Meldrum Academy and Associated Primaries

'Preferred Methods'

in Mathematics and Numeracy

Context

This "Preferred Methods" booklet was developed by the Meldrum Numeracy Group which includes representatives from across the Secondary curriculum and colleagues from the associated Primary Schools.

It is hoped that this Preferred Methods booklet will become an integral part of an implicit 'mathematics course' for the Meldrum Cluster and will help to ensure a cohesive and progressive experience for pupils. The methods included are those agreed on as the most appropriate and it is understood that not every pupil will find the preferred method acceptable.

The co-operative development of resources to be used throughout the cluster helps to establish better understanding in both primary and secondary schools about the mathematics courses and teaching approaches in both sectors.

All children and young people need to be flexible and adaptable, with the capacity to continue developing the new skills which they will need for the rapidly changing challenges of life, learning and work in the modern world. Numeric skills are central to this.

Having a coherent strategy in numeracy will develop a confidence and competence in using number that allows individuals to solve problems, interpret and analyse information, make informed decisions, function responsibly in everyday life and contribute effectively to society. It gives increased opportunities within the world of work and sets down foundations which can be built upon through life-long learning.

Contents

Numbers

Whole number Our counting numbers and zero - {0,1,2,3… } etc.

Integer Our Whole Numbers and their negatives - {…-3,-2,-1,0,1,2,3…} etc.

Factors The numbers you multiply together to get another number.
e.g. The Factors of 24 are {1,2,3,4,6,8,12,24}

Prime Number A number with exactly 2 factors (namely, itself and 1).
*Note 1 is not prime as it only has 1 factor.

Square Number The number you get when you multiply another number by itself.
e.g. $7^2 = 7 \times 7 = 49$

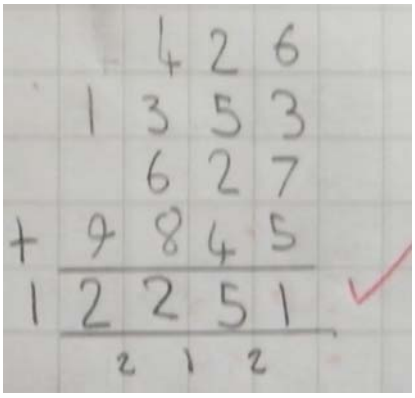
Cubed Number The number you get when another number is used 3 times in a multiplication.
e.g. $4^3 = 4 \times 4 \times 4 = 64$

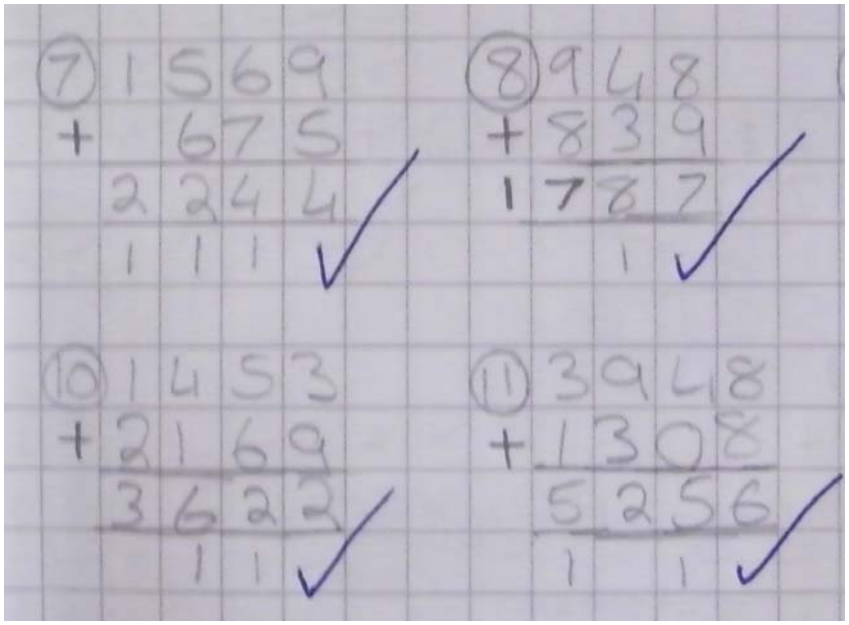
Addition

Written Method

10s of Th	Th	H	T	U
	3	7	4	0 8
+		5	7	9 6
	4	3	2	0 4
	1	1	1	1

- Column headings may be added
- 1 number per square
- Numbers 'carried' underneath





Some Mental Strategies

425 + 863

I add 400 and 800 to get 1200,
25 plus 63 is 88,
1200 plus 88 is **1288**

189 + 435

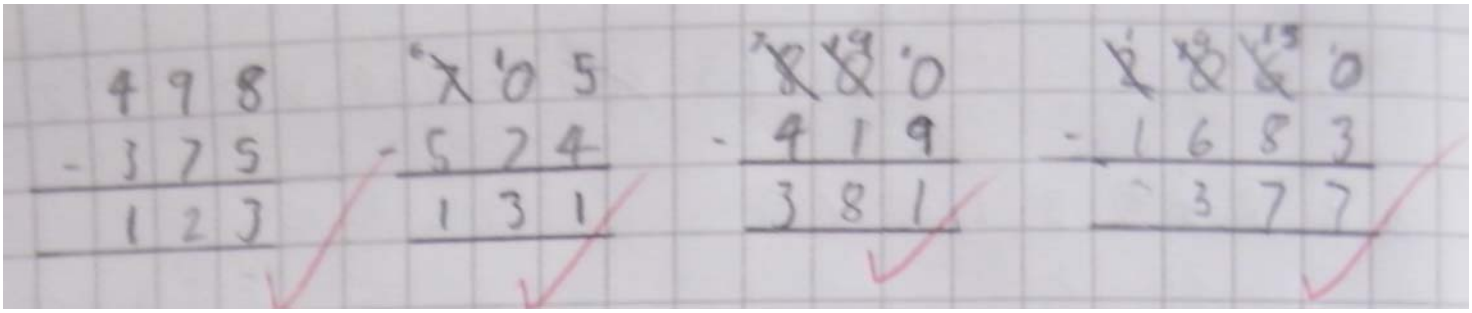
I know 200 plus 435 is 635,
189 is 11 less than 200,
635 take away 11 is **624**

Subtraction

Written Method

10s of Th	Th	H	T	U
	7		4	
2	~~8~~ ^{1}0		~~5~~ ^{1}3	
-	6	3	2	8
2	1	7	2	5

- Column headings may be added
- 1 number per square
- Exchanges on top line
  - ✓ "Exchange 1 Ten for 10 units"
  - ✓ "Exchange 1 Thousand for 10 Hundreds"
- Answer can be checked by adding 21725 to 6328



Some Mental Strategies

Find the difference between 520 and 284

520 minus 200 is 320
320 minus 80 is 240
240 minus 4 is **236**

I know 520 minus 300 is 220,
284 is 16 less than 300,
220 plus 16 is **236**

Multiplication

Written Methods

Single Digit Multiplier

Th	H	T	U
	3	7	4
x			8
2	9	9	2
	2	5	3

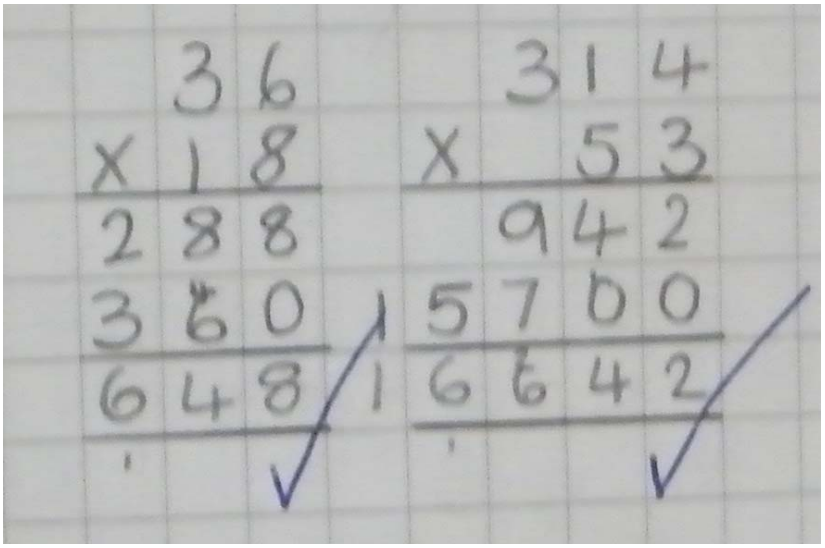
- Column headings can be added
- 1 digit per box
- Numbers 'carried' underneath

8 times 4 is 32,
8 times 70 is 560 and
30 makes 590,
8 times 300 is 2400
and 500 makes 2900

Long Multiplication

Th	H	T	U	
	3	7	6	
x		2	4	
	1	5	0	4 ← *376 x 4*
	7	5	2	0 ← *376 x 20*
	9	0	2	4
1				

- Each stage of the calculation can be verbalised.



Mental Strategies

30 x 27

I know to multiply by 3 then
multiply by 10
3 times 27 is 81; 10 times 81 is **810**

Multiplying by
20, 30, 40 etc
& 200, 300 etc

4 x 72

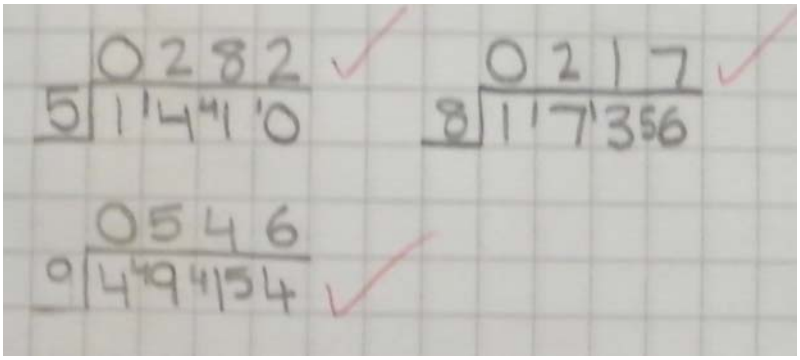
To multiply by 4 I can double
and double again.
72 - - 144 - - **288**

Division

Written Method

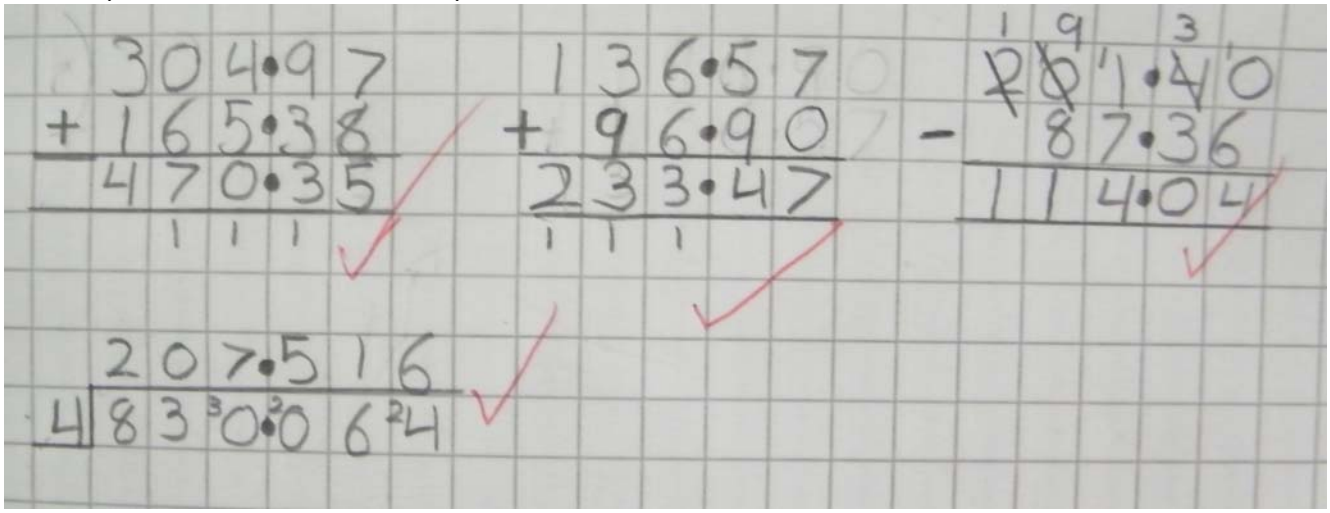
$$6 \overline{)2\,8^{4}1^{5}8^{4}8} = 4\,6\,9\,8$$

6 into 2 doesn't go,
6 into 28 goes 4 times remainder 4,
6 into 41 goes 6 times remainder 5,
6 into 58 goes 9 times remainder 4,
6 into 48 goes 8 times exactly.



Decimals

Decimal points should be lined up as follows:



Multiply or Divide by 10, 100 or 1000

0.21 x 10

H	T	U	•	t	h	th
		0	.	2	1	
		2	.	1		

- Column headings can be added
- Digits move left when multiplying

376 ÷ 100

H	T	U	•	t	h	th
3	7	6	.			
		3	.	7	6	

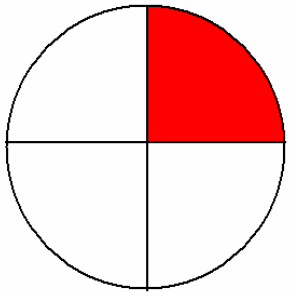
- Digits move right when dividing

Fractions

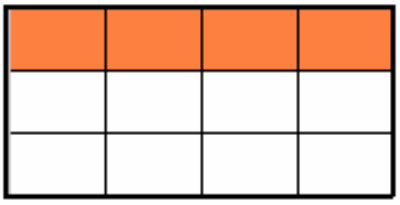
What is a fraction?

numerator → $\frac{1}{4}$ ← denominator

(one quarter) of the shape is shaded



Equivalent Fractions



*one third is also four twelfths

$$\frac{1}{3} \xrightarrow{\times 4} \frac{4}{12}$$

$$\frac{1}{4} \xrightarrow{\times 3} \frac{3}{12}$$

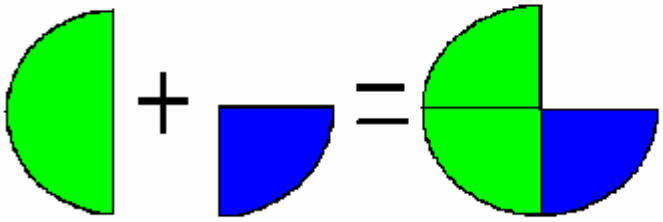
$$\frac{1}{2} \xrightarrow{\times 4} \frac{4}{8}$$

Simplifying Fractions

*Divide the numerator & denominator by the highest common factor (HCF)

$$\frac{5}{20} \xrightarrow{\div 5} \frac{1}{4} \qquad \frac{12}{28} \xrightarrow{\div 4} \frac{3}{7} \qquad \frac{24}{40} \xrightarrow{\div 8} \frac{3}{5}$$

Adding Fractions



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

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

*Denominators must be the same before adding fractions – to do this we use equivalent fractions. Some more examples….

$$\frac{1}{3} + \frac{1}{4} = \frac{4}{12} + \frac{3}{12} = \frac{7}{12}$$

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

Fraction of a Quantity

-divide by the denominator, multiply by the numerator.

$\frac{1}{4}$ *of* 120
= 120 ÷ 4
= 30

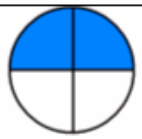
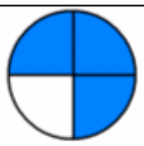
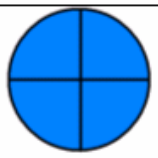
$\frac{7}{10}$ *of* 140
=140 ÷ 10 x 7
= 14 x 7
= 98

$\frac{3}{5}$ *of* 220
= 220 ÷ 5 x 3
= 44 x 3
= 132

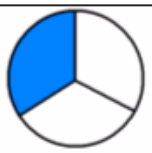
Percentages

Equivalences

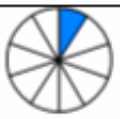
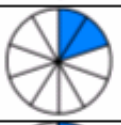
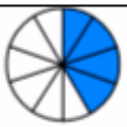
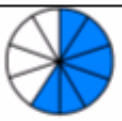
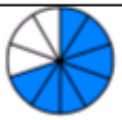
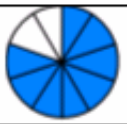
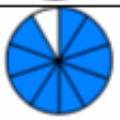
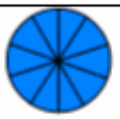
Quarters

Fraction	Percentage	Decimal	Picture
$\frac{1}{4}$	25%	0.25	
$\frac{2}{4} = \frac{1}{2}$	50%	0.5	
$\frac{3}{4}$	75%	0.75	
$\frac{4}{4}$	100%	1	

Thirds

Fraction	Percentage	Decimal	Picture
$\frac{1}{3}$	$33\frac{1}{3}\%$	0.333...	
$\frac{2}{3}$	$66\frac{2}{3}\%$	0.666...	
$\frac{3}{3}$	100%	1	

Tenths

Fraction	Percentage	Decimal	Picture
$\frac{1}{10}$	10%	0.1	
$\frac{2}{10} = \frac{1}{5}$	20%	0.2	
$\frac{3}{10}$	30%	0.3	
$\frac{4}{10} = \frac{2}{5}$	40%	0.4	
$\frac{5}{10} = \frac{1}{2}$	50%	0.5	
$\frac{6}{10} = \frac{3}{5}$	60%	0.6	
$\frac{7}{10}$	70%	0.7	
$\frac{8}{10} = \frac{4}{5}$	80%	0.8	
$\frac{9}{10}$	90%	0.9	
$\frac{10}{10}$	100%	1	

Non-Calculator Method – using equivalences

1) 40% of 250g

10% is 250 ÷ 10 = 25
40% is 25 x 4 = <u>100g</u>

2) 75% of £640

25% is 640 ÷ 4 = 160
75% is 160 x 3 = <u>£480</u>

3) 5% of 790m

10% is 790 ÷ 10 = 79
5% is 79 ÷ 2 = <u>39.5m</u>

4) 3% of 1.8Tonne

1% is 1800kg ÷ 100 =18kg
3% is 18 x 3 = <u>54kg</u>

Calculator Method

First find 1% by dividing by 100 then find the required percentage.

1) 19% of \$60

60 ÷ 100 x 19
= \$11.40

2) 84% of £550

550 ÷ 100 x 84
= £462

3) 150% of 775km

775 ÷ 100 x 150
= 1162.5km

Expressing an amount as % of another

Alan scored 29 out of 35 in a Science test and 36 out of 50 in a Geography test. Which subject would you suggest he was doing better in?

Science $\frac{29}{35}$

29 ÷ 35 x 100 = 82.9%

Geography $\frac{36}{50}$

36 ÷ 50 x 100 = 72%

i.e. numerator ÷ denominator x 100

He is doing better in science because 82.9% > 72%

Some more equivalences

Percentage	Decimal	Fraction
1%	0.01	$\frac{1}{100}$
5%	0.05	$\frac{5}{100} = \frac{1}{20}$
90%	0.9	$\frac{90}{100} = \frac{9}{10}$
3%	0.03	$\frac{3}{100}$
34%	0.34	$\frac{34}{100} = \frac{17}{50}$
55%	0.55	$\frac{55}{100} = \frac{11}{20}$
150%	1.5	$1\frac{1}{2}$
120%	1.2	$1\frac{1}{5}$
425%	4.25	$4\frac{1}{4}$

Data Handling

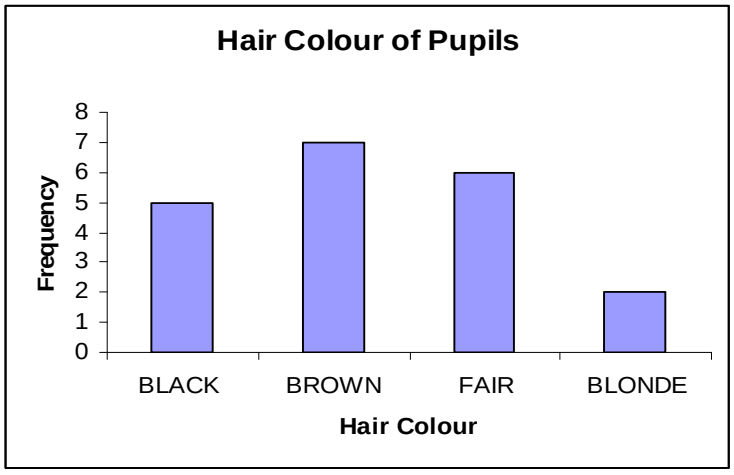
Different types of data can be collected

Example 1 20 pupils in the class are asked "What is your hair colour?"

Collect and organise the data using a ***Frequency Table***

Hair Colour	Tally	Frequency
BLACK	𝍸	5
BROWN	𝍸 II	7
FAIR	𝍸 I	6
BLONDE	II	2
	Total	20

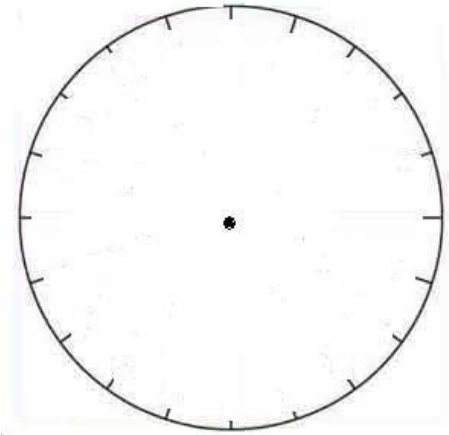
Display the data using a ***Bar Graph***



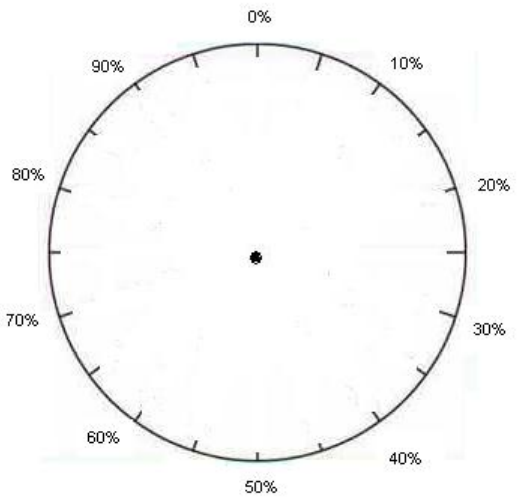
- Label axes
- Bars are separated equally
- Colour if required
- Numbers go on line, not in boxes
- Give the graph a title

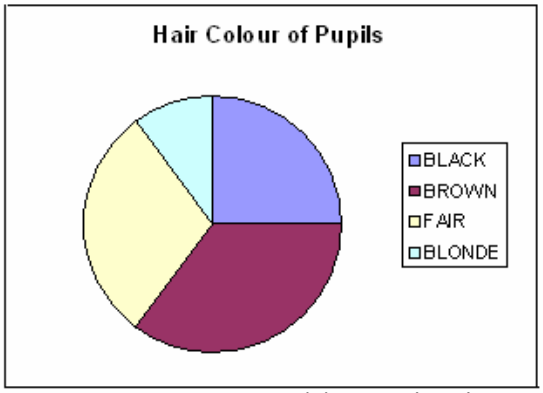
Another method of displaying the data is to use a ***Pie Chart***. Two possible methods are:

Provide a circular template with 20 equal divisions



Use a ***Pie Chart Scale*** which uses percentages





- Label each sector
- Use colours and key if necessary
- Give the graph a title

If using percentages an additional column may be added:

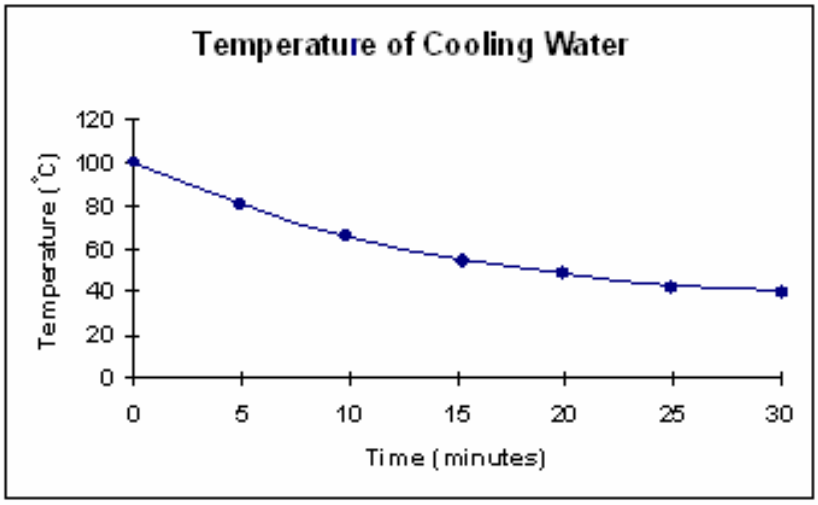
Hair Colour	Frequency	Pie Chart %
BLACK	5	$\frac{5}{20} = \frac{25}{100} = 25\%$
BROWN	7	$\frac{7}{20} = \frac{35}{100} = 35\%$
FAIR	6	$\frac{6}{20} = \frac{30}{100} = 30\%$
BLONDE	2	$\frac{2}{20} = \frac{10}{100} = 10\%$
Total	20	100%

Example 2 ***Continuous Data***

Boiling water is allowed to cool and the temperature (°C) is recorded every 5 minutes. The data is organised in a table as follows:

Time (mins)	0	5	10	15	20	25	30
Temperature (°C)	100	81	65	55	48	43	41

This type of data is best displayed using a ***Line Graph***



- Use a ruler to draw axes
- Choose appropriate scales
- Label axes
- Numbers go on lines, not in boxes
- Dots are marked clearly
- Join dots with a smooth curve or draw line of best fit
- Give the graph a title

Multiplication Table

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

Conversions