Maths Grade 4 Knowledge Organiser

4.1 Understand & use a multiplier

- 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

4.2 Divide an amount into a given ratio

e.g. Divide £40 in the ratio of 1 : 3 : 4
Total number of shares = 1+3+4=8
1 share = £40÷8 = £5
3 shares = 3 x £5 = £15
5 shares = 5 x £5 = £25

e.g. A and B share some sweets in ratio 3:2
A gets 12 sweets
So 3 shares = 12
1 share = 12 ÷ 3 = 4
B gets 2 x 4 = 8 sweets

4.3 4 rules of fractions with mixed numbers

Change mixed numbers to improper fractions first:

e.g. $2\frac{3}{4} = \frac{11}{4}$

Then follow the same rules:

- **Add & subtract**

Denominators must be the same

- **Multiply**

Multiply numerators; multiply denominators

- **Divide**

Invert fraction after ÷
Multiply numerators; multiply denominators

4.4 Round to one significant figure

These all have ONE significant figure

300 80 2
0.7 0.05 0.003

4.4 Estimate answers to calculations

- Round each number to 1sf first

e.g. $\frac{423 \times 28}{568} = \frac{400 \times 30}{600} = \frac{12000}{600} = 20$

e.g. $\frac{3.26 \times 11.8}{0.58} = \frac{3 \times 10}{0.6} = \frac{30}{0.6} = \frac{300}{6} = 50$

e.g. $\frac{8.3 \times 35.6}{0.49} = \frac{8 \times 40}{0.5} = \frac{320}{0.5} = 640$

(÷0.5 = doubling the number being divided)

4.5 Find LCM of 2 numbers

Write down multiples of each number
Pick out the lowest common multiple
e.g. To find LCM of 12 and 15

- Multiples of 12: 12,24,36,48,**60**...
- Multiples of 15: 15,30,45,**60**

LCM of 12 and 15 = 60

4.5 Find HCF of 2 numbers

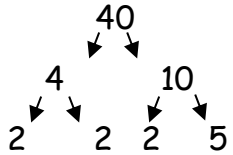
Write down factors of each number
Pick out the highest common factor
e.g. To find the HCF of 12 and 15

- Factors of 12: 1,12,2,6,**3**,4
- Factors of 15:1,15,**3**,5

HCF of 12 and 15 = 3

4.5 Express a number as the product of its prime factors

e.g.



$40 = 2x2x2x5 = 2^3 x5$

4.6 Expand brackets and simplify

Multiply everything inside the bracket by what is outside
Then collect like terms together

$3(x + 2) + 2(x - 5)$
$= 3x + 6 + 2x - 10$
$= 5x - 4$

Watch for the negative sign in front of the bracket
It changes the sign inside the bracket

$3(x + 2) - 2(x - 5)$
$= 3x + 6 - 2x + 10$
$= x + 16$

4.7 Apply the laws of indices

When multiplying ADD the indices
When dividing SUBTRACT the indices
Treat numbers as normal

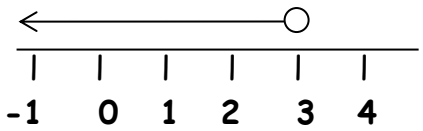
e.g. $3a^2 \times 2a^3 = (3 \times 2)a^{2+3} = 6a^5$
$10a^6 \div 5a^2 = (10 \div 5)a^{6-2} = 2a^4$

4.8 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)*
$2x < 6$ *(÷2 each side)*
$x < 3$



4.8 Use trial & improvement method to solve an equation

To solve $2x^2 - 3x = 16$ (correct to 1dp)

Try x=3	$2 \times 3^2 - 3 \times 3 = 9$	
Try x=4	$2 \times 4^2 - 3 \times 4 = 20$	
Try x=3.5	$2 \times 3.5^2 - 3 \times 3.5 = 14$	Too small
Try x=3.6	$2 \times 3.6^2 - 3 \times 3.6 = 15.12$	Too small
Try x=3.7	$2 \times 3.7^2 - 3 \times 3.7 = 16.28$	Too big

x = 3.7 (the solution that gives the closest to 16)

4.9 Rearrange a formula

- Use the same balancing steps as when you solve equations

e.g. Make 't' the new subject in:

$v = u + at$ *(-u from each side)*
$v - u = at$ *(÷a each side)*
$\frac{v - u}{a} = \frac{at}{a}$
$t = \frac{v - u}{a}$

4.10 Sequences

- **Understand position and term**

Position	1	2	3	4
Term	3	7	11	15

+4

Term to term rule = +4
Position to term rule is $\times 4 - 1$
(because position 1 x 4 - 1 = 3)
nth term $= n \times 4 - 1 = 4n - 1$

- **Generate terms of a sequence**

If the nth term is 5n + 1
1st term *(n=1)* = 5x1 + 1 = 6
2nd term *(n=2)* = 5x2 + 1= 11
3rd term *(n=3)* = 5x3 + 1 = 16

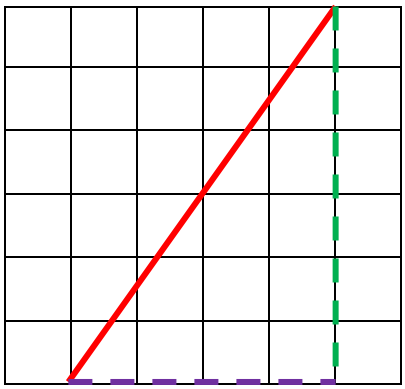
4.11 Straight line graphs or linear graphs

These are graphs that can be written in the form: y= **m**x + **c**

- m means gradient of the line
- c is where the graph cuts the y-axis

e.g. y = 3x – 1
Has a gradient of 3 and cuts the y-axis at -1

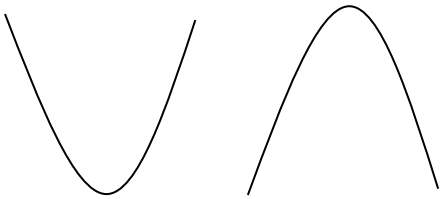
- **To find the gradient of a line**
  - The gradient of a line is its 'slope'
  - It is measured by vertical ÷ horizontal



Gradient = 6 ÷ 4 = 1.5

4.11 Graphs of quadratic equations

The shape of a quadratic graph is a parabola



You will need to complete a table of values to work out the points to plot

e.g. $y = x^2 - 2x - 3$

x	-2	-1	0	1	2	3
y	5	0	-3	-4	-3	0

- **To solve $x^2 - 2x - 3 = 0$**

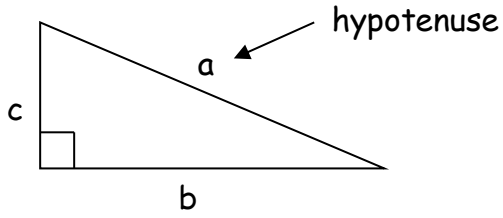
Note down the values of x where the graph cuts the x-axis

- **To solve $x^2 - 2x - 3 = 4$**

Note down the values of x where the graph cuts the line y = 4

4.12 Pythagoras Theorem

For this right angled triangle:



$a^2 = b^2 + c^2$

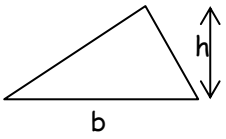
- If finding the hypotenuse
  ADD the squares of the other 2 sides
  Then square root
- If finding a shorter side
  SUBT the squares of the other 2 sides
  Then square root

4.13 Find lengths, areas & volumes

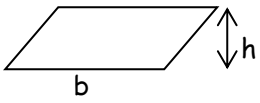
Formulae to learn:

Area of rectangle = l x w

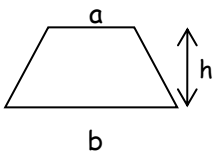
Area of triangle = $\frac{b \times h}{2}$



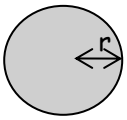
Area of parallelogram = b x h



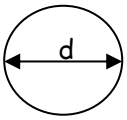
Area of trapezium = $\frac{1}{2}(a + b)xh$



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

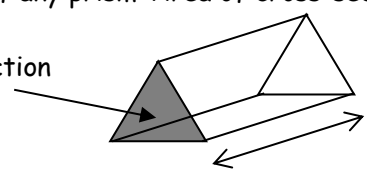


Circumference = $\pi \times d$

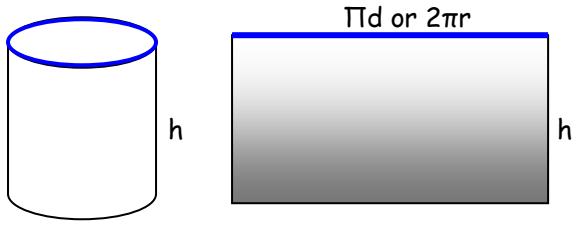


Volume of any prism=Area of cross-section x length

cross section



Curved Surface Area of cylinder = 2πrh



4.14 Transformations

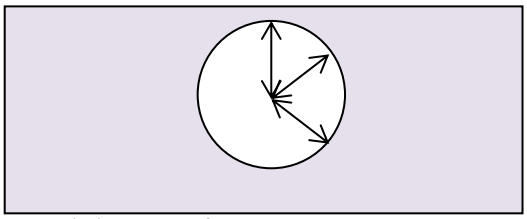
There are 4 main transformations and must be described accurately

Transformation	Described by:
REFLECTION	Line of reflection
TRANSLATION	Vector
ROTATION	Angle, direction, centre
ENLARGEMENT	Scale factor, centre

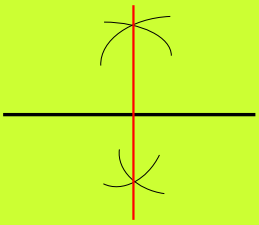
4.15 Locus of point

LOCUS is the path or region a point covers as it moves according to a rule

- Fixed distance from a point – circle

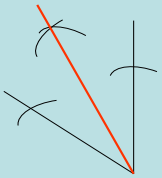


- Equal distance from two points perpendicular bisector
- Draw a straight line through where the arcs cross above and below.



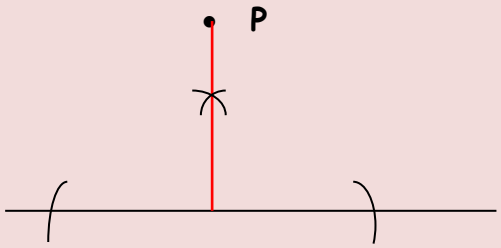
- Equal distance from two intersecting lines – angle bisector

Draw a line from where the arcs cross to the vertex of the angle



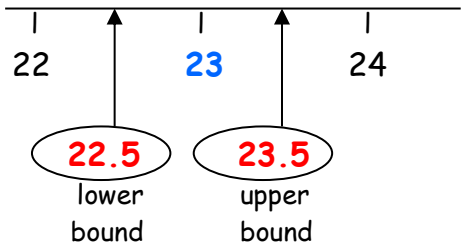
- Perpendicular from a point to a line

Draw arcs from the point P on the line



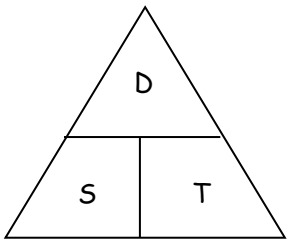
4.16 Bounds of measurement

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

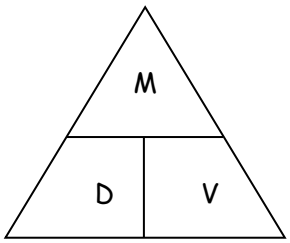


4.17 Compound Measures

- These triangles are useful
- Cover the quantity you are trying to find
- What is uncovered is the formula to use



D~Distance
S~Speed
T~Time



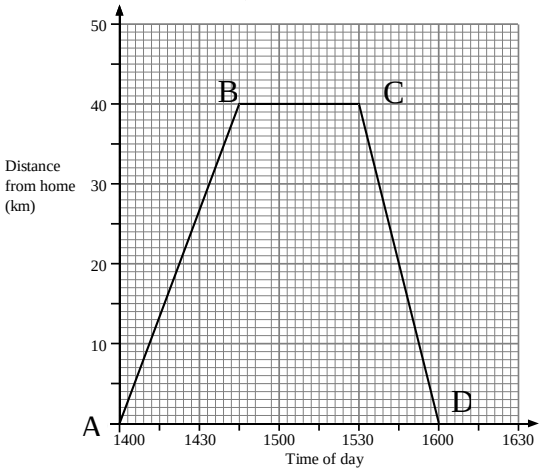
M~Mass
D~Density
V~Volume

Examples

Speed = Distance / Time Time = Distance / Speed

Distance = Speed x Time

Distance/Time Graph



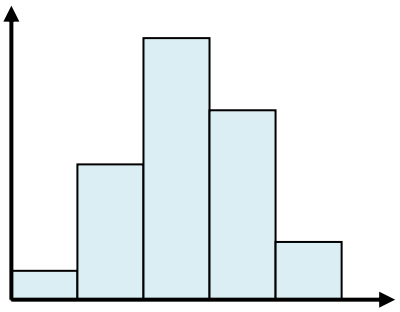
- AB shows the journey away
- BC shows no movement
- CD shows journey back
- The steeper the line the higher the speed

4.18 Design & criticise a questionnaire

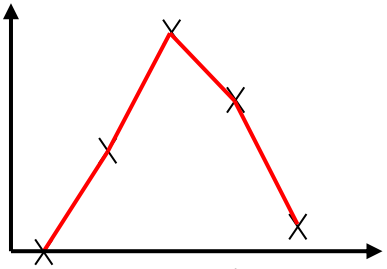
- Questions should be simple
- The answers need to be 'yes or 'no' or a 'number' or from a choice of answers
- Tick boxes are useful
- Avoid responses open to interpretation
- No overlapping values in response boxes
- Avoid leading questions
- Avoid open-ended questions
- Avoid biased questions
- Ensure the sample is large enough

4.19 Frequency Polygon

- plot mid-points of bars & join



Histogram



Frequency polygon

- Frequency polygons and stem & leaf diagrams are often used to compare 2 distributions on the same diagram

4.20 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

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

Est. Mean = $\frac{\Sigma fx}{\Sigma f} = \frac{8660}{100} =$ **86.6sec**

Modal class = **$90 < t \leq 100$**

(because this class interval has the largest frequency i.e. 24)

Median = $\frac{1}{2}(100 + 1)^{th} = 50.5^{th}$

= **$80 < t \leq 90$**

4.21 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 would be used to compare two sets of data

4.22 Understand relative frequency

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

Relative probability = No. times an outcome occurs / Total number of trials

Expected frequency=probability x number of trials

e.g. Probability of spinning a '3' is 0.12

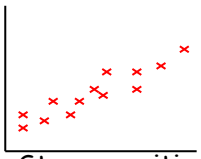
The number of '3's expected in 100 spins =

0.12 x 100 = 12

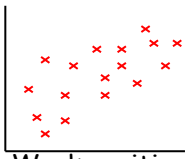
4.23 Scatter graphs

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

e.g. Positive Correlation



Strong positive

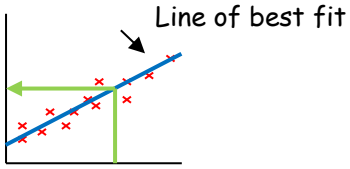


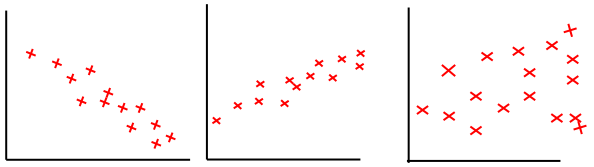
Weak positive

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





Negative Positive No correlation