# Stage 8 PROMPT Sheet

## 8/1 Multiply & divide decimals

**~Multiply** * take out decimal point
* multiply
*put decimal point back in

e.g. 3.2 x 0.4

- 32 x 4 (remove decimal points)
- 128 (multiply)
- 1.28 (put decimal point back in-2 decimal places)

**~Divide** * make divisor into a whole number
* multiply both numbers

e.g. 2.84 ÷ 0.2 (multiply both numbers by 10)

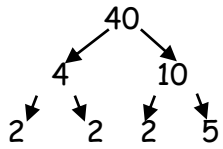
- 28.4 ÷ 2
- 14.1

**~Inverses**

2.4 x 36 = 86.4

- 86.4 ÷ 36 = 2.4
- 86.4 ÷ 2.4 = 36

## 8/2 Prime factorisation




$40 = 2x2x2x5 = 2^3 \times 5$

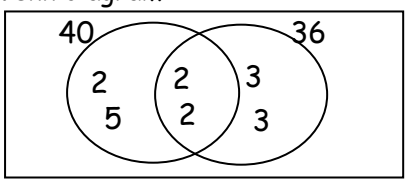
### Extend to find HCF & LCM

Example: To find HCF & LCM of 40 and 36

$40 = 2x2x2x5 = 2^3 \times 5$

$36 = 2x2x3x3 = 2^2 \times 3^2$

Using a Venn diagram:




HCF = 2x2 = $2^2$

LCM = $2^2 \times 2 \times 5 \times 3 \times 3 = 2^3 \times 3^2 \times 5$

## 8/3 Round to significant figures

**~ ONE significant figure**

| | | |
|---|---|---|
| 300 | 80 | 2 |
| 0.7 | 0.05 | 0.003 |

**~Estimate answers to calculations**

*Round each number to 1significant figure first*

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

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

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

***(÷0.5 = doubling the number being divided)***

## 8/4 Powers and roots

$4^2$ - we say 4 squared or the square of 4
- It means 4x4 = 16

$2^3$ - we say 2 cubed or the cube of 2
- It means 2x2x2 = 8

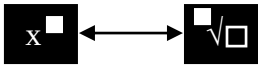
$3^4$- we say 3 to the power of 4
- It means 3x3x3x3 = 81

The inverse operation for 'power' is 'root'

$\sqrt{16} = 4$

$\sqrt[3]{8} = 2$

$\sqrt[4]{81} = 3$




## 8/5 Convert decimals to fractions & vv

**~Decimals to fractions**

$2.475 = 2\frac{475}{1000} = 2\frac{19}{40}$

$\frac{4}{10}$ $\frac{7}{100}$ $\frac{5}{1000}$

**~Fractions to decimals** - by changing

e.g. $\frac{4}{5} = \frac{8}{10} = 0.8$

e.g. $\frac{9}{12} = \frac{3}{4} = 0.75$

**~Fractions to decimals** - by dividing

e.g. $\frac{3}{8} = 3 \div 8 = 0.375$

## 8/6 Factorise an expression

This is the opposite of expand – put bracket back in

$4y - 12 = 4(x - 3)$
$y^2 + 7y = y(y + 7)$

} Expand the answers to check that they give the original expression

## 8/7 Laws of indices

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

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

$10a^6 \div 5a^2 = (10 \div 5)a^{6-2} = 2a^4$

$(3^4)^2 = 3^4 \times 3^4 = 3^{4+4}$ OR $3^{4\times2} = 3^8$

**Note:** $k^2 \times k^2 \times k^2 = k^6$; $k^2 + k^2 + k^2 = 3k^2$

### Zero and negative indices

e.g. $3^0 = 1$; $23^0 = 1$; $x^0 = 1$

e.g. $2^{-1} = \frac{1}{2}$; $2^{-2} = \frac{1}{2^2}$; $2^{-3} = \frac{1}{2^3}$

## 8/8 Change the subject of a formula

- Use the same balancing steps as when you solve equations

Example: Make 't' the new subject in:

$v = u + at$ *(-u from each side)*

$v - u = at$ *(÷a each side)*

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

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

## 8/9 Substitute into expression/formula

- Write down the expression/formula
- Substitute the numbers given
- Use BIDMAS

e.g. $S = 2a^2 + 2c$ when $a = 3$, $c = 5$

$S = 2(3)^2 + 2x(5)$

$S = 2x9 + 10$

$S = 28$

**SUVAT formulae will be given:**

$v = u+at$
$s = ut + \frac{1}{2}at^2$
$v^2 = u^2 + 2as$

s=displacement; u=initial velocity
v=final velocity; a=acceleration; t=time

Whenever you have a SUVAT question, identify the **three** things you know and the **one** thing you want to find out. Use the equation with these four things in.

- *If something is starting from rest then the initial velocity (u) is zero*
- *acceleration - gravity applies to all falling objects approximately 10m/s²*

## 8/10 Solve equations-unknown both sides

~Multiply out brackets first
~Letters on both sides? - get rid of the smaller first
~Solve by balancing in the usual way

e.g.

To solve: $5(x - 3) = 3x + 7$ (expand bracket)

$5x - 15 = 3x + 7$ (-3x from both sides)

$2x - 15 = + 7$ (+15 to each side)

$\frac{2x}{2} = \frac{22}{2}$ (÷2 both sides)

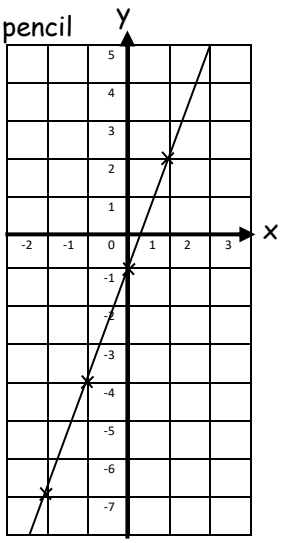
$x = 11$

## 8/11 Plot & interpret linear graphs

Example: $y = 3x - 1$

| x | -2 | -1 | 0 | 1 | 2 |
|---|---|---|---|---|---|
| y | -7 | -4 | -1 | 2 | 5 |

~Substitute values of x into the equation
~Plot the points in pencil
~Join the points with a ruler& pencil




## 8/12 Find gradients & intercepts of linear graphs

**~algebraically**

These are graphs that can be written in the form:

$y = mx + c$

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

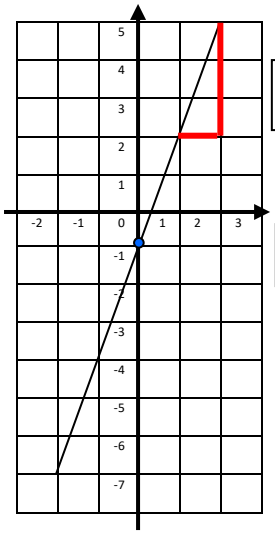
e.g. $y = 3x - 1$

Has a gradient of 3 and cuts the y-axis at -1

## 8/12 (continued)

~graphically

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



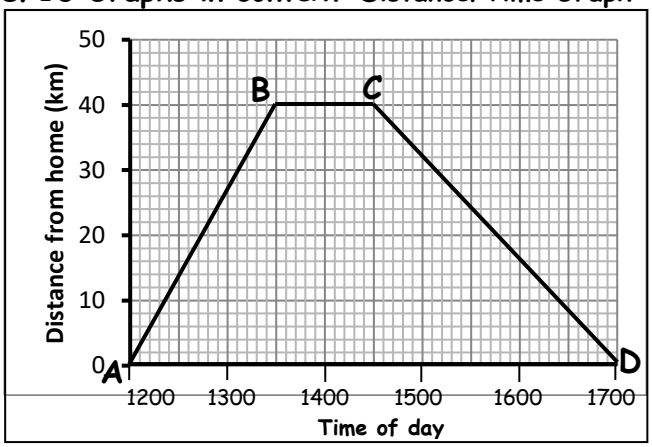
Gradient = $\frac{3}{1}$ = 3

y-intercept = −1

Equation of straight line:
y= mx + c
y= 3x -1

**Remember GRADIENT is a rate of change**

## 8/13 Graphs in context-Distance/Time Graph

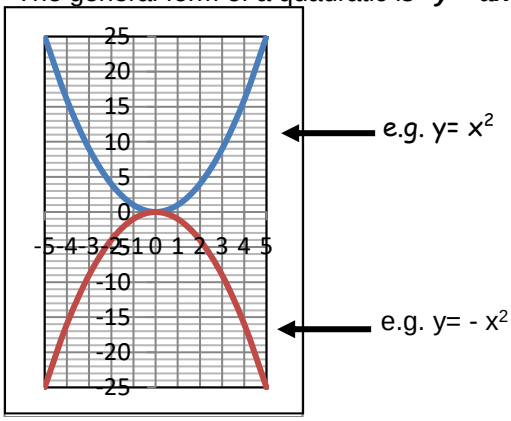



- AB shows the journey away
- BC shows no movement
- CD shows journey back
- The steeper the line the higher the speed

## 8/14 Draw & interpret quadratic graphs

~The quadratic graph is a **smooth** curved parabola passing through the plotted points

~The general form of a quadratic is "$y = ax^2 + bx + c$"




## 8/15 Sequences

~Find nth term from position to term rule

| Position | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| Term | 3 | 7 | 11 | 15 |

×4-1

+4

Term to term rule = +4

Position to term rule is x 4 - 1

*(because position ($T_1$) = 1 x 4 – 1 = 3)*

nth term ($T_n$) = n x 4 -1 = 4n – 1

(n is the position of the term)

~Generate terms of a sequence from nth term

If the nth term is 5n + 1

1st term $T_1$ *(n=1)* = 5x1 + 1 = 6

2nd term $T_2$ *(n=2)* = 5x2 + 1= 11

3rd term $T_3$ *(n=3)* = 5x3 + 1 = 16

## 8/16 Expand two brackets

- Use F O I L

$(x + 3)(x - 2)$

F O I L

$x^2 - 2x + 3x - 6$

$= x^2 + x - 6$

$(x + 3)(x - 3)$

F O I L

$x^2 - 3x + 3x - 9$

$= x^2 - 9$

## 8/17 Multiplicative relation from ratio

**Example** **boys : girls is 5:3**

**Boys** = $\frac{5}{8}$

**Girls** = $\frac{3}{8}$

## 8/18 Proportion as equality of ratios

**~Map scale** **1 : 10000**

⇨ **1cm : 10000cm**

⇨ **1cm : 100m**

**~Conversion** **8km : 5miles**

⇨ **1km : 1.6miles**

**~Mixing** **3red : 2 white**

⇨ **1.5 red : 1 white**

## 8/19 Increase & decrease by a percentage

- To increase a quantity by 5%

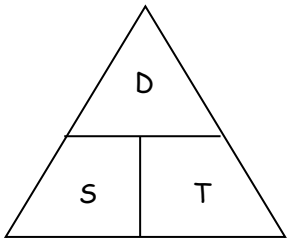
Multiply the quantity by 1.05 (100+5 = 105)

- To decrease a quantity by 5%

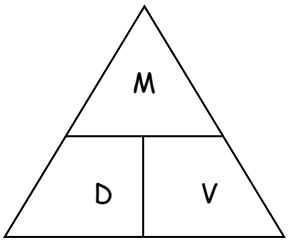
Multiply the quantity by 0.95 (100-5 = 95)

## 8/20 Compound units

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




D~Distance
S~Speed (mph)
T~Time



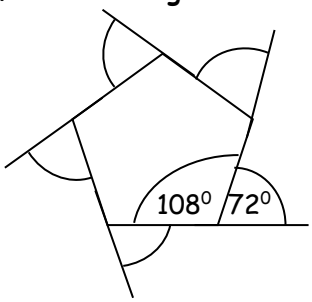

M~Mass
D~Density ($g/cm^3$)
V~Volume

## 8/21 Angles of polygons

~Polygons have straight sides
~Polygons are named by the number sides

3 sides – triangle
4 sides – quadrilateral
5 sides – pentagon
6 sides – hexagon
7 sides – heptagon
8 sides – octagon
9 sides – nonagon
10 sides - decagon

**With ALL sides equal they are called REGULAR**
**Sum of exterior angles is always $360^0$**



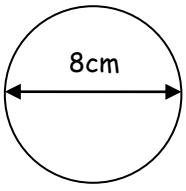

~ the interior & exterior angle add up to $180^0$

~ the interior angles add up to:

Triangle = $1 \times 180^0 = 180^0$
Quadrilateral = $2 \times 180^0 = 360^0$
Pentagon = $3 \times 180^0 = 540^0$
Hexagon = $4 \times 180^0 = 720^0$ etc

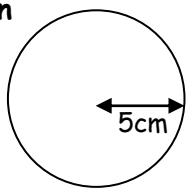
## 8/22 Circumference of circle - Learn

$C = \pi \times d$
$= \pi \times 8$
$= 25.1cm$



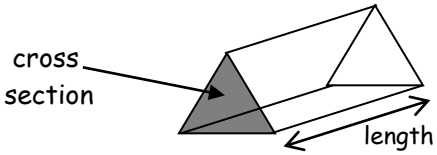

## 8/22 Area of circle - Learn

$A = \pi \times r^2$
$= \pi \times r^2$
$= \pi \times 5^2$
$= \underline{78.5cm^2}$




## 8/23 Volume of prism - Learn

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

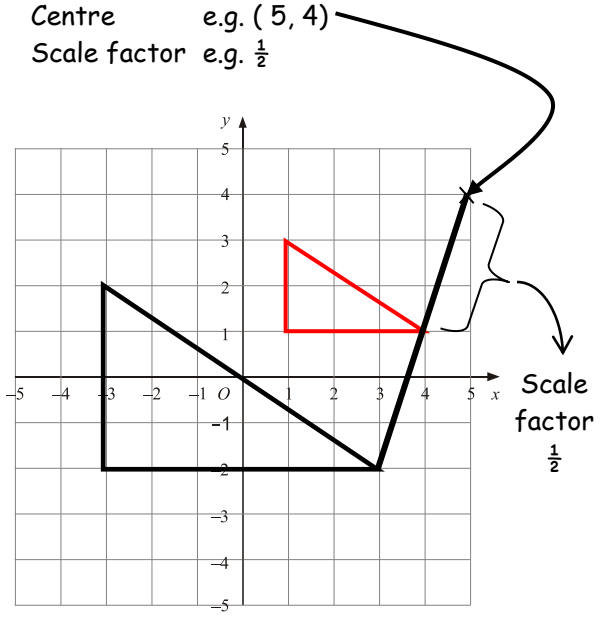



## 8/24 Enlargement

- **Enlarge a shape by fraction scale factor**

You need to know:

- Centre e.g. ( 5, 4)
- Scale factor e.g. $\frac{1}{2}$




**The image is similar; all lengths are half the original**

## 8/25 Scales and bearings

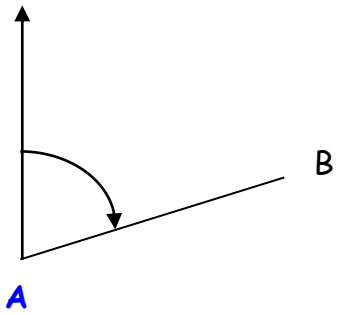
**~Scales**

- A scale is represented by a ratio
  **e.g. 1 : 50 000**
  **which means**
  **1cm : 50000cm(or 500 m or 0.5 km)**

**~Bearings**

- A bearing is a direction measured as an angle clockwise from the North
- It needs 3 digits so may need a 0 in front e.g. $072^0$
- Bearings are given from a fixed point so look for the fixed point after the word 'FROM'

e.g. A bearing of 072$^0$ from A to B




## 8/26 Probability

If 2 outcomes cannot occur together, they are mutually exclusive

~ If 2 outcomes A and B are mutually exclusive

$P(A) + p(B) = 1$

~ If 3 outcomes A B and C are mutually exclusive

$P(A) + p(B) + p(C) = 1$

e.g. If outcomes A, B and C are mutually exclusive and

p(A) = 0.47

p(B) = 0.31

then

p(C) = 1 – (0.47 + 0.31)

= 1 – 0.78

= 0.22

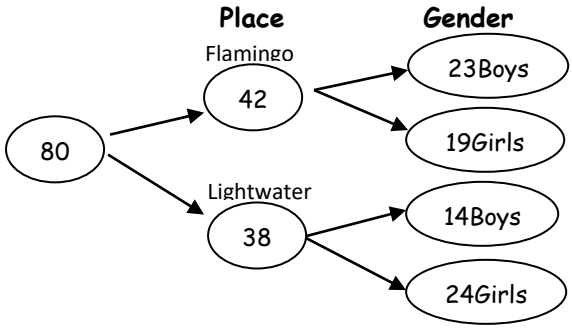
## 8/27 Frequency trees

These are a means of representing & sorting data

**Example:** 80 children went on a school trip to Flamingo Land or Lightwater Valley

23 boys and 19 girls went to Flamingo Land

14 boys went to Lightwater Valley.




**Two-way tables**

| | Flamingo | Lightwater | Total |
|---|---|---|---|
| Boys | 23 | 14 | 37 |
| Girls | 19 | 24 | 43 |
| Total | 42 | 38 | 80 |

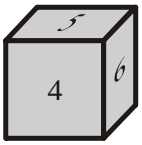
## 8/28 Sample space & probability

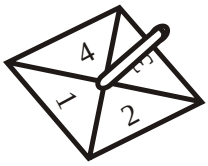
**Outcomes can be presented:**

- **In a list**
- **In a table or sample space**

**Example of a sample space**

To show all possible outcomes from spinning a spinner and rolling a dice




| | | Dice | | | | | |
|---|---|---|---|---|---|---|---|
| | + | 1 | 2 | 3 | 4 | 5 | 6 |
| Spinner | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | 2 | 3 | | | | | |
| | 3 | 4 | | | | | |
| | 4 | 5 | | | | | |

## 8/29 Estimate mean from grouped data

| 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 = $\frac{\Sigma fx}{\Sigma f} = \frac{8660}{100} = 86.6$sec

Modal class = $90 < t \leq 100$

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

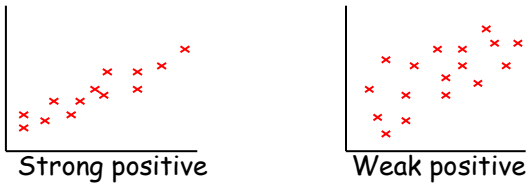
Median = $\frac{1}{2}(100 + 1)^{th} = 50.5^{th}$

= $80 < t \leq 90$

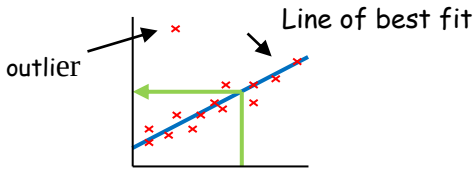
## 8/30 Scatter graphs

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**




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

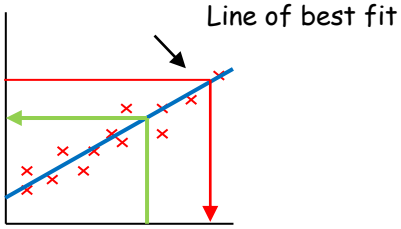




Correlation does not always imply causation
**i.e. does not imply that one causes the other**

### Make predictions with line of best fit

The line of best fit can be used to predict data




### Interpolation from scatter diagrams

This is a method of estimating values between **known data points**

### Extrapolation from scatter diagrams

This is a method of estimating values **beyond/out of known data points**

- Extrapolation should be used with caution as it can give results that will not be observed in real life,
- Using a trend line calculated from a small number of samples and not a population is inaccurate
- We do not know whether the linear pattern progresses past the data we are given.