

Emerson Park Academy

Mathematics Department

# Numeracy Across the Curriculum

Information for parents and  
students



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## Introduction

Recently, the Maths department set up links with several other departments to see how topics involving numbers are taught across the school.

This booklet has been produced to inform parents and teachers how, and when, each topic is taught within the Maths Department at Emerson Park Academy.

Other departments will use this booklet to make them aware of how and when topics are taught in Maths. Teaching of topics will then be more uniform throughout the school which should make it easier for pupils to learn.

## MATHSWATCH CLIP – N1

### Basics

Every pupil should know their **multiplication tables**. Their six, seven, eight, and nine times tables are very important and can be practiced at home.

Primary School learning about **place value** is often forgotten and can be reinforced at home.

Remember:

hundreds	tens	units	decimal point	tenths	hundredths
3	5	6	.	7	5

Reading and writing large numbers is a common difficulty that you can help with (Numeracy and Literacy)

E.g. 3,678,023 read as: (Numeracy)

Three million, six hundred and seventy eight thousand and twenty three.  
(Literacy)

Pupils can be made aware at home of metric and imperial weights.

**Task** : *measures and their own height and weight in both.*

They can practice estimating sensibly, getting the feel of large and small weights, heights and distances and using money in a practical way.

The better your child knows the basics, the easier it will be for him or her to make progress.

Approximately equal to symbol is



## Estimating

We expect pupils to:

1) Estimate height and length in cm, m,  $\frac{1}{2}$ m. E.g.

Length of pencil = 10cm



Width of desk =  $\frac{1}{2}$ m



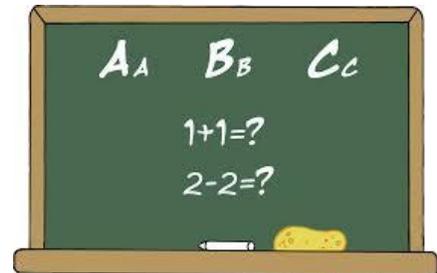
Estimate small weights, small areas, small volumes

Bag of sugar = 1 kg.

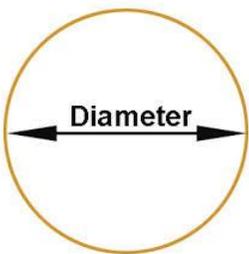


2) Estimate areas in square metres, lengths in mm and m. E.g.

Area of blackboard =  $4\text{m}^2$



Diameter of 1p = 15 mm.



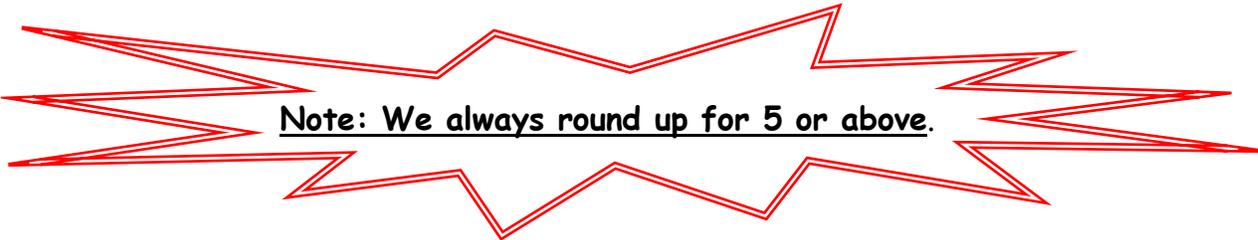
Approximately equal to symbol is



## Rounding

We expect pupils to:

- round 2 or 3 digit whole numbers to the nearest 10
- round any number to the nearest whole number, 10 or 100 round any number to 1 decimal place
- round to any number of decimal places or significant figures.



**Note: We always round up for 5 or above.**

### **WORKED EXAMPLES:**

Example 1

74 to the nearest 10 → 70

386 to the nearest 10 → 390.

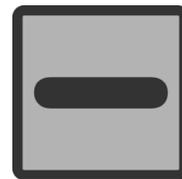
Example 3

347.5 = 348 (to nearest whole number); or 350 (to nearest ten); or 300 (to nearest hundred.)

7.51 to 1 decimal place) 7.5; 8.96 (to 1 decimal place) to 9.0.

Example 3

3.14159 (to 3 decimal places) to 3.142; or 3.14 (to 2 decimal places);  
Or 3.14 (to 3 significant figures).



MATHSWATCH CLIP – C2, C8

## Subtraction

we should be able to use:

- Subtraction using decomposition (as a written method)
- Check by addition
- Promote alternative mental methods where appropriate.

### WORKED EXAMPLES

- Decomposition:

$$\begin{array}{r} 6 \\ 27 \overset{1}{\cancel{-}} \\ \underline{38} \\ 233 \end{array}$$

$$\begin{array}{r} 39 \\ 40 \overset{1}{\cancel{-}} \\ \underline{74} \\ 326 \end{array}$$

- Counting on:

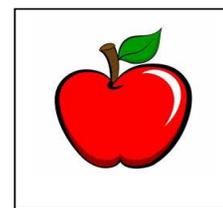
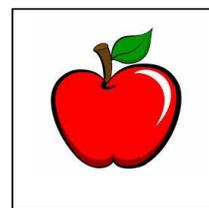
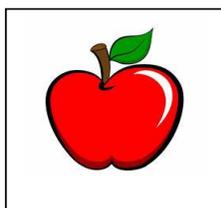
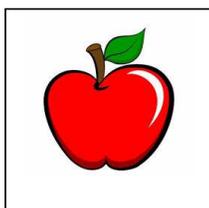
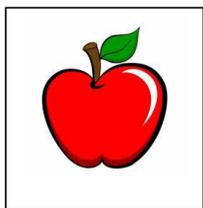
To solve  $41 - 27$ , count on from 27 until you reach 41

- Breaking up the number being subtracted:

eg To solve  $41 - 27$ , subtract 20 then subtract 7

**WE DO NOT...**

**"Borrow and pay back"**





**MATHSWATCH CLIP - N3, N16, N17, C17, C24, C27, C28A, C28B**

## Fractions

- We expect pupils to:  
Do simple fractions of 1 or 2 digit numbers e.g.

$$\frac{1}{3} \text{ of } 9 = 3 \quad (9 \div 3) \qquad \frac{1}{5} \text{ of } 70 = 14 \quad (70 \div 5)$$

- we expect pupils to:  
Do simple fractions of up to 4 digit numbers e.g.

$$\frac{3}{4} \text{ of } 176 = 132 \quad (176 \div 4 \times 3)$$

Use equivalence of widely used fractions and decimals e.g.  $\frac{3}{10} = 0.3$

Find widely used fractions mentally  
Find fractions of a quantity with a calculator.

- We:  
Use equivalence of all fractions, decimals and percentages  
Add, subtract, multiply and divide fractions with and without a calculator.

### WORKED EXAMPLES

Add and Subtract	Multiply	Divide
Make the denominators equal	Multiply top and multiply bottom	Invert the second fraction and multiply

$\frac{1}{2} + \frac{1}{3}$ $= \frac{3}{6} + \frac{2}{6}$ $= \frac{5}{6}$	$\frac{2}{3} \times \frac{3}{4}$ $= \frac{6}{12}$ $= \frac{1}{2}$	$\frac{3}{4} \div \frac{2}{5} \text{ (times and flip)}$ $= \frac{3}{4} \times \frac{5}{2}$ $= \frac{15}{8} \text{ (Improper fraction)}$ $= 1\frac{7}{8}$
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## Co-ordinates

we expect pupils to:

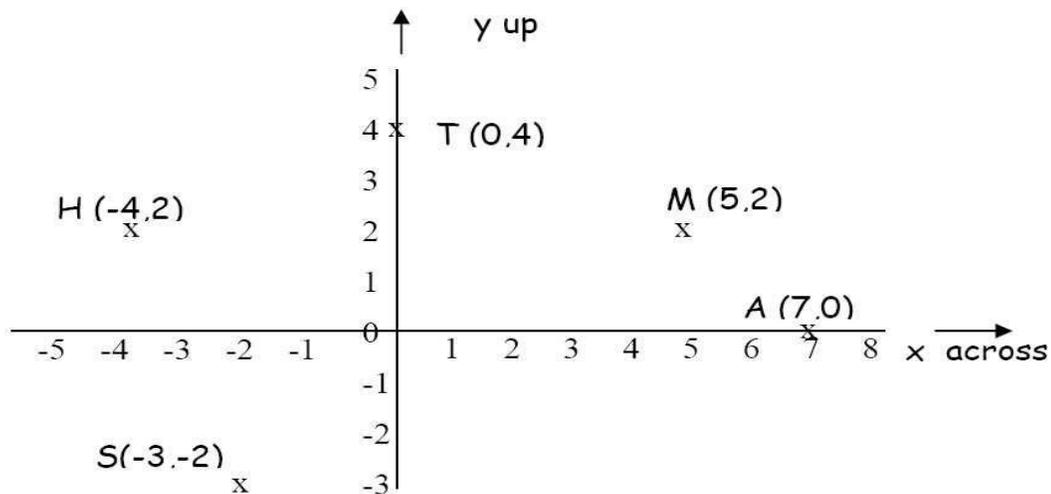
- Use a co-ordinate system to locate a point on a grid
- Number the grid lines rather than the spaces
- Use the terms across/back and up/down for the different directions
- Use a comma to separate as follows : 3 across 4 up = (3,4)

We expect pupils to:

- Use co-ordinates in all four quadrants to plot positions.

WORKED EXAMPLE:

Plot the following points: M (5,2), A (7,0), T (0,4), H (-4,2), S (-3,-2)



## Percentages



We expect pupils to:

Find 50%, 25%, 10% and 1% without a calculator and use addition to find other amounts eg.

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

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

$$10\% = \frac{1}{10} = 0.10$$

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

Find percentages with a calculator

(E.g. 23% of £300 =  $23 \div 100 \times 300 = \text{£}69$ )

Recognise that "of" means multiply.

We expect pupils to:

Express a fraction as a percentage via the decimal equivalent.

### WORKED EXAMPLES

- Find 36% of £250

10% is £25

30% is £75 (10% × 3)

5% is £12.50 (10% ÷ 2)

1% is £ 2.50 (10% ÷ 10)

36% is **£90** (30% + 5% + 1% = £75 + £12.50 + £2.50)

- Express two fifths as a percentage

$$\begin{array}{ccccccc} & \rightarrow & \times 2 & & \rightarrow & \times 10 & \rightarrow \\ \frac{2}{5} & = & \frac{4}{10} & = & \frac{40}{100} & = & 40\% \end{array}$$



This rule is equivalent for % profit, increase or decrease.

- Increase £350 by 15%

$$15\% \text{ of } 350 = 15 \div 100 \times 350 = \text{£}52.50 \quad (\text{to find the increase})$$

$$\text{£}350 + \text{£}52.50 = \underline{\text{£}402.50} \quad (\text{then add on for the new total})$$

**WE DO NOT...**

**Use the % button on the calculator because of inconsistencies between models.**



## Proportion

We expect pupils to:

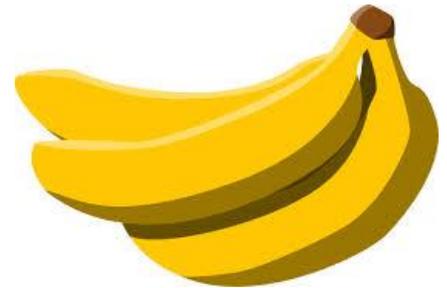
- Identify direct and inverse proportion
- Record appropriate 'headings' with the unknown on the right
- Use the unitary method (i.e. find the value of 'one' first then multiply by the required value)
- If rounding is required we do not round until the last stage.

### WORKED EXAMPLES:

#### A. Direct Unitary Method

If 5 bananas cost 80p, then what will 3 bananas cost?

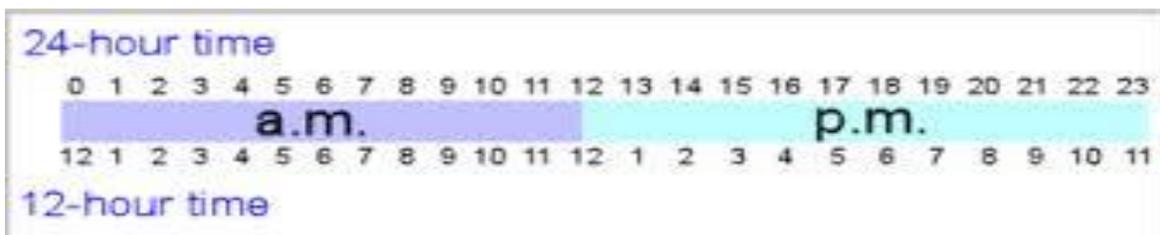
Bananas	cost (pence)
5	80
1	$80 \div 5 = 16$
3	$16 \times 3 = 48$



#### B. Inverse Unitary Method

The journey time at 60 km/h = 30 minutes so what is the journey time at 50km/h?

Speed (km/h)	Time (mins)
60	30
1	$30 \times 60 = 1800$ minutes
50	$1800 \div 50 = 36$ minutes





## Equations

We expect pupils to solve simple equations by:

- 'Rearranging'
- Performing the same operation to each side of the equation
- Doing "Undo" operations e.g  
undo + with -, undo - with +  
undo x with ÷, undo ÷ with x
- Encouraging statements like:  
"Move the +5 over becomes -5"  
"Move times 3 becomes divide 3"
- We prefer:  
The letter x to be written differently from a multiplication sign  
One equals sign per line  
Equals signs beneath each other  
We discourage bad form such as  $3 \times 4 = 12 \div 2 = 6 \times 3 = 18$ .

### WORKED EXAMPLES:

EXAMPLE 1

$$2x + 3 = 9 - 3 \quad \text{take away 3}$$

$$\frac{2x}{2} = \frac{6}{2} \quad \text{divide by 2 both sides}$$

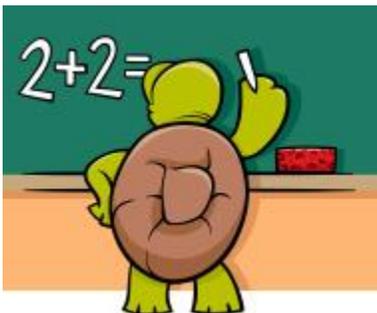
$$x = 3$$

EXAMPLE 2

$$3x + 6 = 2x - 18 - 6 \quad -6 \text{ and } -2x$$

$$\text{sides } 3x - 2x = -18 - 6$$

$$x = -24$$



## Line Graphs

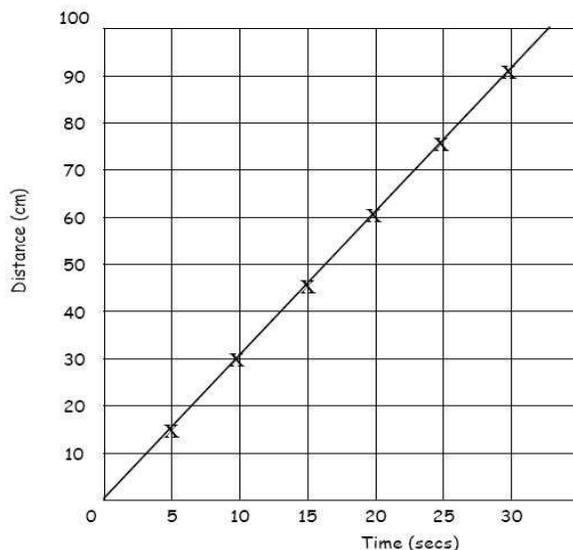
We expect pupils to:

- Use a sharpened pencil and a ruler
  - Choose an appropriate scale for the axes to fit the paper
  - Label the axes
  - Give the graph a title
  - Number the lines **not** the spaces
  - Plot the points neatly (using a cross or dot)
  - Fit a suitable line.
- 
- If necessary, make use of a jagged line to show that the lower part of a graph has been missed out.

**WORKED EXAMPLES:** The distance a gas travels over time has been recorded in the table below:

Time (s)	0	5	10	15	20	25	30
Distance (cm)	0	15	30	45	60	75	90

Distance travelled by a gas over time



# Bar Graphs

We expect pupils to:

- Use a pencil
- Give the graph a title
- Label the axes
- Label the bars in the centre of the bar (each bar has an equal width)
- Label the frequency (up the side) on the lines not on the spaces
- Make sure there are equal spaces between the bars.

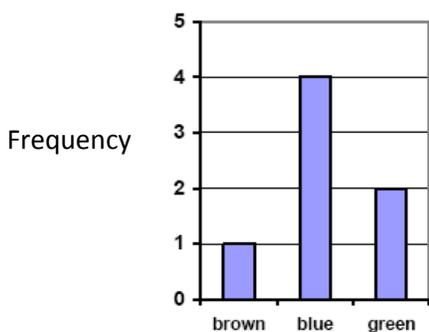
Pupils should be able to

- Construct bar graphs with frequency graduated in single units/multiple units.
- Construct bar graphs involving simple fractions or decimals.

## WORKED EXAMPLES:

Level 2

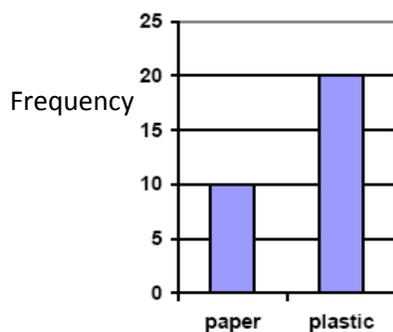
colour of eyes



Eye colour

Level 2

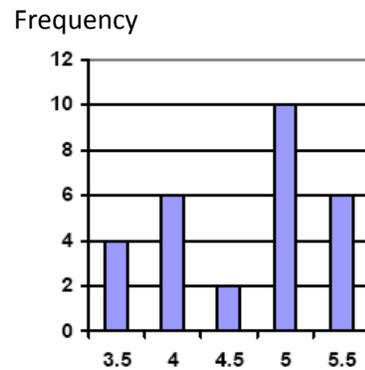
quantities of litter



Litter

Level 3

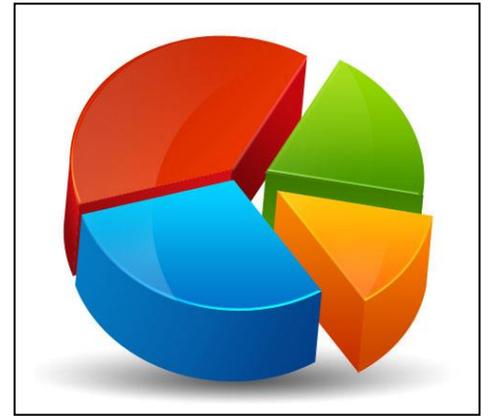
shoe size



Shoe size

**MATHSWATCH CLIP – D10**

**Pie Charts**



We expect pupils to:

- Use a pencil
- Label all the slices or insert a key as required
- Give the pie chart a title.

Construct pie charts involving simple fractions, decimals or percentages.

Construct pie charts of raw data.

**WORKED EXAMPLES:**

**Level 3**

30% of pupils travel to school by bus, 10% by car, 55% walk and 5% cycle.

Draw a pie chart of the data.

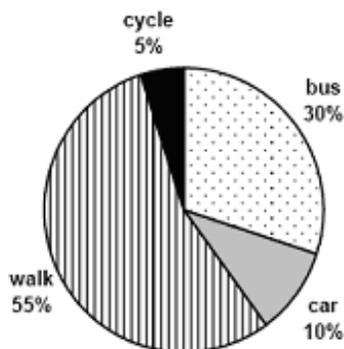
Bus 30% =  $30 \div 100 \times 360 = 108^\circ$

Car 10% =  $10 \div 100 \times 360 = 36^\circ$

Walk 55% =  $55 \div 100 \times 360 = 198^\circ$

Cycle 5% =  $5 \div 100 \times 360 = 18^\circ$

Transport to school



**Level 4**

20 pupils were asked "What is your favourite subject?"

Replies were Maths 5, English 6, Science 7, Art 2

Draw a pie chart of the data.

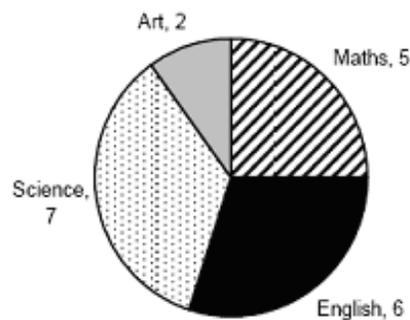
Maths (5)  $5/20 = 5 \div 20 \times 360 = 90^\circ$

English (6)  $6/20 = 6 \div 20 \times 360 = 108^\circ$

Science (7)  $7/20 = 7 \div 20 \times 360 = 126^\circ$

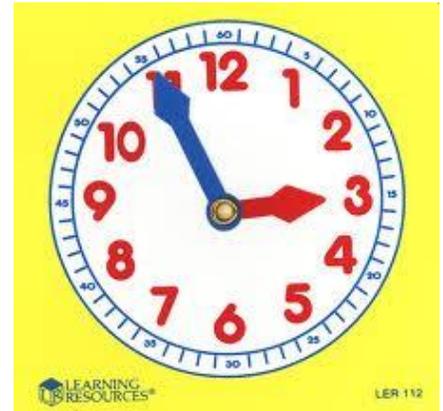
Art (2)  $2/20 = 2 \div 20 \times 360 = 36^\circ$

Favourite subject



(A full pie chart =  $360^\circ$ )

## Time Calculations



We expect pupils to:

- Convert between the 12 and 24 hour clock (2327 = 11.27pm)
- Calculate duration in hours and minutes by counting up to the next hour then on to the required time.
- Convert between hours and minute (multiply by 60 for hours into minutes).

### WORKED EXAMPLES

1) How long is it from 0755 to 0948?

0755    0800    0900    0948  
(5 mins)    (1hr)    (48mins)

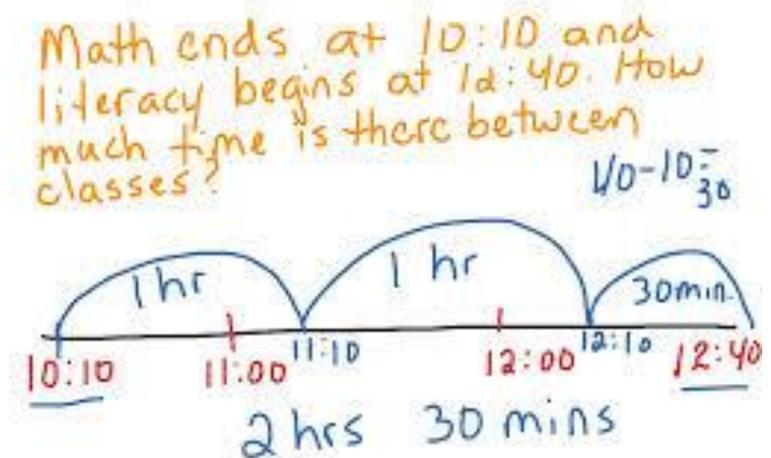
Total time 1 hr 53 minutes

2) Change 27 minutes into hours

27 min =  $27 \div 60 = 0.45$  hours

**WE DO NOT...**

**Teach time as a subtraction calculation.**



## Using Formulae

We expect pupils to use simple formulae at Level 4 by:

- Writing down the formula first
- Rewriting the formula replacing the letters by the appropriate numbers (substitution)
- Solving the equation
- Interpreting the answer and putting the appropriate units back into context.

### WORKED EXAMPLES

The length of a string  $S$  mm for the weight of  $W$  grams is given by the formula:

$$S = 16 + 3W$$

(a) Find  $S$  when  $W = 3$ grams

$$S = 16 + 3W$$

Write formula

$$S = 16 + 3 \times 3$$

replace letters by numbers

$$S = 16 + 9$$

Solve the equation

$$S = 25$$

Length of string is 25 mm (interpret result in context)

(b) Find  $W$  when  $S = 20.5$  mm

$$S = 16 + 3W$$

Write formula

$$20.5 = 16 + 3W$$

Replace letters by numbers

$$4.5 = 3W$$

Solve the equation

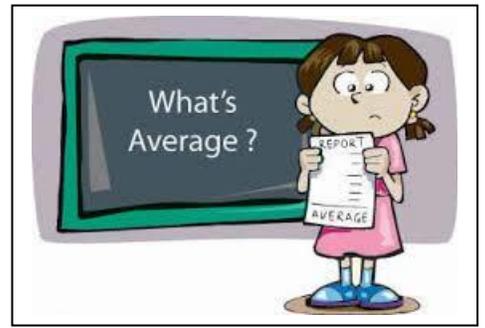
$$1.5 = W$$

The weight is 1.5g

Interpret result in context

### WE DO NOT:

- Rearrange the formula before substitution (*too difficult*)
- State the answer only; working must be shown.



## Data Analysis

**We expect pupils to:**

- Analyse ungrouped data using a tally table and frequency column or an ordered list
- Calculate range of a data set. In Maths this is taught as the difference between the highest and lowest values of the data set.  
(Range is expressed differently in biology)
- Calculate the mean (average) of a set of data.
  
- Use a stem and leaf diagram
- Calculate the mean (average)
- Median ( central value of an ordered list)
- Mode (most common value) of a data set
- Obtain these values from an ungrouped frequency table.

Correlation in scatter graphs is described in qualitative terms.

E.g.

"The warmer the weather, the less you spend on heating" is negative correlation.

"The more people in your family, the more you spend on food" is positive correlation.

Probability is always expressed as a fraction.

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

### **WORKED EXAMPLE**

The results of a survey of the number of pets pupils owned were

3,3,4,4,4,5,6,6,7,8

$$\text{Mean} = \frac{\text{Sum of Scores}}{\text{No. of Scores}} = \frac{3+3+4+4+4+5+6+6+7+8}{10} = 50 \div 10 = 5$$

Median = the middle =  $(4 + 5) \div 2 = 4.5$

Mode = most common = 4

Range = highest - lowest =  $8 - 3 = 5$

## Scientific Notation or Standard Form

In Maths we introduce scientific notation at level 4.

It is part of the *General* and *Credit Standard* grade course and taught at the beginning of S2 (*Credit* and *Level 4*) and the beginning of S3 (*General*)

We teach that a number in scientific notation consists of a number between one and ten multiplied by a power of 10.

For example

$$24,500,000 = 2.45 \times 10^7$$

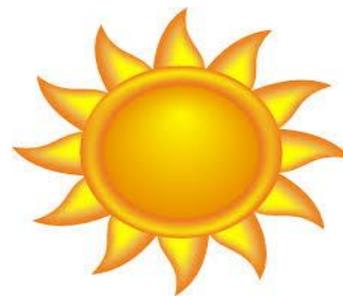
$$0.000988 = 9.88 \times 10^{-4}$$

- Pupils should be aware of terms like:
  - 'Kilo' meaning one thousand
  - 'Milli' meaning one thousandth.
- Pupils should be able to use powers and square roots.

### Distance to the SUN



$$\begin{aligned} 149,600,000 \text{ km} \\ = \\ 1.496 \times 10^8 \end{aligned}$$



Brackets,  
Order,  
Division,  
Multiplication  
Addition,  
Subtraction

## Order of Operations or BODMAS

BODMAS/BIDMAS is the mnemonic which we teach in Maths to enable pupils to know exactly the right sequence for carrying out mathematical operations.

Scientific calculators use this rule to know which answer to calculate when given a string of numbers to add, subtract, multiply, divide etc.

For example:

What do you think is the answer to  $2 + 3 \times 5$ ?

Is it  $(2 + 3) \times 5 = 5 \times 5 = 25$ ? Or  $2 + (3 \times 5) = 2 + 15 = 17$ ?

We use BODMAS to give the correct answer:

(B)rackets (O)rder (D)ivision (M)ultiplication (A)ddition (S)ubtraction

According to BODMAS, multiplication should always be done before addition. Therefore, 17 is the correct answer according to BODMAS and should also be the answer which your calculator will give if you type in  $2 + 3 \times 5$  <enter>.

Order means a number raised to a power such as  $2^2$  or  $(-3)^3$ .

### WORKED EXAMPLE

Calculate  $4 + 70 \div 10 \times (1 + 2)^2 - 1$  according to BODMAS rules.

Brackets give  $4 + 70 \div 10 \times (3)^2 - 1$

Order gives  $4 + 70 \div 10 \times 9 - 1$

Division gives  $4 + 7 \times 9 - 1$

Multiplication gives  $4 + 63 - 1$

Addition gives  $67 - 1$

Subtraction gives 66

Answer is 6

Brackets,  
Order,  
Division,  
Multiplication  
Addition,  
Subtraction