

Maths Grade 5 Knowledge Organiser

5.1 Understand & use proportionality

- To increase a quantity by 5%
Multiply the quantity by 1.05 ($100+5 = 105$)
- To decrease a quantity by 5%
Multiply the quantity by 0.95 ($100-5 = 95$)

5.1 Calculate using proportional change

To increase £240 by 15% ($100+15 = 115$)
 $= 1.15 \times \text{£}240 = \text{£}276$
 To decrease £240 by 15% ($100-15 = 85$)
 $= 0.85 \times \text{£}240 = \text{£}204$

5.2 Multiply & divide numbers 0-1

- Multiply e.g. 0.2×0.4
Ignore decimal points & multiply numbers
 $2 \times 4 = 8$
Count the number of decimal places (2)
The answer will have this many (2)
 $0.2 \times 0.4 = 0.08$ (2 decimal places)

- Divide e.g. $8 \div 0.2$
Multiply both by 10
 $80 \div 2 = 40$ makes whole

5.3 4 rules of fractions

- Add & subtract
Denominators must be the same
- Multiply
Multiply numerators; multiply denominators
- Divide
Invert fraction after \div
Multiply numerators; multiply denominators

5.4 Round to one significant figure

These all have ONE significant figure

4000
300
80
2
0.7
0.05
0.003

5.4 Estimate answers to calculations

- Round each number to 1sf first
 e.g. $\frac{423}{568} \times \frac{28}{600} = \frac{400}{600} \times \frac{30}{600} = \frac{12000}{600} = 20$
 e.g. $\frac{3.26}{0.58} \times \frac{11.8}{0.6} = \frac{3}{0.6} \times \frac{10}{0.6} = \frac{30}{0.6} = \frac{300}{6} = 50$
 e.g. $\frac{8.3}{0.49} \times \frac{35.6}{0.5} = \frac{8}{0.5} \times \frac{40}{0.5} = \frac{320}{0.5} = 640$
 ($\div 0.5 = \text{doubling the number being divided}$)

5.5 Use a calculator efficiently

Know your keys
 x^2 x^3 x^\square $\sqrt{\quad}$ $\sqrt[3]{\quad}$ $(-)$ $\frac{\square}{\square}$

5.6 Expand two brackets

Use FOIL	Use GRID									
<p>$(x-3)(x+5)$</p> <p>F O I L</p> <p>$= x^2 + 5x - 3x - 15$ $= \underline{x^2 + 2x - 15}$</p>	<p>$(x-3)(x+5)$</p> <table border="1"> <tr> <td></td> <td>x</td> <td>$+5$</td> </tr> <tr> <td>x</td> <td>x^2</td> <td>$+5x$</td> </tr> <tr> <td>-3</td> <td>$-3x$</td> <td>-15</td> </tr> </table> <p>$= \underline{x^2 + 2x - 15}$</p>		x	$+5$	x	x^2	$+5x$	-3	$-3x$	-15
	x	$+5$								
x	x^2	$+5x$								
-3	$-3x$	-15								

5.7 Solve simultaneous equations by an algebraic method

- Make the number of ys the same
- Add or subtract to eliminate the ys
Same signs ~ subtract
Different signs ~ add
- Find the value of x
- Substitute the value of x to find y

e.g. $2x - 3y = 11$ (x2)
 $5x + 2y = 18$ (x3)

$$4x - 6y = 22$$

$$15x + 6y = 54$$

Add the two equations to eliminate y

$$19x = 76$$

$$x = 4$$

Substitute $x = 4$ into one of the equations

$$5x + 2y = 18$$

$$5 \times 4 + 2y = 18$$

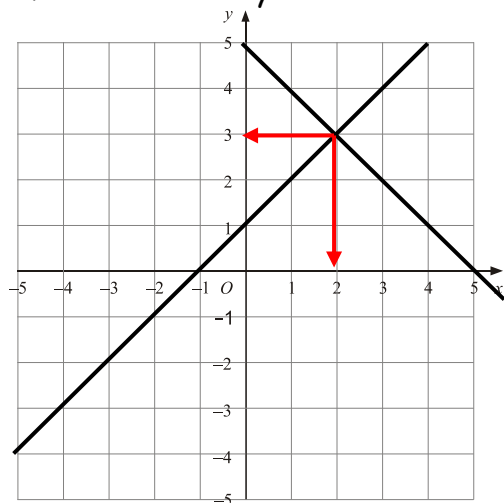
$$20 + 2y = 18$$

$$2y = -2$$

$$y = -1$$

5.7 Solve simultaneous equations graphically

- Draw the graphs of the equations
- Find where they cross



Solution is $x = 2, y = 3$

5.8 Solve inequalities in one variable

$a < b$ means a is less than b

$a \leq b$ means a is less than or equal to b

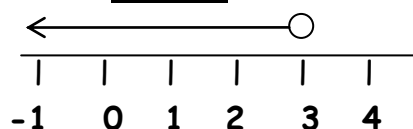
$a > b$ means a is greater than b

$a \geq b$ means a is greater than or equal to b

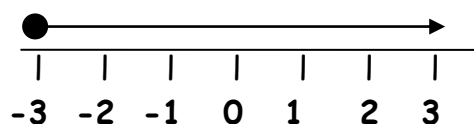
Inequalities can be treated like equations

The solution can be shown on a number line

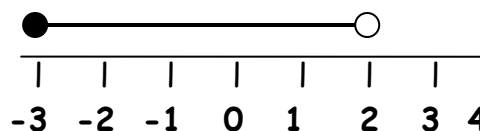
e.g.1 $2x - 4 < 2$ (+4 to each side)
 $2x < 6$ ($\div 2$ each side)
 $x < 3$



e.g. 2 $2x - 7 \leq 5x + 2$ ($-2x$ each side)
 $-7 \leq 3x + 2$ (-2 each side)
 $-9 \leq 3x$ ($\div 3$ each side)
 $-3 \leq x$ (swap around)
 $x \geq -3$ (swap inequality symbol)



e.g. 3 $-7 \leq 2x - 1 < 3$ (+1 to each part)
 $-6 \leq 2x < 4$ ($\div 2$ each side)
 $-3 \leq x < 2$



5.9 Substitute numbers into expressions

Once numbers have replaced letters:

- Remember the order of operations
BIDMAS
- Remember the rules for signs

$$\begin{array}{l} - \times - = + \\ - \times + = - \end{array}$$

$$\begin{array}{l} -- = + \\ +- = - \end{array}$$

5.9 Rearrange a formula

- Use the same balancing steps as when you solve equations
- e.g. Make 't' the new subject in:
- $$v = u + at \quad (-u \text{ from each side})$$
- $$v - u = at \quad (\div a \text{ each side})$$
- $$\frac{v - u}{a} = \frac{at}{a}$$
- $$t = \frac{v - u}{a}$$

5.10 Find the nth term of a quadratic sequence

If the 1st difference is constant, it is linear

e.g. 3 7 11 15 19 23 ...

1st difference → +4 +4 +4 +4 +4

nth term = 4n - 1

If the 2nd difference is constant, it is quadratic

e.g. 3 6 11 18 27 ...

1st difference → +3 +5 +7 +9

2nd difference → +2 +2 +2

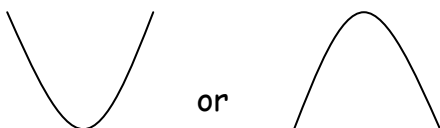
nth term = 1n² +/- a

n² → 1 4 9 16 25

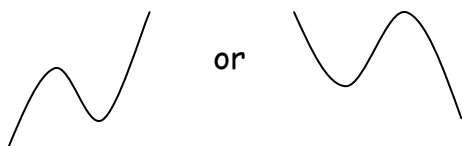
nth term = 1n² + 2

5.11 Plot quadratic & cubic functions

- The graph of a quadratic equation will have a basic shape like this

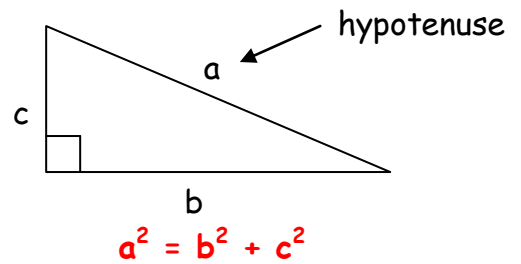


- The graph of a cubic equation will have a basic shape like this



5.12 Pythagoras Theorem

For this right angled triangle:

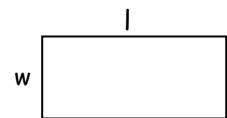


- If finding the hypotenuse
ADD the squares of the other 2 sides
Then square root
- If finding a shorter side
SUBT the squares of the other 2 sides
Then square root

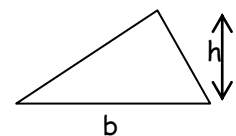
5.13 Find lengths, areas & volumes

Formulae to learn:

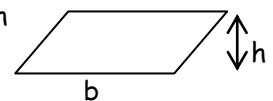
Area of rectangle = l x w



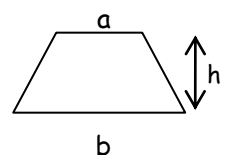
Area of triangle = $\frac{b \times h}{2}$



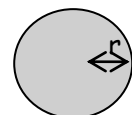
Area of parallelogram = b x h



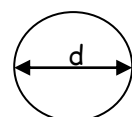
Area of trapezium = $\frac{1}{2}(a + b) \times h$



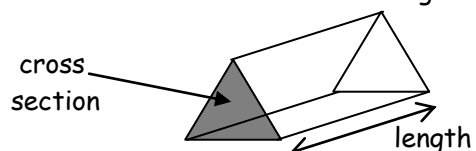
Area of circle = $\pi \times r^2$



Circumference = $\pi \times d$

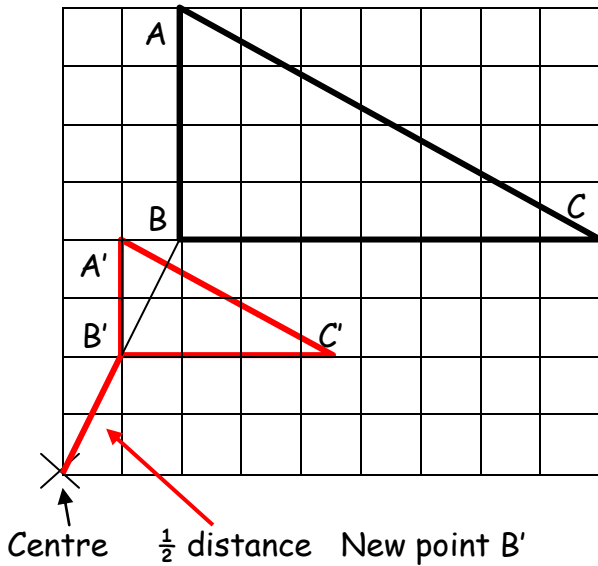


Volume = Area of cross-section x length



5.14 Enlarge a shape by a fractional sf

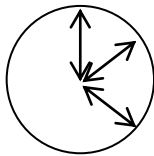
- Start at the centre of enlargement
 - Measure distance to a vertex of the shape
 - Multiply that distance by the scale factor
 - This is the distance of the new point
- e.g. To enlarge triangle ABC by $sf = \frac{1}{2}$



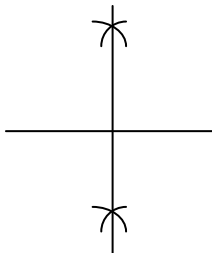
5.15 Locus of point

The path or region a point covers as it moves according to a rule

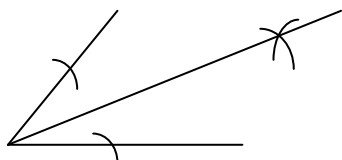
- Fixed distance from a point - **circle**



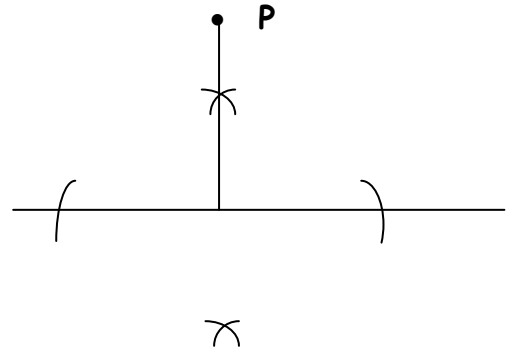
- Equal distance from two points
perpendicular bisector



- Equal distance from two intersecting lines -
angle bisector

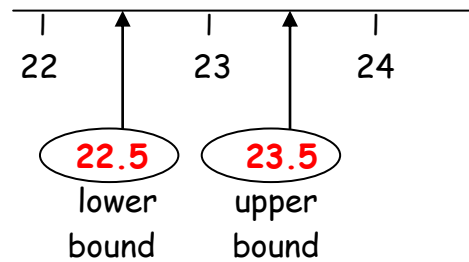


- Perpendicular from a point to a line



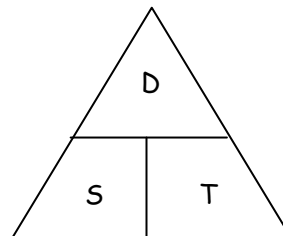
5.16 Bounds of measurement

- If 23cm is rounded to nearest whole cm
- 23 is between the whole numbers 22 and 24

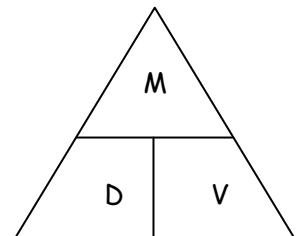


5.17 Compound Measures

- These triangles are useful
- Cover the quantity you are trying to find



D~Distance
S~Speed
T~Time



M~Mass
D~Density
V~Volume

Examples

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$\text{Time} = \frac{\text{Distance}}{\text{Speed}}$$

$$\text{Distance} = \text{Speed} \times \text{Time}$$

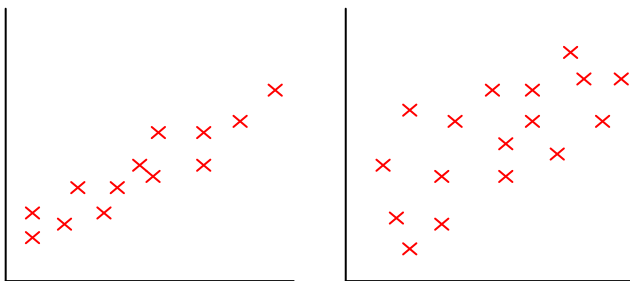
5.18 Plan a Statistical Enquiry

- Questions should be simple
- The answers need to be 'yes or 'no' or a 'number' or from a choice of answers
- Tick boxes are useful
- Avoid leading questions
- Avoid open-ended questions
- Avoid biased questions
- Ensure the sample is large enough
- Ensure the sample will give valid results

5.19 Graphical representation

- Scatter diagrams - used to investigate correlation

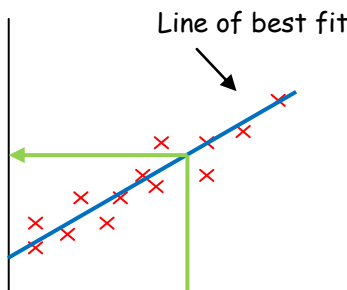
e.g. Positive Correlation



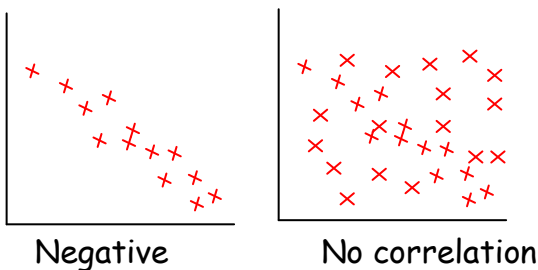
Strong positive

Weak positive

If it shows correlation, draw a line of best fit on it
 Points which do not fit the trend are called **OUTLIERS** and should be ignored
 The line can be used to predict data



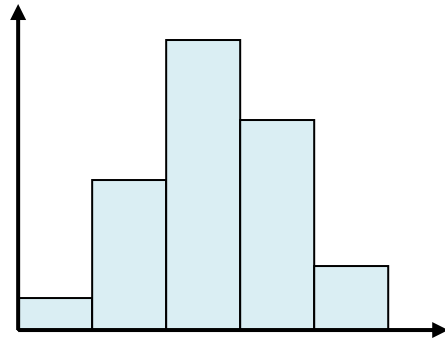
Line of best fit



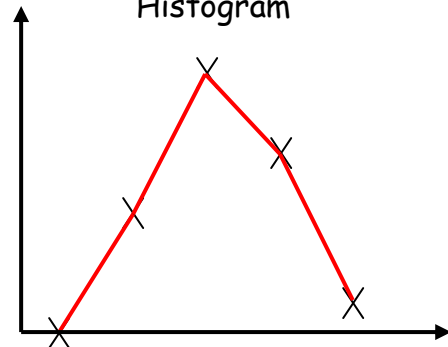
Negative

No correlation

- Frequency polygon - used to compare two sets of data



Histogram



Frequency polygon

Plot frequencies at the midpoint of each class interval
 Join successive points with a straight line

5.20 Estimate mean

Time (t sec)	x	f	fx
$60 < t \leq 70$	65	12	780
$70 < t \leq 80$	75	22	1650
$80 < t \leq 90$	85	23	1955
$90 < t \leq 100$	95	24	2280
$100 < t \leq 110$	105	19	1995

$$\Sigma f = 100 \quad \Sigma fx = 8660$$

$$\text{Mean} = \frac{\Sigma fx}{\Sigma f} = \frac{8660}{100} = \mathbf{86.6 \text{ sec}}$$

Modal class = **$90 < t \leq 100$**
 (because this class interval has the largest frequency i.e. 24)

$$\text{Median} = \frac{1}{2} (100 + 1)^{\text{th}} = 50.5^{\text{th}} \\ = \mathbf{80 < t \leq 90}$$

5.21 Compare distributions

- Compare an average using mean, median or mode.
- Compare spread using the range
(the higher the range, the bigger the spread of data)
- Frequency polygons and stem & leaf diagrams are often used to compare 2 distributions on the same diagram

5.22 Understand relative frequency

This is the name given to an estimate of probability from an experiment or a survey

Relative probability = $\frac{\text{No. times an outcome occurs}}{\text{Total number of trials}}$

5.23 Examine results of an enquiry Justify choice of presentation

A scatter diagram would be used to find out if there is any correlation or relationship between two sets of data

A frequency polygon would be used to compare two sets of data