

Meldrum Academy and Cluster Primaries



Methods in Numeracy.



Context

This “Preferred Methods” booklet was originally developed by the Meldrum Numeracy Group which included representatives from across the Secondary Curriculum and colleagues from the associated Primary Schools. This latest version re-named “Methods in Numeracy” has been updated by Meldrum Academy maths staff to cover the Level 2 Benchmarks in Numeracy and some maths skills required across the Secondary School for BGE learning.

It is hoped that this Methods in Numeracy booklet will inform pupils and staff on how common numeracy topics are taught in mathematics, and throughout Meldrum Academy. Using a consistent approach across all subjects will make it easier for pupils to consolidate their understanding and apply their skills. This will help to improve the transition for pupils going into S1 and prepare them for maths at Meldrum Academy. The methods included here, are those agreed on by experts in education as the most appropriate and reliable and are widely taught in schools across Scotland.

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1. Key Words

Calculate	Find the answer to a problem. It does not mean that you must use a calculator.
Cubed Number	The number you get when you multiply another number by itself 3 times. Example: 4 cubed is $4^3 = 4 \times 4 \times 4 = 64$
Denominator	The bottom number in a fraction.
Digit	0, 1, 2, 3, 4, 5, 6, 7, 8 or 9. Example: 459 has digits 4, 5 and 9.
Estimate	To make an approximate or rough answer, often by rounding.
Evaluate	To work out the answer.
Integer	All the whole numbers and their negatives including zero.
Even	A number that is divisible by 2. Even numbers will end with 0, 2, 4, 6 or 8.
Factor	A number that divides exactly into another number with no remainders. Example: the factors of 15 are 1, 3, 5 and 15.
Greater than (>)	Is bigger or more than. Example: $10 > 6$, 10 is greater than 6.
Less than (<)	Is smaller or lower than. Example: $12 < 20$, 12 is less than 20.
Mean	A type of average – Add up a set of numbers and divide by the amount of numbers in the set.
Median	A type of average – the middle number in an ordered set of data (ordered from lowest to highest).
Mode	A type of average – the most frequent number or category in a set.
Multiple	A number which can be divided by a particular number leaving no remainder. Example: Multiples of 4 are 8, 12, 16, 40. They are answers in the times tables for that number.
Negative Number	A number less than zero. Example: -5.
Numerator	The top number in a fraction
Odd Number	A number that is not exactly 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 (sometimes referred to as BODMAS or BOMDAS).
Place value	The value a digit dependent on its place in a number. Example: in the number 2753.6, the 7 digit has a place value of 100's.
Prime Number	A number with exactly 2 factors. It can only be divided by itself and 1. Note: 1 is not a prime number as it has only 1 factor.
Remainder	The amount left over when dividing a number.
Square Number	The number you get when you multiply another number by itself. Example: 5 squared is $5^2 = 5 \times 5 = 25$.

2. Four Operators

Add

Addition

Plus

Total

Sum

And

Altogether

Multiply

Multiplication

Times

Lots of

Product

Subtract

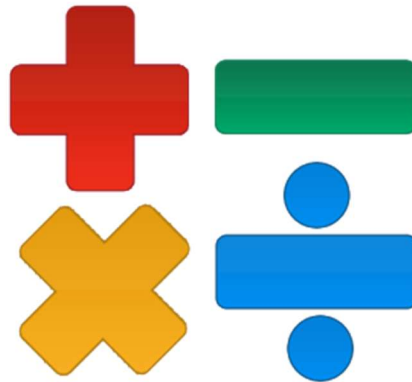
Subtraction

Decrease

Minus

Difference

How many more?



Division

Divide

Share

Group

Split

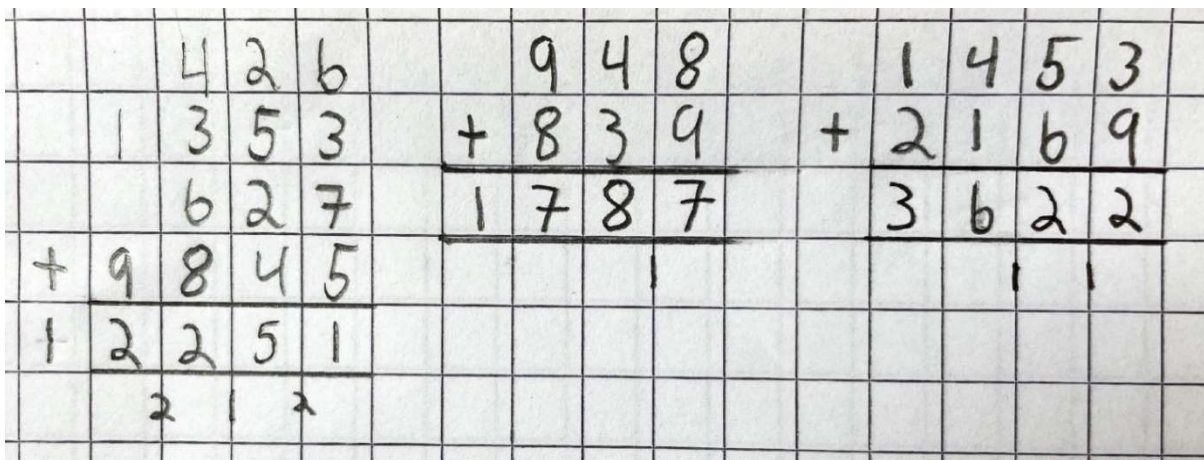
How many each?

2a. Addition

Written Method

	TTh	Th	H	T	U
	3	7	4	0	8
+		5	7	9	6
	4	3	2	0	4
	1	1	1	1	

- Ensure digits are lined up according to place value (column headings can be added).
- **U** – units or sometimes called ‘ones’.
- Start at right hand side.
- Write down units. Carried tens are written underneath.



Mental Strategies: - Encourage pupils to develop a variety of strategies.

54 + 27



Add place value columns separately then add together.

$50 + 20 = 70$

$4 + 7 = 11$

$70 + 11 = \underline{81}$

OR

$54 + 20 = 74$

$74 + 7 = \underline{81}$

189 + 435



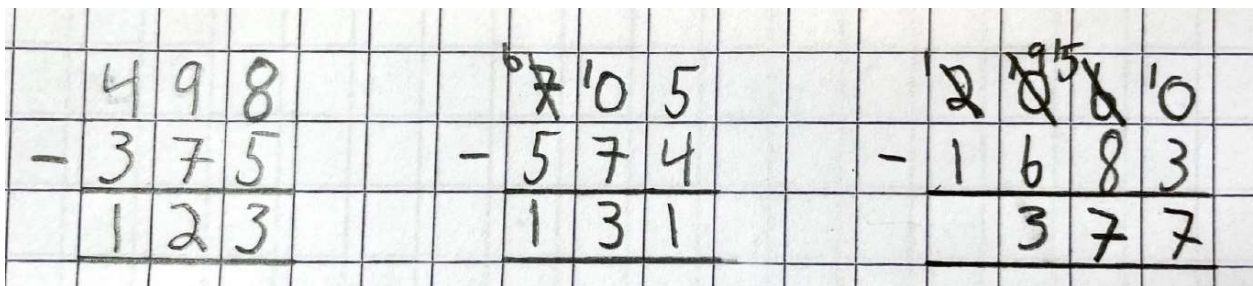
I know $200 + 435$ is 635
 189 is 11 less than 200
 635 take away 11 is 624

2b. Subtraction

Written Method

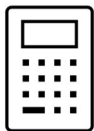
	TTh	Th	H	T	U
		3	1	8	1
	1	4	5	9	0
-		2	6	8	2
	1	1	9	0	8

- Ensure digits are lined up according to place value (column headings can be added).
- Start at right hand side.
- Remember to exchange if you don't have enough.
Exchange 1 ten for 10 units.
Exchange 1 thousand for 10 hundreds.
- Answer can be checked by adding 11908 to 2682 .



Mental Strategies: - Encourage pupils to develop a variety of strategies.

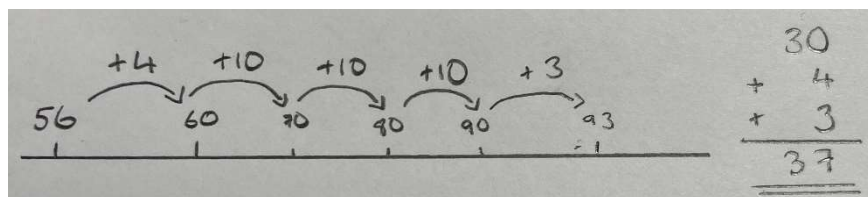
93 - 56



Count on from 56 until you reach 93.

4 units from 56 to 60, 30 from 60 to 90 then 3 from 90 to 93.

$$4 + 30 + 3 = 37$$



Find the difference between 520 and 284.



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

2c. Multiply - It is important that you know multiplication tables from 1 to 10.

Written Method: Single digit.

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

- Column headings can be added.
- Start at right hand side.
- Write down units. Carried tens are written underneath.
- 8 times 4 is 32.
- 8 times 70 is 560 plus 30 carried is 590.
- 8 time 300 is 2400 plus 500 carried is 2900.

Grid Method: to be encouraged when looking at multiplying by 2 or more digits.

27 x 14				
x	20	7		200
10	200	70		70
4	80	28	+	28
				378

273 x 38				
x	200	70	3	6000
30	6000	2100	90	2100
8	1600	560	24	1600
				560
				90
			+	24
				10374

Mental Strategies: Multiply by 10, 100 and 1000 or multiples of 10, 100 and 1000.

Move the digits to the right in terms of place values by the number of zeros in 10, 100, 1000 etc.

278 x 100 digits move 2 places left.

TTh	Th	H	T	U
		2	7	8
2	7	8	0	0

Multiply by single digit then by 10, 100 and 1000.

34 x 5000 multiply by 5 first, then move digits 3 places left (5000 - 3 zeros).

	H	T	U
		3	7
x			5
1	8	5	
3			

then

HTh	TTh	Th	H	T	U
			1	8	5
1	8	5	0	0	0

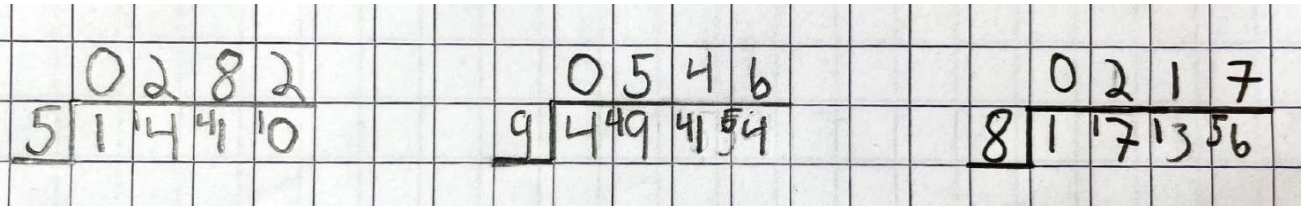
2d. Division

Written Method

Single Digit: start at left hand side.

6	2	4	6	9	8
5	1	4	4	1	0

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.

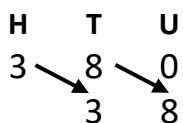


Mental Strategies

Divide by 10, 100 and 1000 or multiples of 10, 100 and 1000.

Move the digits to the right in terms of place values by the number of zeros in 10, 100, 1000 etc.

$380 \div 10$ digits move 1 place right.



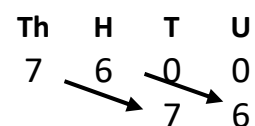
Divide by single digit then by 10, 100 and 1000.

$15200 \div 200$ divide by 2 first, then move digits 2 places right (200 - 2 zeros).

$15200 \div 2 = 7600$

then

$\div 100$



3. Decimals

When adding, subtracting, dividing and multiplying decimal numbers by a single digit, the decimal points must be lined up.

$$\begin{array}{r} 304.97 \\ + 165.38 \\ \hline 470.35 \\ 111 \end{array}$$

$$\begin{array}{r} 136.57 \\ + 96.90 \\ \hline 233.47 \\ 111 \end{array}$$

$$\begin{array}{r} 9.3 \\ - 87.36 \\ \hline 114.04 \end{array}$$

$$\begin{array}{r} 207.516 \\ - 483.3020 \\ \hline 624 \end{array}$$

4. Rounding

Rules:

0 – 4 leave alone

5 – 9 round up.

Nearest 10

Th H T U

$\begin{array}{r} 483 2 \\ \hline 4830 \end{array}$ <p>No 5 or more?</p>	$\begin{array}{r} 483 7 \\ \hline 4840 \end{array}$ <p>Yes 5 or more?</p>	$\begin{array}{r} 19 5 \\ \hline 200 \end{array}$ <p>Yes 5 or more?</p>
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Nearest 100

Th H T U

$\begin{array}{r} 82 31 \\ \hline 8200 \end{array}$ <p>No 5 or more?</p>	$\begin{array}{r} 58 72 \\ \hline 5900 \end{array}$ <p>Yes 5 or more?</p>	$\begin{array}{r} 89 \\ \hline 100 \end{array}$ <p>Yes 5 or more?</p>
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One Decimal Place

T U . ¹th ^hth

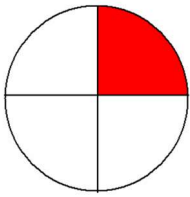
$\begin{array}{r} 23.6 4 \\ \hline 23.6 \end{array}$ <p>No 5 or more?</p>	$\begin{array}{r} 57.8 9 \\ \hline 57.9 \end{array}$ <p>Yes 5 or more?</p>	$\begin{array}{r} 11.9 9321 \\ \hline 12.0 \end{array}$ <p>Yes 5 or more?</p>
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Two Decimal Places

T U . ¹th ^hth thth

$\begin{array}{r} 23.64 2 \\ \hline 23.64 \end{array}$ <p>No 5 or more?</p>	$\begin{array}{r} 74.83 7 \\ \hline 74.84 \end{array}$ <p>Yes 5 or more?</p>	$\begin{array}{r} 11.89 721 \\ \hline 11.90 \end{array}$ <p>Yes 5 or more?</p>
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5. Fractions



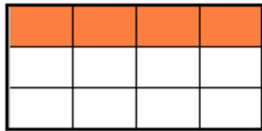
One part of four is shaded or

One quarter of the shape is shaded.

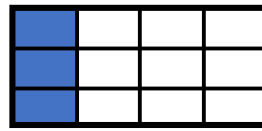
$$\frac{1}{4}$$

← Numerator
← Denominator

Equivalent Fractions: Multiply numerator and denominator by same number.



$$\frac{1}{3} \stackrel{\times 4}{=} \frac{4}{12}$$



$$\frac{1}{4} \stackrel{\times 3}{=} \frac{3}{12}$$

Simplifying Fractions: Divide numerator and denominator by a common factor.

$$\frac{5}{20} \stackrel{\div 5}{=} \frac{1}{4}$$

$$\frac{12}{28} \stackrel{\div 4}{=} \frac{3}{7}$$

$$\frac{24}{40} \stackrel{\div 2}{=} \frac{12}{20} \stackrel{\div 4}{=} \frac{3}{5}$$

It may take more than 1 attempt to fully simplify a fraction.

Adding/Subtracting Fractions: Denominators must be the same using equivalent fractions.

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

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

$$\begin{aligned} \frac{7}{9} - \frac{1}{4} \\ = \frac{28}{36} - \frac{9}{36} \\ = \frac{19}{36} \end{aligned}$$

Fractions of a Quantity: Divide by the Denominator, Times by the Top number (numerator).

$$\begin{aligned} \frac{1}{4} \text{ of } 120 \\ = 120 \div 4 \\ = 30 \end{aligned}$$

$$\begin{aligned} \frac{7}{10} \text{ of } 140 \\ = 140 \div 10 \times 7 \\ = 14 \times 7 \\ = 98 \end{aligned}$$

$$\begin{aligned} \frac{3}{5} \text{ of } 220 \\ = 220 \div 5 \times 3 \\ = 44 \times 3 \\ = 132 \end{aligned}$$

6. Equivalence: Fractions, Decimals, Percentages

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

Tenths		
Fraction	Percentage	Decimal
$\frac{1}{10}$	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

Thirds		
Fraction	Percentage	Decimal
$\frac{1}{3}$	$33\frac{1}{3}$	0.3333...
$\frac{2}{3}$	$66\frac{2}{3}$	0.666...
$\frac{3}{3}$	100%	1

Non- Calculator using equivalences.

40% of 250g

10% is $250 \div 10 = 25$

40% is $25 \times 4 = 100$ g

75% of \$640

25% is $640 \div 4 = 160$

75% is $160 \times 3 = \$480$

5% of 790 m

10% is $790 \div 10 = 79$

5% is $79 \div 2 = 39.5$ m

Calculator

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

19% of £60

$\pounds 60 \div 100 \times 19$

= £11.40

84% of 550 ml

$550 \div 100 \times 84$

= 462 ml

150% of 750 km

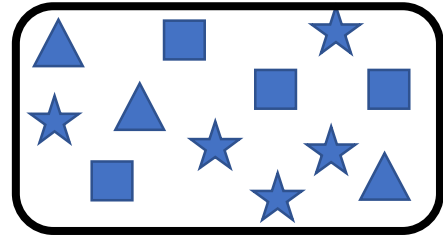
$750 \div 100 \times 150$

= 1125 km

7. Ratio and Proportion

Ratio

- Compare different quantities.
- Colon symbol to show ratio (:).
- The order is which you write a ratio is important.



The ratio of square to triangles 4:3

The ratio of triangles to stars 3:5

The ratio of stars to square 5:4

The ratio of stars to triangles to squares 5:3:4

Like fractions, ratios can be simplified.

Divide both sides by a common factor.

Example: State ratio in its simplest form.

5:25 (divide both by 5)

1:5

20:60 (divide both by 20)

1:3

Example: 480 silver birch and 360 rowan trees were planted.

Calculate the simple whole number ratio of silver birch to rowan trees planted.

480 : 360 (divide both by 10)

48 : 36 (divide both by 12)

4 : 3

Proportion

- Compares the parts of a quantity to the whole quantity.
- Can be expressed as a fraction, decimal or percentage.

The proportion of squares $\frac{4}{12} = \frac{1}{3}$ (or $33\frac{1}{3}\%$ or 0.333...)

The proportion of stars $\frac{5}{12}$ (or 41.7% or 0.417)

The proportion of triangles $\frac{3}{12} = \frac{1}{4}$ (or 25% or 0.25)

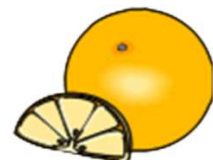
Simple proportion: as one item increase the other will also increase.

Unitary method: find the value of one item first.

If 11 oranges cost 88p, how much would 20

1 orange = $88 \div 11 = 8\text{p}$

20 oranges = $20 \times 8 = 160\text{p}$ or £1.60



8. Data Handling

8a. Averages and Range

Example: The number of sweets in 8 jars of sweets.

40, 42, 36, 51, 65, 46, 40, 40

Mean - Add up a set of numbers and divide by the amount of numbers in the set.

$$\frac{40 + 42 + 36 + 51 + 65 + 46 + 40 + 40}{8} = \frac{360}{8} = \mathbf{45}$$

Median - the middle number in an ordered set of data (ordered from lowest to highest).

Rewrite data in order: 36, 40, 40, 40, 42, 46, 51, 65.

Median is $\frac{40 + 42}{2} = \mathbf{41}$

Mode - the most frequent number or category in a set.

Mode is **40**.

Range – difference between the highest and lowest values.

Range = $65 - 36 = \mathbf{29}$

Data can be collected and presented in different ways.

Discrete Data: data is counted.

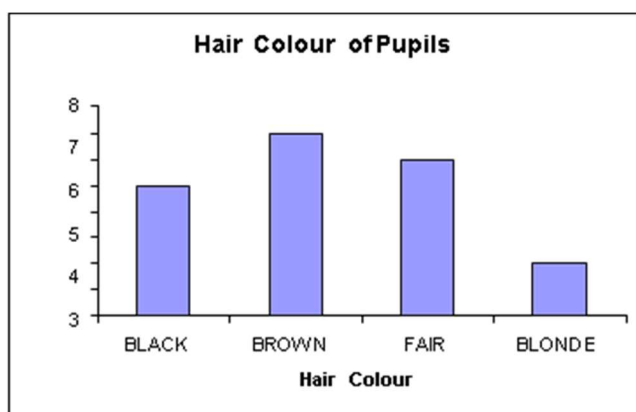
Continuous Data: data is measured.

8b. Discrete Data Example: 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		5
BROWN		7
FAIR		6
BLONDE		2
	Total	20

This type of data is displayed using a **Bar Graph**.

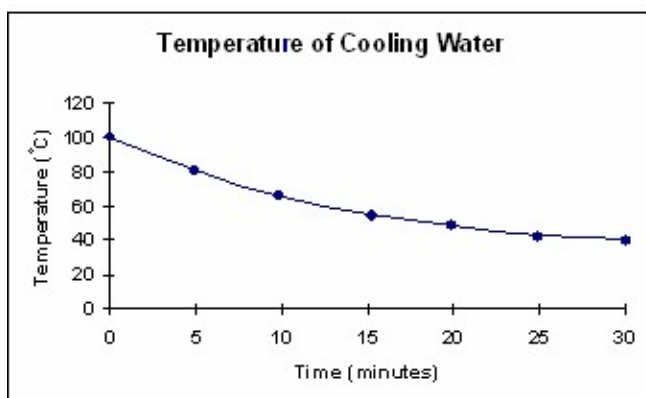


- Use a ruler.
- Draw and Label axes.
- Use appropriate scales.
- Bars are separated equally.
- Give the graph a title.

8c. Continuous Data Example: 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 displayed using a **Line Graph**.

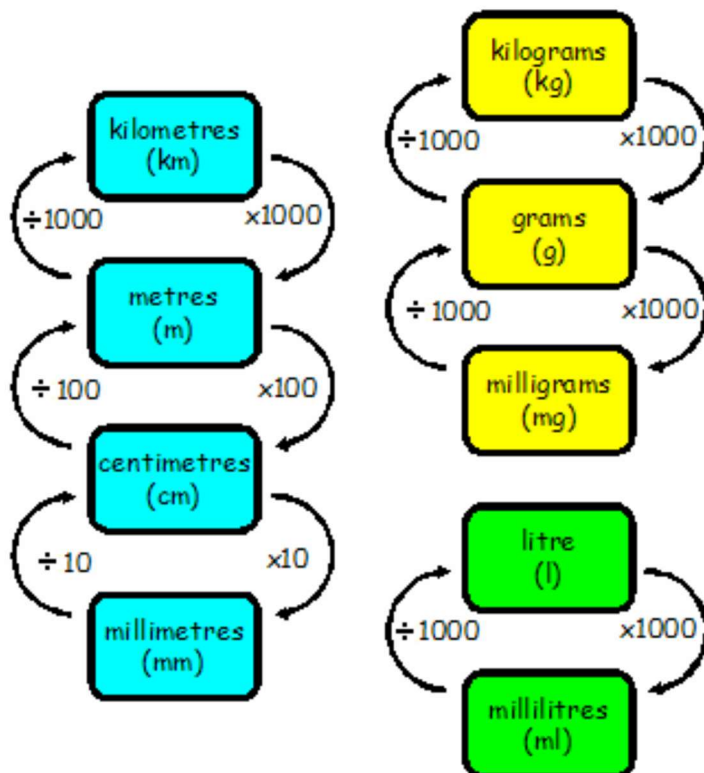


- Use a ruler.
- Draw and Label axes.
- Choose appropriate scales.
- Scale labels do not go between.
- Dots are marked clearly.
- Join dots with a curve.
- Give the graph a title.

9. Multiplication Table

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

10. Unit Conversions



Important to know.
 $1 \text{ cm}^3 = 1 \text{ ml}$
 $1000 \text{ cm}^3 = 1 \text{ l}$