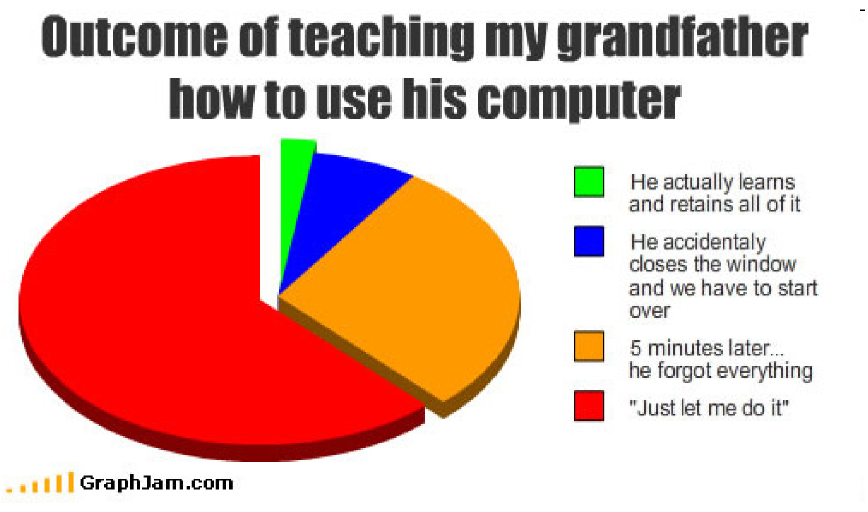
MTH 2-21a / MTH 3-21a)

Having discussed the variety of ways and range of media used to present data, I can interpret and draw conclusions from the information displayed, recognising that the presentation may be misleading.

MNU 2-20a

I have carried out investigations and surveys, devising and using a variety of methods to gather information and have worked with others to collate, organise and communicate the results in an appropriate way.

MNU 2-20b



Data and Analysis

I can work collaboratively, making appropriate use of technology, to source information presented in a range of ways, interpret what it conveys and discuss whether I believe the information to be robust, vague or misleading.

MNU 3-20a

(When analysing information or collecting data of my own, I can use my understanding of how bias may arise and how sample size can affect precision, to ensure that the data allows for fair conclusions to be drawn.

MTH 3-20b)

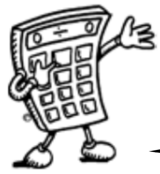
I can evaluate and interpret raw and graphical data using a variety of methods, comment on relationships I observe within the data and communicate my findings to others.

MNU 4-20a

(In order to compare numerical information in real-life contexts, I can find the mean, median, mode and range of sets of numbers, decide which type of average is most appropriate to use and discuss how using an alternative type of average could be misleading.

***MTH 4-20b**)*

Information Handling : Tables



In Mathematics pupils are expected to,
•from **level 2** onwards- read data from a table

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.

In Mathematics pupils are expected to,
•from **level 3** onwards- use frequency tables

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

Class intervals

<table>
<tr><th>Mark</th><th>Tally</th><th>Frequency</th></tr>
<tr><td>16 - 20</td><td>||</td><td>2</td></tr>
<tr><td>21 - 25</td><td>|||| ||</td><td>7</td></tr>
<tr><td>26 - 30</td><td>|||| ||||</td><td>9</td></tr>
<tr><td>31 - 35</td><td>||||</td><td>5</td></tr>
<tr><td>36 - 40</td><td>|||</td><td>3</td></tr>
<tr><td>41 - 45</td><td>||</td><td>2</td></tr>
<tr><td>46 - 50</td><td>||</td><td>2</td></tr>
</table>

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.

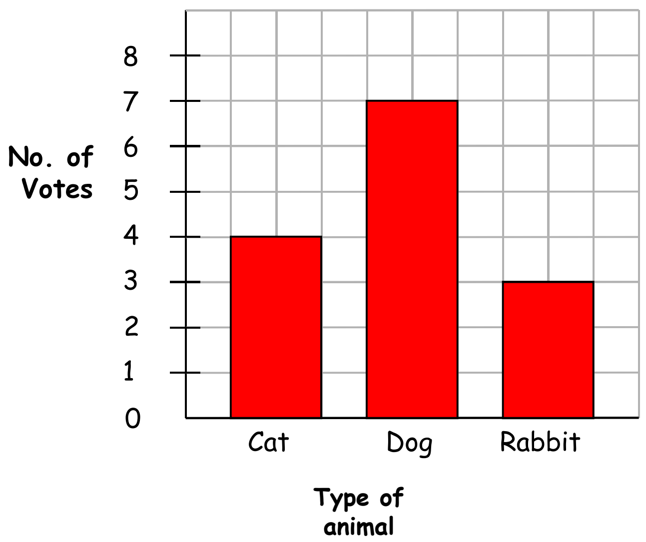
Bar Graphs

In Mathematics pupils are expected to,

- from **level 1** onwards – organise and display their findings in different ways
- from **level 1** onwards – sort information in a logical organised imaginative way
- from **level 2** onwards – work with others to collate, organise and communicate the results in an appropriate way

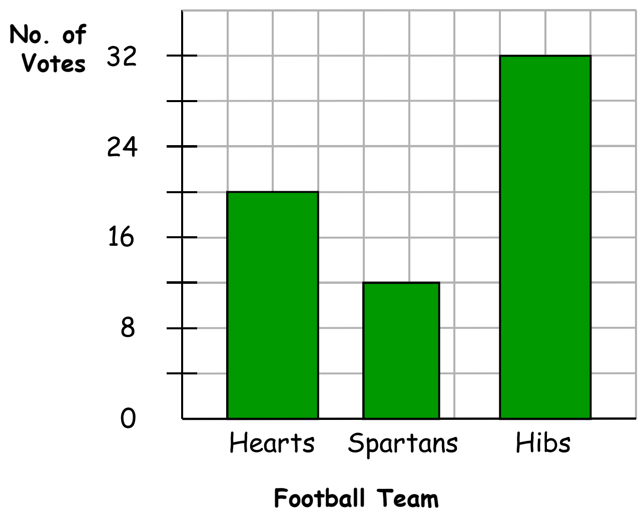
e.g. at Level 0

Bar Graph of Favourite Animals



e.g. at Level 0

Bar Graph of Favourite Football Teams



Good Practice

We always use a pencil and a ruler.
The graph has a title.
We label the axes.
We label the bars in the centre of the bar (each bar as an equal width).
We label the frequency up the left hand side with the numbers on the lines and not in the spaces.
We make sure that there is a space between the bars.

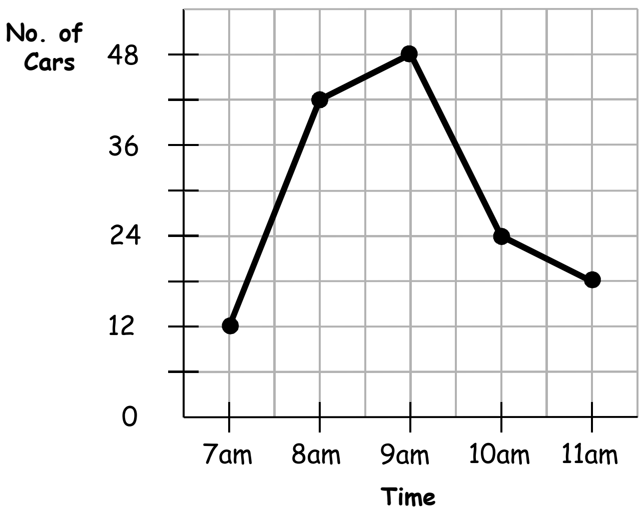
Line Graphs

In Mathematics pupils are expected to,

- from **level 2/3 onwards – display data in a clear way using a suitable scale.**

e.g. at Level 1

Line Graph of Traffic Over Time



The number of cars observed passing the school in the first minute after the hour were as follows,

Time	No. of cars
7am	12
8am	40
9am	48
10am	24
11am	18

Good Practice

We always use a pencil and a ruler.
We choose an appropriate scale for the axes to fit the paper.
The graph has a title.
We label the axes.
We number the lines not the spaces.
We join each point to the next consecutively using a ruler.

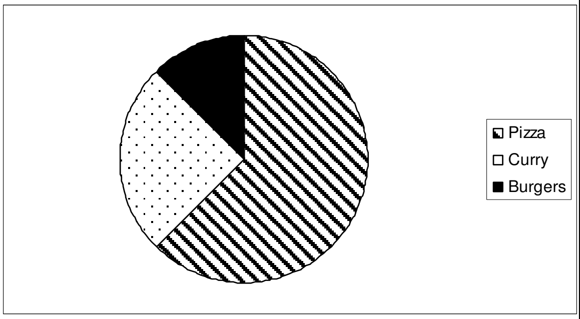
Pie Charts

e.g. at Level 2

A group of pupils were surveyed.

$\frac{5}{8}$ of them said their favourite food was pizza.

$\frac{1}{4}$ of them said curry. $\frac{1}{8}$ of them said burgers.

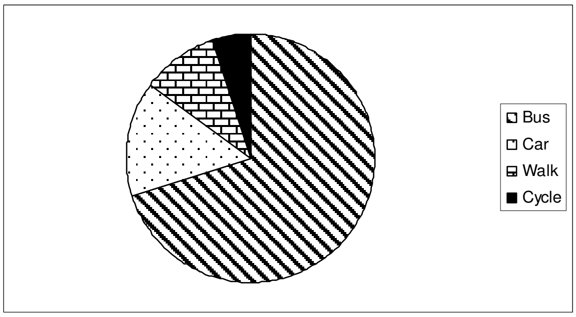


Display this data on a pie chart.

* The pupils are provided with a template that is split into eight sections to do this on.

e.g. at Level 2

A group of pupils were surveyed.
70% of them get the bus to school.
15% of them walk to school
10% of them come by car.
5% of them cycle to school.



Display this data on a pie chart.

* The pupils are provided with a template that is split into twenty sections to do this on.

Pie Charts

e.g. at Level 3

24 pupils in S1 were asked which primary school they attended. 13 pupils said Balgreen, 8 said Stenhouse, 2 said Dalry and 1 said Craiglockhart.

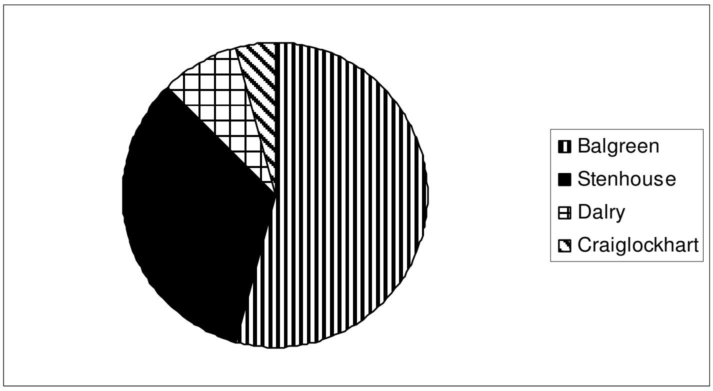
Display this data on a pie chart.

Balgreen $= \frac{13}{24}$ of $360^\circ = 360 \div 24 \times 13 = 195^\circ$

Stenhouse $= \frac{8}{24}$ of $360^\circ = 360 \div 24 \times 8 = 120^\circ$

Dalry $= \frac{2}{24}$ of $360^\circ = 360 \div 24 \times 2 = 30^\circ$

Craiglockhart $= \frac{1}{24}$ of $360^\circ = 360 \div 24 \times 1 = 15^\circ$



* The pupils are provided with a blank circle with one drawn radius to do this on.

Data Analysis

In Mathematics pupils are expected to,

- from **level 2** onwards – find the range of a set of data by subtracting the lowest number from the highest number (different from Biology!)

- from **level 2** onwards – find the mean of a set of data

e.g. Find the range and the mean of the following set of data

23 27 22 26 19 21

Range = 27 – 19 = 8

$$\text{Mean} = \frac{23 + 27 + 22 + 26 + 19 + 21}{6} = \frac{138}{6} = 23$$

- from **level 3** onwards – use a stem – and – leaf diagram

e.g. Show this list of the ages of the members of a golf club in an ordered stem – and – leaf diagram.

28 39 30 43 19 37 39 24 32 27 21 42 53 37

Working

1	9					
2	8	4	7	1		
3	9	0	7	9	2	7
4	3	2				
5	3					

Ages of Golf Club Members

1	9					
2	1	4	7	8		
3	0	2	7	7	9	9
4	2	3				
5	3					

n = 14

1 | 9 = 19 years old

Good Practice

We always give a stem – and – leaf diagram a title, a key and use n to state the sample size

Data Analysis

In Mathematics pupils are expected to,

- from **level 3** onwards – find the median and mode of a set of data

  e.g. Find the median and mode and the mean of the following set of data

  31 24 19 27 24 25 30 26

Mode = most common number = 24

Median = will be in the middle when the numbers are in ascending order

19 24 24 25 $\uparrow$ 26 27 30 31

$$\text{Median} = \frac{25 + 26}{2} = 25{\cdot}5$$

- from **level 3** onwards – comment on correlation in a scatter graph

  e.g. "The bigger the fence, the more paint will be needed to paint it" represents positive correlation.

  e.g. "The more people that are painting the fence, the less time will be needed" represents negative correlation.

- from **level 3** onwards – solve problems involving basic probability

  e.g. If we roll a die, what is the probability of it landing on a number bigger than 2 ?

$$P\text{ (more than a 2)} = \frac{4}{6} = \frac{2}{3}$$

Fractions

I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations.

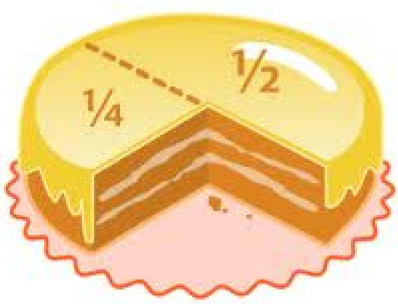
MNU 3-07a

(By applying my knowledge of equivalent fractions and common multiples, I can add and subtract commonly used fractions.

MTH 3-07b)

(Having used practical, pictorial and written methods to develop my understanding, I can convert between whole or mixed numbers and fractions.

MTH 3-07c)



Fractions

In Mathematics pupils are expected to,

- from **level 1** onwards – find simple fractions of an amount by applying knowledge of division

e.g. Find $\frac{1}{4}$ of 92

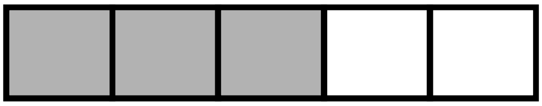
$$
\begin{array}{r|l}
 & 2\ \ 3 \\ \hline
4 & 9\ {}^{1}2
\end{array}
$$

$= 92 \div 4$

$= 23$

- from **level 1** onwards – identify basic fractions from a simple diagram

e.g. What fraction of this shape is shaded?



$= \frac{3}{5}$

- from **level 2** onwards – find fractions of a quantity

e.g. Find $\frac{3}{7}$ of 588

$$
\begin{array}{r|l}
 & 0\ \ 8\ \ 4 \\ \hline
7 & \cancel{5}\ {}^{5}8\ {}^{2}8
\end{array}
$$

$$
\begin{array}{r}
8\ \ 4 \\
\times\ \ \ \ \ 3 \\ \hline
2\ \ 5\ \ 2 \\ \hline
{\scriptstyle 1}\ \ \ \
\end{array}
$$

$= 588 \div 7 \times 3$

$= 84 \times 3$

$= 252$

Good Practice

We divide by the bottom number and then multiply by the top one.

Fractions

In Mathematics pupils are expected to,

- from **level 2** onwards – simplify fractions

e.g. Simplify $\frac{40}{56}$.

$$\frac{40}{56} \underset{\div 8}{\overset{\div 8}{=}} \frac{5}{7}$$

- from **level 2** onwards – equate simple fractions to decimals and vice versa

e.g. Convert $\frac{7}{10}$ to a decimal $\frac{7}{10} = 0{\cdot}7$

Convert $\frac{2}{25}$ to a decimal $\frac{2}{25} = \frac{8}{100} = 0{\cdot}08$

- from **level 3** onwards – convert an improper fraction to a mixed number and vice versa

e.g. Convert $\frac{7}{3}$ to a mixed number $\frac{7}{3} = 2\frac{1}{3}$

e.g. Convert $5\frac{3}{4}$ to an improper fraction $5\frac{3}{4} = \frac{23}{4}$

- from **level 3/4** onwards – add and subtract fractions

e.g.
$$\frac{6}{7} + \frac{3}{4}$$
$$= \frac{24}{28} + \frac{21}{28}$$
$$= \frac{45}{28}$$
$$= 1\frac{17}{28}$$

e.g.
$$6\frac{1}{4} - 3\frac{3}{5}$$
$$= 3\frac{1}{4} - \frac{3}{5}$$
$$= 3\frac{5}{20} - \frac{12}{20}$$
$$= 2\frac{25}{20} - \frac{12}{20}$$
$$= 2\frac{13}{20}$$

Fractions

Good Practice

We make the denominators equal to add and subtract.

In Mathematics pupils are expected to,

- from **level 4** onwards – multiply and divide fractions

e.g. $\frac{7}{10} \times 2\frac{1}{2}$

$= \frac{7}{{}_{2}\cancel{10}} \times \frac{\cancel{5}^{1}}{2}$

$= \frac{7}{4}$

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

e.g. $5\frac{1}{7} \div 2\frac{1}{4}$

$= \frac{36}{7} \div \frac{9}{4}$

$= \frac{{}^{4}\cancel{36}}{7} \times \frac{4}{\cancel{9}_{1}}$

$= \frac{16}{7}$

$= 2\frac{2}{7}$

Good Practice

When multiplying we cancel at the earliest opportunity.
We then do " top x top" and "bottom x bottom".
When dividing we invert the second fraction only and then multiply.

Percentages

I have investigated the everyday contexts in which simple fractions, percentages or decimal fractions are used and can carry out the necessary calculations to solve related problems.

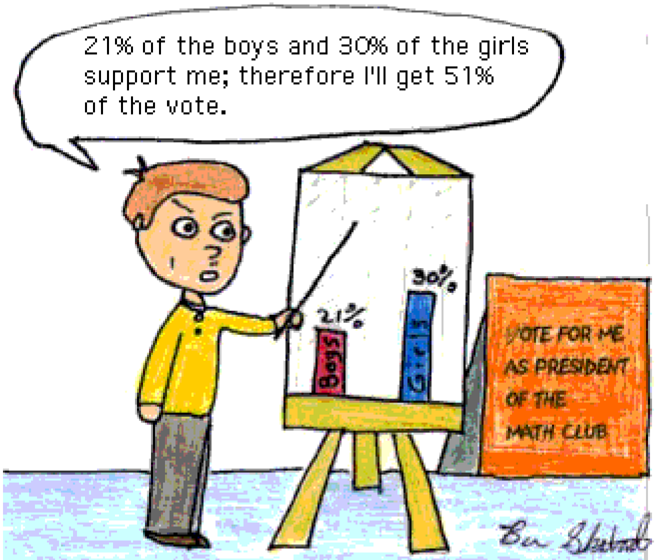
MNU 2-07a

I can show the equivalent forms of simple fractions, decimal fractions and percentages and can choose my preferred form when solving a problem, explaining my choice of method.

MNU 2-07b

I can solve problems by carrying out calculations with a wide range of fractions, decimal fractions and percentages, using my answers to make comparisons and informed choices for real-life situations.

MNU 3-07a



Percentages 1

In Mathematics pupils are expected to,

- from **level 2** onwards – be able to show equivalent forms of simple percentages, fractions and decimals

e.g. Convert 20% to a fraction and a decimal.

$$20\% = \frac{20}{100} = \frac{2}{10} = \frac{1}{5}$$

(÷ 10, ÷ 2)

$$20\% = 0{\cdot}20 = 0{\cdot}2$$

e.g. Express $\frac{13}{20}$ as a percentage and a decimal.

$$\frac{13}{20} = \frac{65}{100} = 65\%$$

(× 5)

$$\frac{13}{20} = 0{\cdot}65$$

- from **level 3** onwards – be able to solve a wide range of percentage calculations without using a calculator

e.g. Find 70% of £59

$= \frac{7}{10}$ of £59

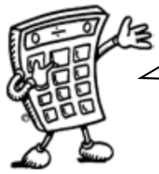
= £59 ÷ 10 × 7

= £41·30

£59 ÷ 10 = £5·90

$$\begin{array}{r} 5 \cdot 9\ 0 \\ \times \quad\quad 7 \\ \hline 4\ 1 \cdot 3\ 0 \\ \hline {}_{6}\quad \end{array}$$

Percentages 2



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

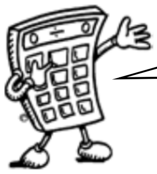
36% means
36% is therefore equivalent to $\frac{9}{25}$ and 0.36

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%	$\frac{1}{10}$	0.1
20%	$\frac{1}{5}$	0.2
25%	$\frac{1}{4}$	0.25
$33^{1}/_{3}\%$	$\frac{1}{3}$	0.333…
50%	$\frac{1}{2}$	0.5
$66^{2}/_{3}\%$	$\frac{2}{3}$	0.666…
75%	$\frac{3}{4}$	0.75

Percentages 3



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 £640

25% of £640 $= \frac{1}{4}$ of £640 = £640 ÷ 4 = £160

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% of 200g = $\frac{1}{100}$ of 200g = 200g ÷ 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% of £35 = $\frac{1}{10}$ of £35 = £35 ÷ 10 = £3.50

so 70% of £35 = 7 x £3.50 = £24.50

Percentages 4

Non- Calculator Methods (continued)

The previous 2 methods can be combined so as to calculate any percentage.

Example Find 23% of £15000

10% of £15000 = £1500	so 20% = £1500 x 2 = £3000
1% of £15000 = £150	so 3% = £150 x 3 = £450
23% of £15000	= £3000 + £450 = £3450

Finding VAT (without a calculator)

Value Added Tax (VAT) = 15%
To find VAT, firstly find 10%

Example Calculate the total price of a computer which costs £650 excluding VAT

10% of £650 = £65	(divide by 10)
5% of £650 = £32.50	(divide previous answer by 2)

so 15% of £650 = £65 + £32.50 = £97.50

Total price = £650 + £97.50 = £747.50

<u>Percentages 5</u>

In Mathematics pupils are expected to,

- from **level 2** onwards – find simple percentages of a quantity using a calculator

e.g. Find 63% of £78

$= \frac{63}{100}$ of £78

$= 63 \div 100 \times$ £78

$= 0.63 \times 78$

= £49·14

- from **level 3/4** onwards – solve percentage increase and decrease problems

e.g. A yearly bus pass costing £350 will increase by 3% next year.
Find the new cost.

100% + 3% = 103%

£350 × 1·03 = £360·50

- from **level 3/4** onwards – express one quantity as a percentage of another

e.g. A sports club has 75 members. 18 of these are junior members.
Express the number of junior members as a percentage of the total number of members.

$\frac{18}{75} \times 100$

= 24%

<u>WE DO NOT ...</u>
use the % button on a calculator as SQA will not give a candidate full credit unless the strategy is shown

use the % button on a calculator because of inconsistencies between calculator models.

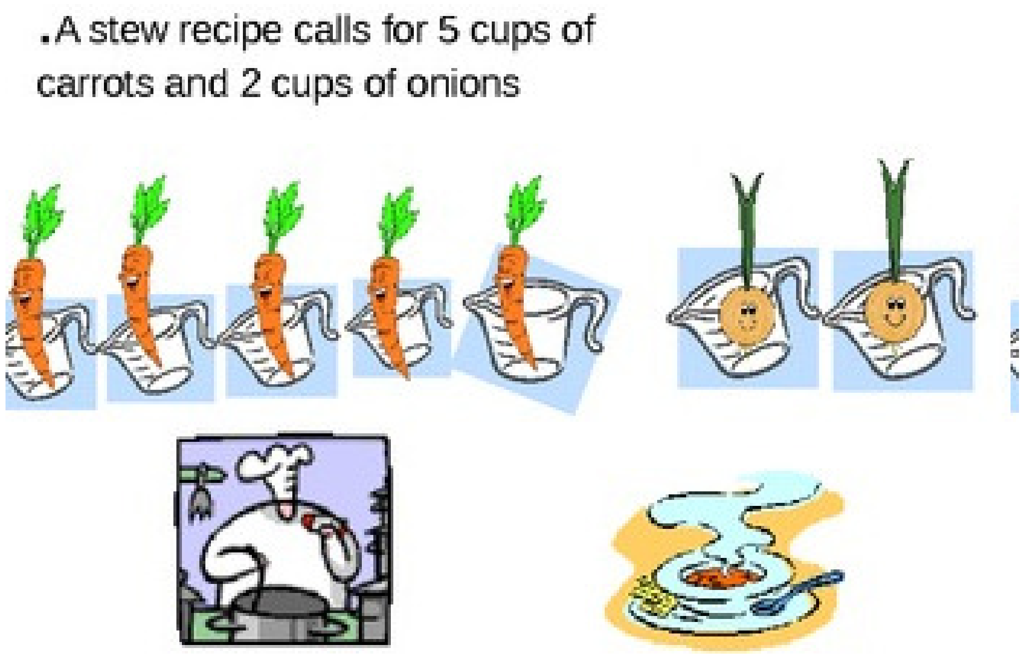
Ratio and Proportion

I can show how quantities that are related can be increased or decreased proportionally and apply this to solve problems in everyday contexts.

MNU 3-08a

Using proportion, I can calculate the change in one quantity caused by a change in a related quantity and solve real-life problems.

MNU 4-08a



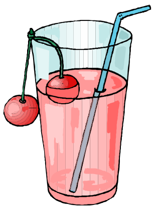
Ratio 1

In Mathematics pupils are expected to
from **level 3** onwards – show how quantities that are related can be increased or decreased

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
And simplified to 5:3

B B B B B R R R
B B B B B R R R

Blue : Red = 10 : 6
= 5 : 3

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

Ratio 2

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	
x5			x5
	15	**10**	

So the chocolate bar will contain 10g of nuts.

<u>Ratio 3</u>

Sharing in a given ratio

Example

Lauren and Sean 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 Sean received £36

Proportion

In Mathematics pupils are expected to,

- from **level 3** onwards – solve direct proportion problems using the unitary method

e.g. If is costs £119 to buy 7 DVDs, then what would 9 DVDs cost ?

7 DVDs $\longrightarrow$ £119
1 DVD $\longrightarrow$ £119 ÷ 7 = £17
9 DVDs $\longrightarrow$ £17 x 9 = £153

- from **level 3** onwards – solve inverse proportion problems using the unitary method

e.g. A team of 6 workers need 8 days to build a large perimeter wall.
How long would this job take a team of 4 workers ?

6 workers $\longrightarrow$ 8 days
1 worker $\longrightarrow$ 8 x 6 = 48 days
4 workers $\longrightarrow$ 48 ÷ 4 = 12 days

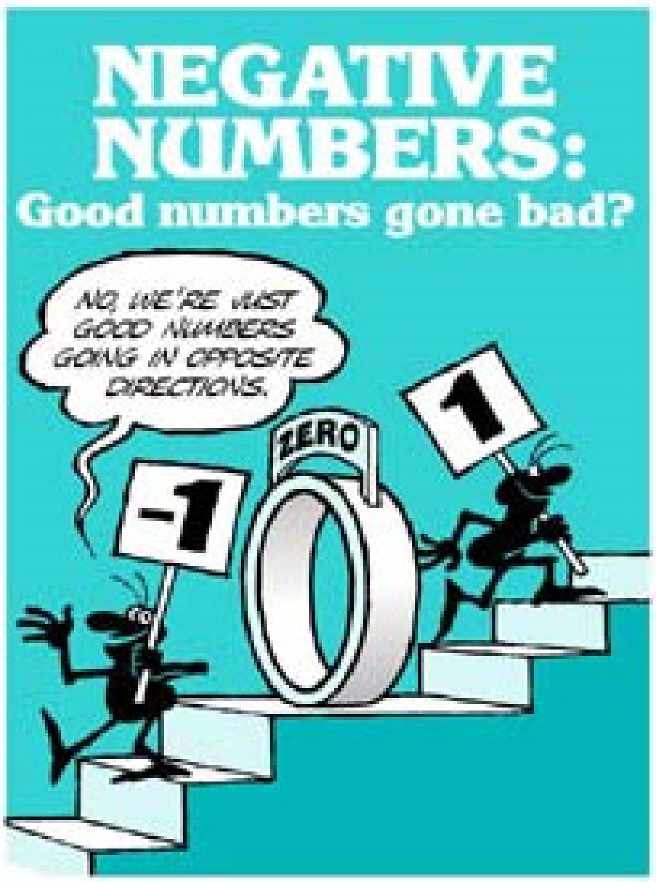
Good Practice

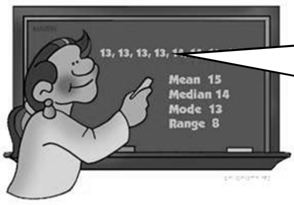
We always place the unknown quantity on the right hand side.
We do not round until the end of the problem if rounding is required.

Negative Numbers

I can use my understanding of numbers less than zero to solve simple problems in context.

MNU 3-04a

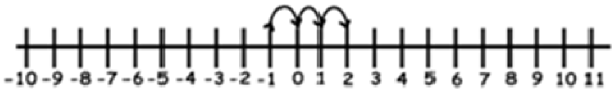




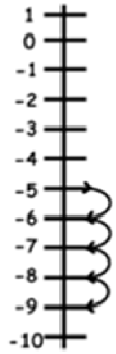
Pupils should be able to draw a number line, either horizontal or vertical, and use it to complete simple calculations.

Example 1 $1 - 5 = -4$

Example 2 $(-1) + 3 = 2$



Example 3 $(-5) - 4 = -9$



Examples in Context:

1. In winter the night time temperature at the North Pole is -41° Celsius. During the day the temperature rises by 7° Celsius. What is the day time temperature?

   $(-41) + 7 = -34$

   Day time temperature is -34° Celsius.

2. Mr Debt's bank account had a balance of £36 00. Mr Debt splashed out on a pair of jeans costing £75 00. What is the balance of Mr Debt's bank account now?

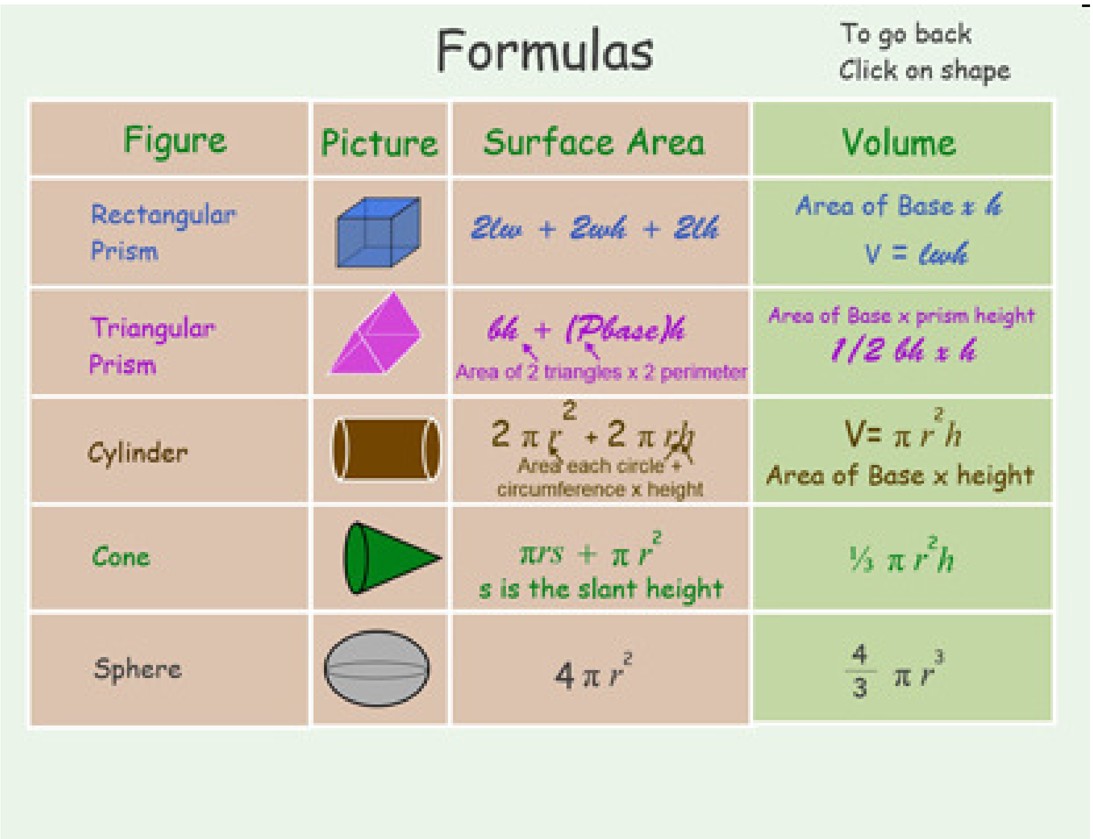
   $36 - 75 = -39$

   Balance is now -£39 00.

Area and Volume

I can solve practical problems by applying my knowledge of measure, choosing the appropriate units and degree of accuracy for the task and using a formula to calculate area or volume when required.

MNU 3-11a



Formulas

To go back
Click on shape

Figure	Picture	Surface Area	Volume
Rectangular Prism		$2lw + 2wh + 2lh$	Area of Base x h $V = lwh$
Triangular Prism		$bh + (P_{base})h$ Area of 2 triangles x 2 perimeter	Area of Base x prism height $1/2\ bh \times h$
Cylinder		$2\pi r^2 + 2\pi rh$ Area each circle + circumference x height	$V = \pi r^2 h$ Area of Base x height
Cone		$\pi rs + \pi r^2$ s is the slant height	$\frac{1}{3}\pi r^2 h$
Sphere		$4\pi r^2$	$\frac{4}{3}\pi r^3$

Area and Volume

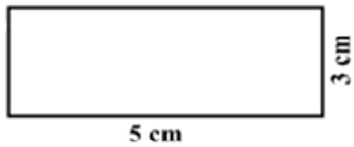
Before beginning a calculation, ensure that the dimensions of the shape are stated with consistent units.

Area of Rectangles

To calculate the area of a rectangle we use the formula

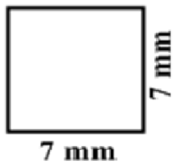
$$\boxed{\text{Area} = \text{Length} \times \text{Breadth}}$$

Example 1 Calculate the area of this rectangle.



Area = l × b
Area = 5 × 3
Area = 15 cm^2

Example 2 Calculate the area of this square.



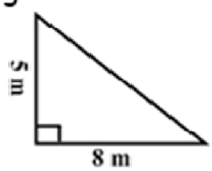
Area = l × b
Area = 7 × 7
Area = 49 mm^2

Area of Triangles

To calculate the area of a triangle we use the formula

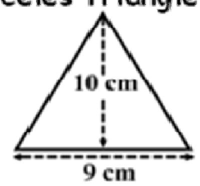
$$\boxed{\text{Area} = \tfrac{1}{2} \times \text{Base} \times \text{Height}}$$

Example 3 Calculate the area of this right-angled triangle.



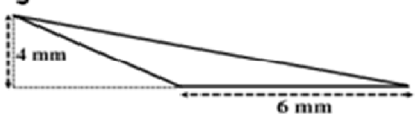
Area = $\frac{1}{2}$ × b × h
Area = $\frac{1}{2}$ × 8 × 5
Area = 20 m^2

Example 4 Calculate the area of this isosceles triangle.



Area = $\frac{1}{2}$ × b × h
Area = $\frac{1}{2}$ × 9 × 10
Area = 45 cm^2

Example 5 Calculate the area of scalene triangle.



Area = $\frac{1}{2}$ × b × h
Area = $\frac{1}{2}$ × 6 × 4
Area = 12 mm^2

Area of Circles

To calculate the area of a circle we use the formula

$$\boxed{\text{Area} = \pi r^2}$$

π = 3 14

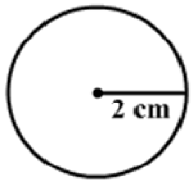
r = circle radius

Example 6 Calculate the area of this circle.

Area = $\pi \times r^2$

Area = 3 14 $\times$ 2 $\times$ 2

Area = 12 56 cm^2



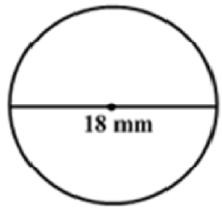
Example 7 Calculate the area of this circle.

Area = $\pi \times r^2$

Area = 3 14 $\times$ 9 $\times$ 9

Area = 254 34 mm^2

diameter = 18 mm, so radius = 9 mm



Volume of Cuboids

To calculate the volume of a cuboid we use the formula

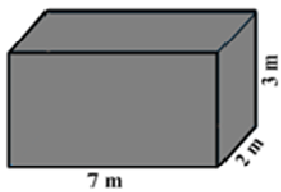
$$\boxed{\text{Volume} = \text{Length} \times \text{Breadth} \times \text{Height}}$$

Example 1 Calculate the volume of this cuboid.

Volume = l $\times$ b $\times$ h

Volume = 7 $\times$ 2 $\times$ 3

Volume = 42 m^3

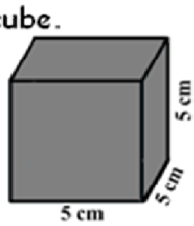


Example 2 Calculate the volume of this cube.

Volume = l $\times$ b $\times$ h

Volume = 5 $\times$ 5 $\times$ 5

Volume = 125 cm^3



Finance

When considering how to spend my money, I can source, compare and contrast different contracts and services, discuss their advantages and disadvantages, and explain which offer best value to me.

MNU 3-09a

I can budget effectively, making use of technology and other methods, to manage money and plan for future expenses.

MNU 3-09b

Maths Outcomes - Algebra and Equations Scientific Notation

Having discussed ways to express problems or statements using mathematical language, I can construct, and use appropriate methods to solve, a range of simple equations.

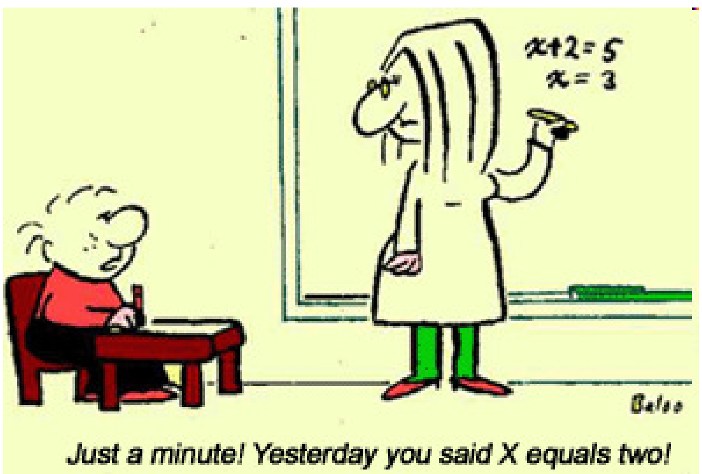
MTH 3-15a

I can create and evaluate a simple formula representing information contained in a diagram, problem or statement.

MTH 3-15b

Within real-life contexts, I can use scientific notation to express large or small numbers in a more efficient way and can understand and work with numbers written in this form.

MTH 4-06b



Solving Equations

In Mathematics pupils are expected to,

- from **level 2** onwards – solve simple one-step equations

e.g. Solve for x.

$$x + 7 = 15$$
$$-7 \qquad -7$$
$$\underline{\underline{x = 8}}$$

$$4x = 24$$
$$\div 4 \qquad \div 4$$
$$\underline{\underline{x = 6}}$$

- from **level 2** onwards – solve simple two-step equations

e.g. Solve for x.

$$6x - 2 = 40$$
$$+2 \qquad +2$$
$$6x = 42$$
$$\div 6 \qquad \div 6$$
$$\underline{\underline{x = 7}}$$

- from **level 3** onwards – solve simple three-step equations

e.g. Solve for x.

$$7x - 2 = 3x + 6$$
$$-3x \qquad -3x$$
$$4x - 2 = 6$$
$$+2 \qquad +2$$
$$4x = 8$$
$$\div 4 \qquad \div 4$$
$$\underline{\underline{x = 2}}$$

Solving Equations

In Mathematics pupils are expected to,

- from **level 3** onwards – solve equations with brackets

e.g. Solve for x.

$$7(x + 4) = 63$$

$$7x + 28 = 63$$

$$-28 \qquad -28$$

$$7x = 35$$

$$\div 7 \qquad \div 7$$

$$\underline{\underline{x = 5}}$$

- from **level 3** onwards – solve equations with fractions

e.g. Solve for x.

$$\frac{1}{4}x - 6 = 14$$

$$\times 4 \qquad \times 4$$

$$x - 24 = 56$$

$$+24 \qquad +24$$

$$\underline{\underline{x = 80}}$$

Good Practice

What we do to one side – we do to the other.

We always use a curly x.

WE DO NOT …

change the side – change the sign

Inequalities

In Mathematics pupils are expected to,

- from **level 3** onwards – insert less than < or greater signs >
  less than or equal to ≤ greater than or equal to ≥

  e.g. Copy and complete

  $9 \ldots\ldots 6$ $\longrightarrow$ $\underline{\underline{9 > 6}}$

  $-5 \ldots\ldots -2$ $\longrightarrow$ $\underline{\underline{-5 < -2}}$

- from **level 3** onwards – select numbers from a given set to satisfy inequations

  e.g. Choose the numbers from this set that satisfy the following inequations.

  $\{-3, -2, -1, 0, 1, 2, 3\}$

  $x \geq -2$ $\longrightarrow$ $\underline{\underline{\{-2, -1, 0, 1, 2, 3\}}}$

  $x < 1$ $\longrightarrow$ $\underline{\underline{\{-3, -2, -1, 0\}}}$

- from **level 3** onwards – solve one-step inequations

  e.g. Solve the inequality.

  $x - 3 \leq 17$

  $+3 \quad +3$

  $\underline{\underline{x \leq 20}}$

  $3x > 21$

  $\div 3 \quad \div 3$

  $\underline{\underline{x > 7}}$

- from **level 3** onwards – solve one-step inequations

  e.g. Solve the inequality.

  $3x + 2 \geq 26$

  $-2 \quad -2$

  $3x \geq 24$

  $\div 3 \quad \div 3$

  $\underline{\underline{x \geq 8}}$

Using Formulae

Order of operation BODMAS See page 49 and 50
In Mathematics pupils are expected to,

- from **level 3** onwards – evaluate formulae using substitution.

e.g. If p = 6, q = 5 and r = 4 then evaluate the following expressions,

$9r - pq + 8$	$7p - 2q + \frac{1}{2}r$	$\frac{p^2}{r}$
$= 9 \times 4 - 6 \times 5 + 8$	$= 7 \times 6 - 2 \times 5 + \frac{1}{2}$ of 4	$= \frac{36}{4}$
$= 36 - 30 + 8$	$= 42 - 10 + 2$	$= 9$
$= 14$	$= 34$	

- from **level 3** onwards – evaluate formulae using substitution (including solving the equation itself).

e.g. The length of a string S mm for the mass of W grams is given by the formula $S = 18 + 4W$

Find S when W = 5 g

$S = 18 + 4W$	(Write the formula)
$S = 18 + 4 \times 5$	(Replace the letters with the correct numbers)
$S = 18 + 20$	Simplify
$S = 38$ mm	Interpret the result in context

Find W when S = 44 mm

$S = 18 + 4W$	(Write the formula)
$44 = 18 + 4W$	(Replace the letters with the correct numbers)
$44 - 18 = 4W$	Rearrange the equation.
$26 = 4W$	Simplify the equation.
$4W = 26$	Swap sides.
$W = \frac{26}{4}$	Rearrange the equation.
$W = 6{\cdot}5$ g	Interpret the result in context

Using Formulae

e.g. $R = 12 - 3K$. Find K if $R = 27$.

$$27 = 12 - 3K$$
$$27 - 12 = -3K$$
$$15 = -3K$$
$$-3K = 15$$
$$K = \frac{15}{-3}$$
$$K = -5$$

OR

$$27 + 3K = 12$$
$$3K = 12 - 27$$
$$3K = -15$$
$$K = \frac{-15}{3}$$
$$K = -5$$

- from **level 3** onwards – evaluate formulae using substitution (including examples that involve powers and roots)

e.g. If $p = 6$, $q = 5$ and $r = 4$ then evaluate the following expression,

$$4q^2 + \sqrt{3pr - 8}$$
$$= 4 \times 5^2 + \sqrt{3 \times 6 \times 4 - 8}$$
$$= 4 \times 25 + \sqrt{72 - 8}$$
$$= 100 + \sqrt{64}$$
$$= 100 + 8$$
$$= 108$$

Good Practice

We always substitute numbers for letters at the earliest opportunity.

WE DO NOT ...

rearrange the formula before substitution.
State the answer without showing all of our working.

Scientific Notation

In Mathematics pupils are expected to,

- from **level 4** onwards – convert numbers from normal form into scientific notation and vice versa

e.g. Convert these numbers into Scientific Notation

34 000
$= 3{\cdot}4 \times 10000$
$= 3{\cdot}4 \times 10^4$

0·009 65
$= 9{\cdot}65 \times 0{\cdot}001$
$= 9{\cdot}65 \times 10^{-3}$

e.g. Convert these numbers into normal form

$7{\cdot}0243 \times 10^2$
$= 7{\cdot}0243 \times 100$
$= 702{\cdot}43$

$2{\cdot}146 \times 10^{-5}$
$= 2{\cdot}146 \times 0{\cdot}000\ 01$
$= 0{\cdot}000\ 021\ 46$

Good Practice

We put spaces between the numbers every three columns where the decimal point would be.

We use the EXP key or the ($\times 10^n$) key on the calculator.

WE DO NOT ...

put commas between the numbers

use the x key on the calculator

use the (y^x) button on the calculator

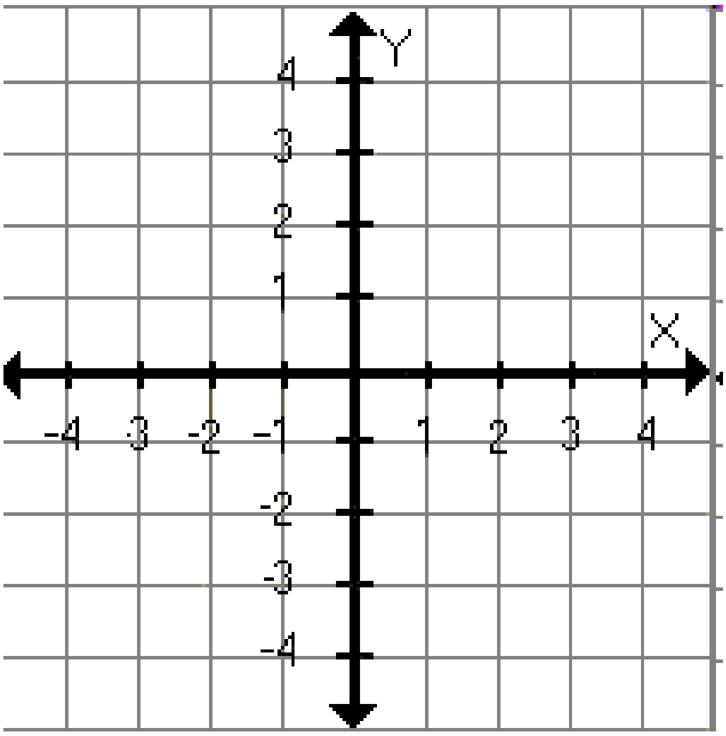
Maths Outcomes - Coordinates

I can use my knowledge of the coordinate system to plot and describe the location of a point on a grid.

MTH 2-18a / MTH 3-18a

I can plot and describe the position of a point on a 4-quadrant coordinate grid.

MTH 4-18a

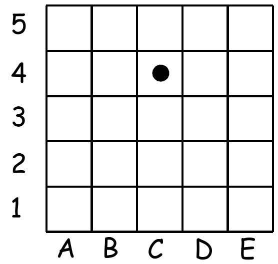


Coordinates

In Mathematics pupils are expected to,

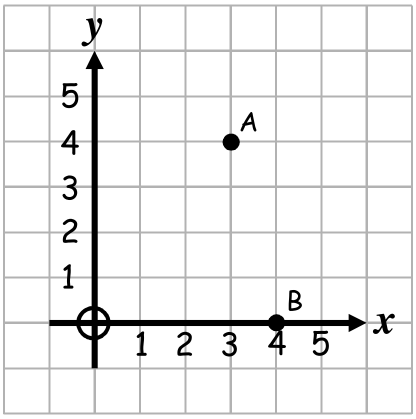
- from **level 1** onwards – be able to use simple grid references

e.g. where is the dot ?



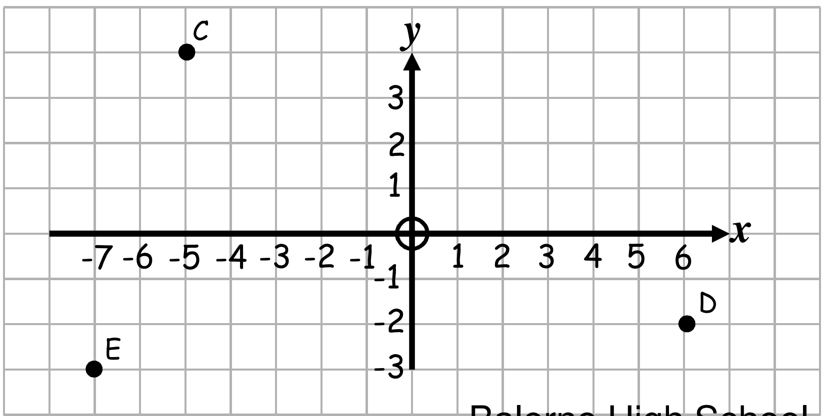
C4

- from **level 2/3** onwards – use a coordinate system to locate and plot points (first quadrant)



e.g. A is located at (3,4).
B is located at (4,0).

- from **level 4** onwards – use a coordinate system to locate and plot points (four quadrants)



e.g. C is located at (-5,4).
D is located at (6,-2).
E is located at (-7, -3).

Coordinates

Good Practice

We always number the grid lines (not the spaces).
We always use brackets and a comma to state coordinates.
At level D we go right and <u>then</u> up.
At level E we use the x number before the y number.
We always use a curly x.

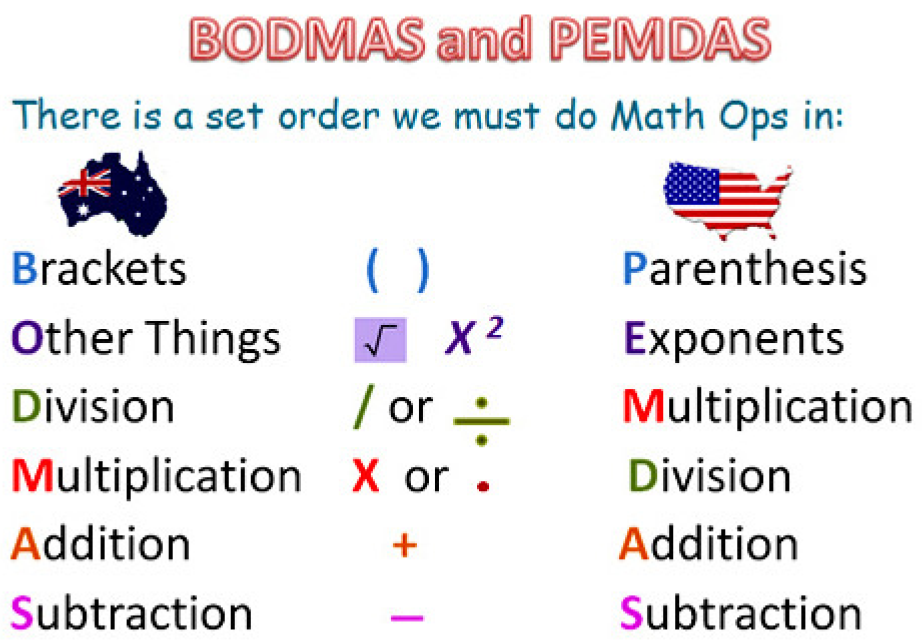
WE DO NOT …

number the spaces when constructing the axes.
have an X that looks like a times sign.

Maths Outcomes - Order of Operations

I have investigated how introducing brackets to an expression can change the emphasis and can demonstrate my understanding by using the correct order of operations when carrying out calculations.

MTH 4-03b



Order of Operations (BODMAS) 1

Consider this: What is the answer to 2 + 5 x 8 ?

Is it 7 x 8 = 56 or 2 + 40 = 42 ?

The correct answer is 42.

Calculations which have more than one operation need to be done in a particular order. The order can be remembered by using the mnemonic **BODMAS**

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

(B)rackets

(O)f

(D)ivide

(M)ultiply

(A)dd

(S)ubract

Scientific calculators use this rule, some basic calculators may not, so take care in their use.

Example 1

$15 - 12 \div 6$
$= 15 - 2$
$= 13$

BODMAS tells us to divide first

Example 2

$(9 + 5) \times 6$
$= 14 \times 6$
$= 84$

BODMAS tells us to work out the brackets first

Example 3

$18 + 6 \div (5-2)$ — Brackets first
$= 18 + 6 \div 3$ — Then divide
$= 18 + 2$ — Now add
$= 20$

Order of Operations (BODMAS) 2

In Mathematics pupils are expected to,

- from **level 3** onwards – evaluate formulae and expressions that involve order of operations

  e.g. Find $11 + 4 \times 6 \div (7 - 5)^3 - 1$

Brackets **O**f **D**ivision **M**ultiplication **A**ddition **S**ubtraction

We break the **brackets**,

$= 11 + 4 \times 6 \div 2^3 - 1$

2 to the power **of** 3,

$= 11 + 4 \times 6 \div 8 - 1$

4 **multiplied** by 6,

$= 11 + 24 \div 8 - 1$

24 **divided** by 8,

$= 11 + 3 - 1$

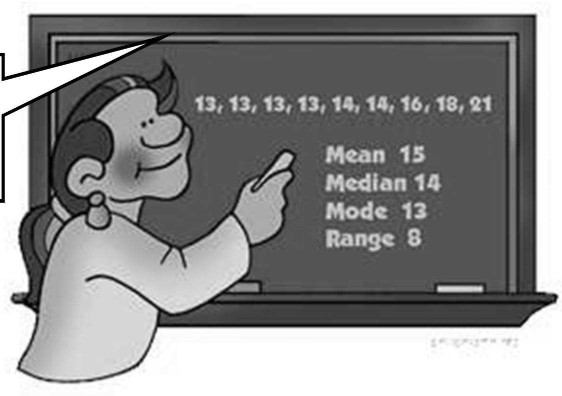
11 **add** 3,

$= 14 - 1$

14 **subtract** 1,

$= 13$

Here are some useful unit conversions:



10 mm	1 cm
100 cm	1 m
1000 m	1 km
1000 mg	1 g
1000 g	1 kg
1000 kg	1 tonne
1000 ml	1 litre
1 ml	1 cm3
60 seconds	1 minute
60 minutes	1 hour
24 hours	1 day
7 days	1 week
14 days	1 fortnight
12 months	1 year
52 weeks	1 year
365 days	1 year
366 days	1 leap year
Decade	10 years
Century	100 years
Millennium	1000 years
1000	1 thousand
1 000 000	1 million
1 000 000 000	1 billion

Mathematical Dictionary (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 meridian) 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!
Data	A collection of information (may include facts, numbers or measurements).
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
K	Thousand e.g. £30K = £30 000
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 (see p47)
Median	Another type of average – the middle number of an ordered set of data (see p48)
Minimum	The smallest or lowest number in a group.
Minus (-)	To subtract.
Mode	Another type of average – the most frequent number or category (see p32)
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 negative sign. Example -5 is a negative number.
Numerator	The top number in a fraction.

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 operations should be done. BODMAS (see p9)
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 100.
Per annum (pa)	Each year Usually used in banking for interest rates or for salaries.
p.m.	(post meridian) 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.
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).

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