Level 7 PROMPT sheet

7/1 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

7/2 Calculate using proportional change

To increase £240 by 15% (100+15 = 115)

= 1.15 x £240 = £276

To decrease £240 by 15% (100-15 = 85)

= 0.85 x £240 = £204

7/2 Multiply & divide numbers 0-1

- **Multiply e.g. 0.2 x 0.4**

Ignore decimal points & multiply numbers

2 x 4 = 8

Count the number of decimal places (2)

The answer will have this many (2)

0.2 x 0.4 = 0.08 *(2 decimal places)*

- **Divide e.g. 8 ÷ 0.2**

Multiply both by 10

80 ÷ 2 = 40 *makes whole*

7/2 4 rules of fractions

- **Add & subtract**

Denominators must be the same

- **Multiply**

Multiply numerators; multiply denominators

- **Divide**

Invert fraction after ÷

Multiply numerators; multiply denominators

7/4 Round to one significant figure

These all have ONE significant figure

4000
300
80
2
0.7
0.05
0.003

7/4 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)

7/5 Use a calculator efficiently

Know your keys

x^2 x^3 $x^{\blacksquare}$ $\sqrt{}$ $\sqrt[3]{}$ (-) $\frac{\blacksquare}{\blacksquare}$

7/6 Expand two brackets

Use FOIL	Use GRID
F L $(x - 3)(x + 5)$ I O **F O I L** $= x^2 + 5x - 3x - 15$ $= x^2 + 2x - 15$	$(x - 3)(x + 5)$ x | +5 x | x^2 | +5x -3 | -3x | -15 $= x^2 + 2x - 15$

7/7 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. $2x - 3y = 11 \quad (x2)$
$5x + 2y = 18 \quad (x3)$

$4x - 6y = 22$
$15x + 6y = 54$

Add the two equations to eliminate y

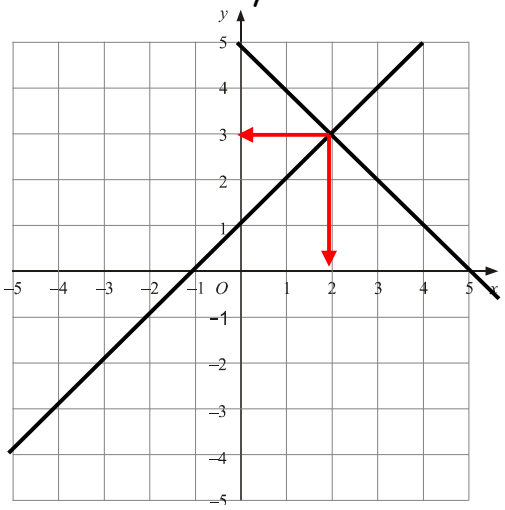
$19x = 76$
$x = 4$

Substitute x = 4 into one of the equations

$5x + 2y = 18$
$5x4 + 2y = 18$
$20 + 2y = 18$
$2y = -2$
$y = -1$

7/7 Solve simultaneous equations graphically

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



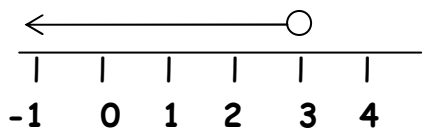
Solution is x = 2, y = 3

7/8 Solve inequalities in one variable

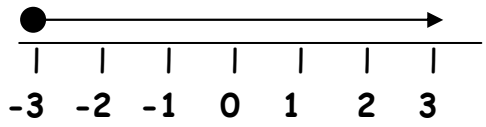
a < b means a is less than b
a ≤ b means a is less than or equal to b
a > b means a is greater than b
a ≥ b means a is greater than or equal to b

Inequalities can be treated like equations
The solution can be shown on a number line

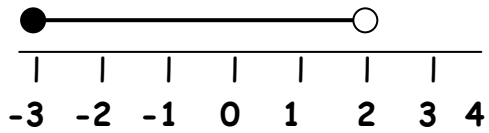
e.g.1 $2x - 4 < 2$ *(+4 to each side)*
$2x < 6$ *(÷2 each side)*
$x < 3$



e.g. 2 $2x - 7 \leq 5x + 2$ *(-2x each side)*
$-7 \leq 3x + 2$ *(-2 each side)*
$-9 \leq 3x$ *(÷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)*
$-6 \leq 2x < 4$ *(÷2 each side)*
$-3 \leq x < 2$



7/9 Substitute numbers into expressions

Once numbers have replaced letters:

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

- x - = +	-- = +
- x + = -	+- = -

7/9 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)*

$\frac{v - u}{a} = \frac{at}{a}$

$t = \frac{v - u}{a}$

7/10 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

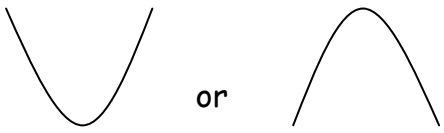
nth term = $1n^2$ +/- a

n^2 → 1 4 9 16 25

nth term = $1n^2 + 2$

7/11 Plot quadratic & cubic functions

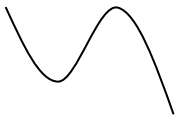
- The graph of a quadratic equation will have a basic shape like this



or

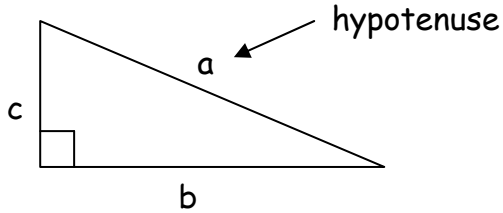
- The graph of a cubic equation will will have a basic shape like this

or



7/12 Pythagoras Theorem

For this right angled triangle:



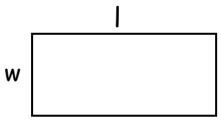
$a^2 = b^2 + c^2$

- 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

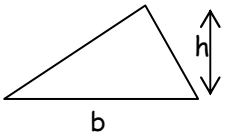
7/13 Find lengths, areas & volumes

Formulae to learn:

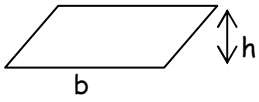
Area of rectangle = l x w



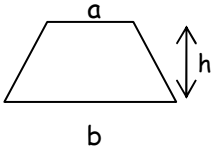
Area of triangle = $\frac{b \times h}{2}$



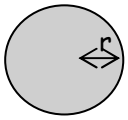
Area of parallelogram = b x h



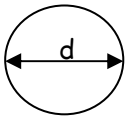
Area of trapezium = $\frac{1}{2}(a + b)xh$



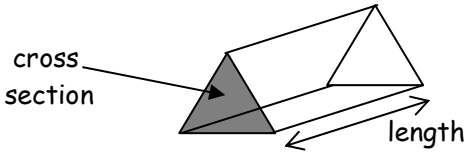
Area of circle = $\pi \times r^2$



Circumference = $\pi \times d$



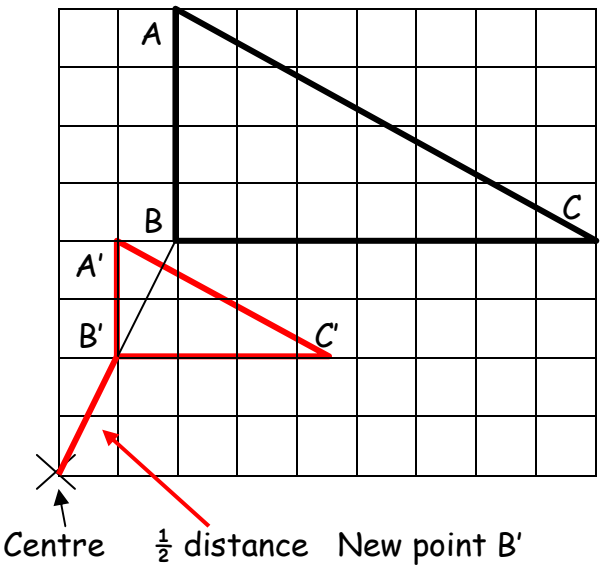
Volume = Area of cross-section x length



7/14 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

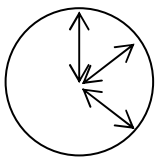
e.g. To enlarge triangle ABC by sf= $\frac{1}{2}$



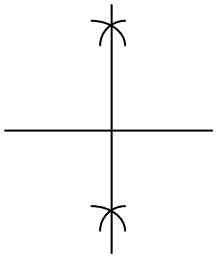
7/15 Locus of point

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

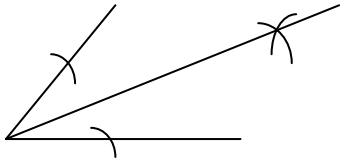
- Fixed distance from a point – circle



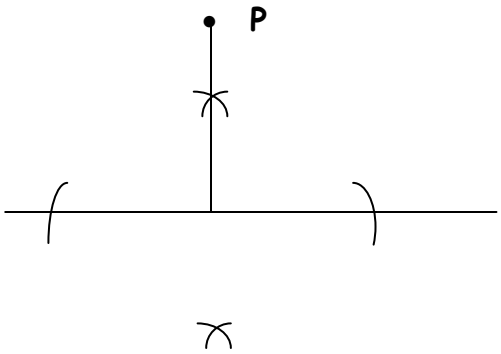
- Equal distance from two points
  perpendicular bisector



- Equal distance from two intersecting lines –
  angle bisector

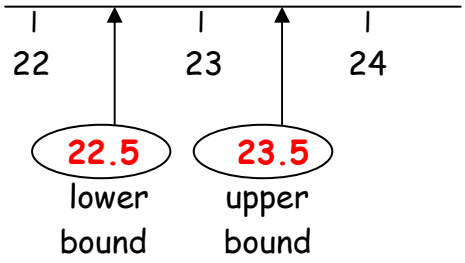


- Perpendicular from a point to a line



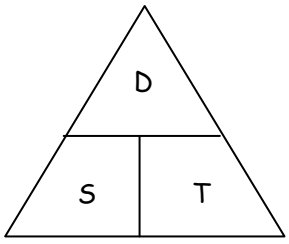
7/16 Bounds of measurement

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

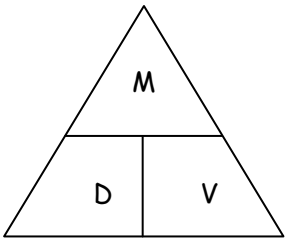


7/17 Compound Measures

- 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

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

Distance = Speed x Time

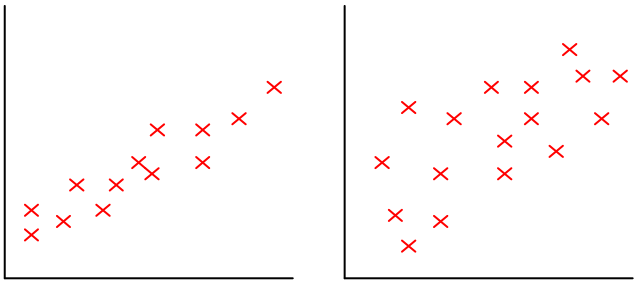
7/18 Plan a Statistical Enquiry

- 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

7/19 Graphical representation

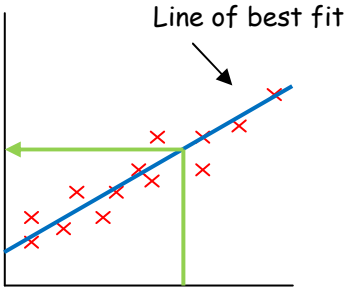
- Scatter diagrams – used to investigate correlation

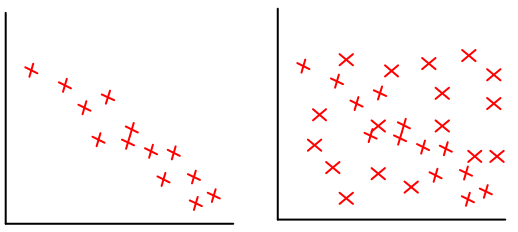
e.g. Positive Correlation



Strong positive Weak positive

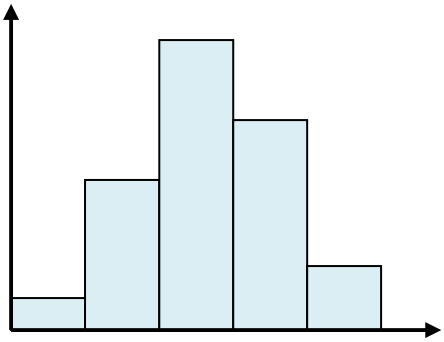
If it shows correlation , draw a line of best fit on it
Points which do not fit the trend are called OUTLIERS and should be ignored
The line can be used to predict data



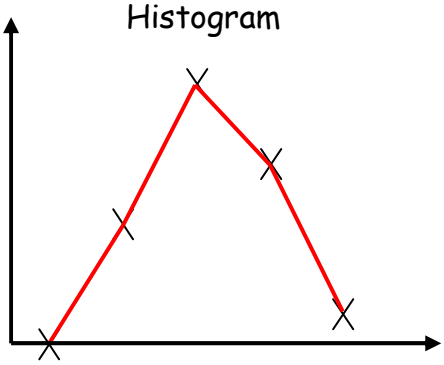


Negative No correlation

- 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

7/20 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

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

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

7/21 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

7/22 Understand relative frequency

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

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

7/23 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