DEO CUSTODE

CARGILFIELD

Maths Revision

Book 2

Name: .....

Number

Fractions

Calculating with Fractions

Addition

$\frac{5}{6} + \frac{3}{4}$ (×2, ×2, ×3, ×3)

$= \frac{10}{12} + \frac{9}{12}$

$= \frac{19}{12}$

$= 1\frac{7}{12}$

Subtraction

$3\frac{1}{3} - 1\frac{2}{3}$

Subtract wholes first

$= 2\frac{1}{3} - \frac{2}{3}$

Change one whole into thirds

$= 1 + \frac{3}{3} + \frac{1}{3} - \frac{2}{3}$

$= 1\frac{2}{3}$

Multiplication

$3\frac{3}{4} \times 1\frac{3}{5} \times \frac{3}{8}$

$= \frac{15}{4} \times \frac{8}{5} \times \frac{3}{8}$

$= \frac{{}^{3}\cancel{15} \times {}^{1}\cancel{8} \times 3}{4 \times \cancel{5} \times \cancel{8}}$ (1, 1)

$= \frac{9}{4}$

$= 2\frac{1}{4}$

Division

$\frac{5}{12} \div \frac{15}{16}$

Invert right hand side

$= \frac{5}{12} \times \frac{16}{15}$

$= \frac{{}^{1}\cancel{5} \times {}^{4}\cancel{16}}{{}^{3}\cancel{12} \times {}^{3}\cancel{15}}$

$= \frac{4}{9}$

Fraction Problems

Merry the monkey eats 1⅓ bananas each day. How many bananas will Merry eat in 12 days?

$1\frac{1}{3} = \frac{4}{3}$

$\cancel{3} \times \frac{4}{\cancel{3}}$ bananas in 1 day (× 3)

4 bananas in 3 days (×4)

16 bananas in 12 days (×4)

How many days will 24 bananas last if Smiley eats $\frac{2}{5}$ of a banana each day?

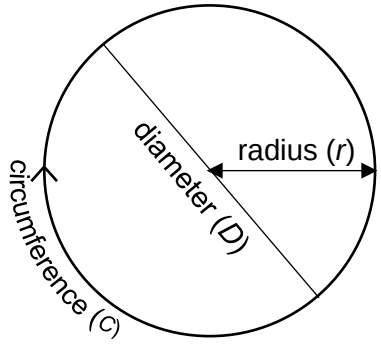
$\cancel{5} \times \frac{2}{\cancel{5}}$ bananas in 1 day (× 5)

2 bananas in 5 days (×12)

24 bananas in 60 days (×12)

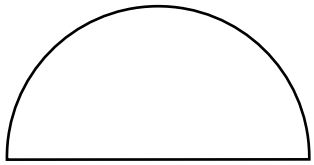
Shapes

Circles



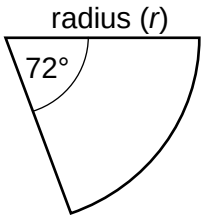
- Area of Circle = πr^2
- Circumference = $2\pi r$

Semi-circles



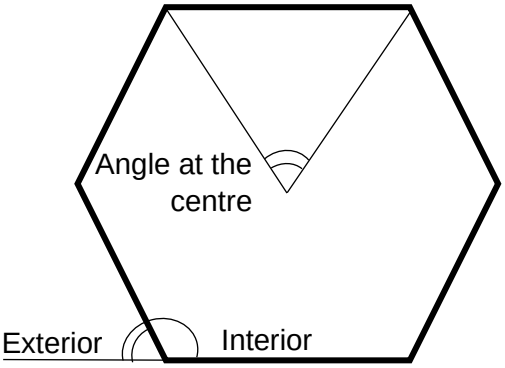
- Area = $\frac{1}{2}\pi r^2$
- Perimeter = $\frac{2\pi r}{2} + D$

Segments



- Find out how many segments make up a full circle:
  e.g. 360° ÷ 72° = 5
- Area of Segment (above) = $\frac{1}{5} \times \pi r^2$
- Perimeter = $\frac{1}{5} \times 2\pi r + 2r$

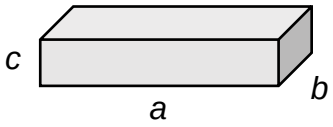
Polygons



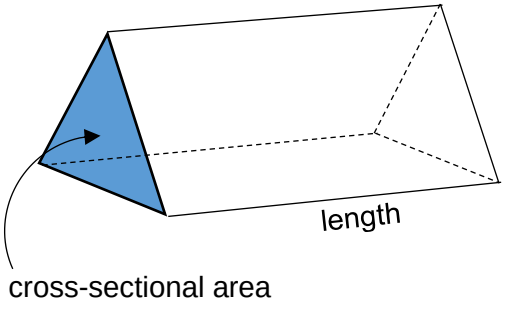
Polygon Formulae:

- Angle at the centre = Exterior angle
- Number of sides(n) = 360 ÷ Exterior angle
- Exterior angle = 360 ÷ Number of sides
- Angle at the centre = Exterior angle
- Interior angle + Exterior angle = 180º
- Sum of Interior angles = 180(n – 2)

Volume



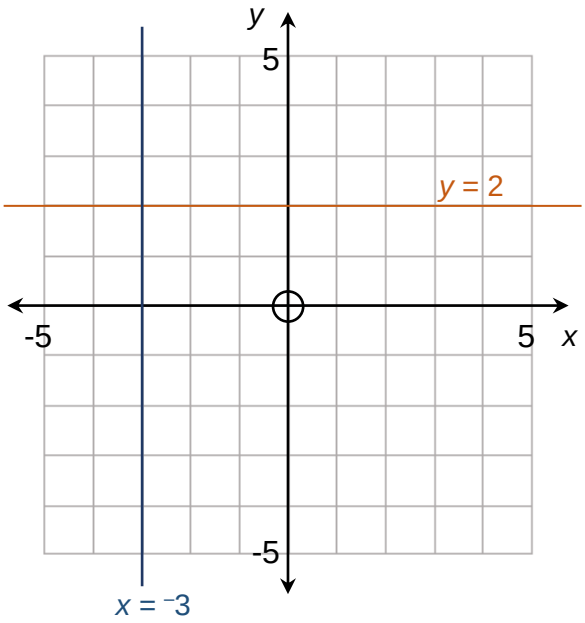
- Volume of a cuboid
  = length x breadth x height
- Surface area of cuboid = $2ab + 2bc + 2ac$
- Volume of a prism
  = cross-sectional area × length
- Surface area of a prism
  = sum of the areas of all faces



Graphs

Straight Line Graphs

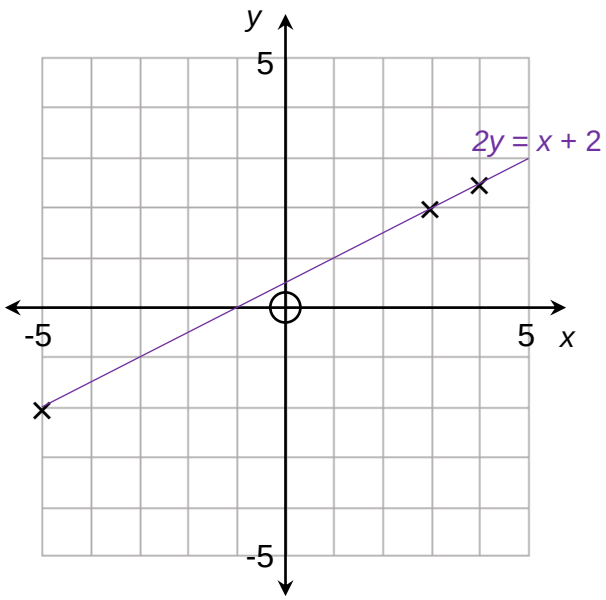
Horizontal and Vertical Graphs



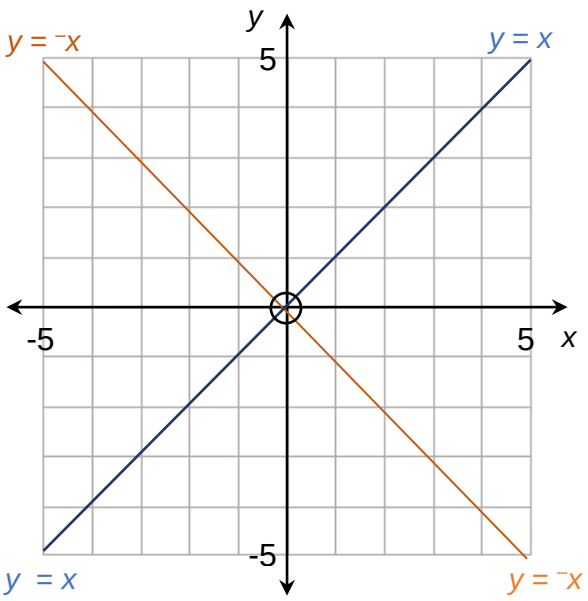
y = mx + c type graphs

2y = x + 1 (which is same as *y = ½x + ½*)

x	-5	3	4
y	⁻2	2	2.5

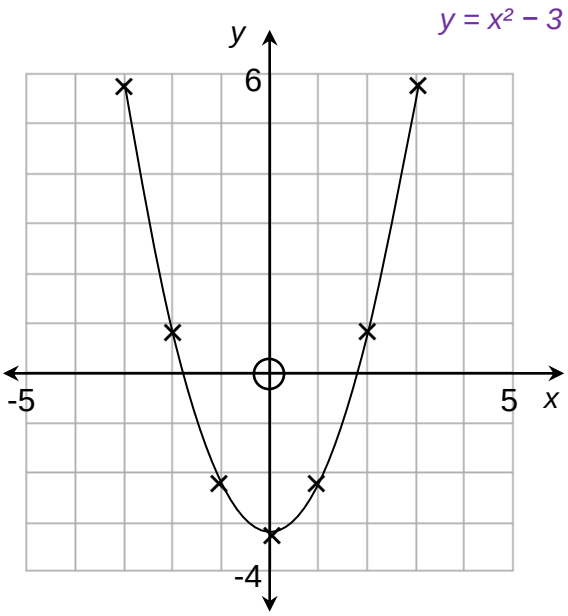


Diagonal Graphs



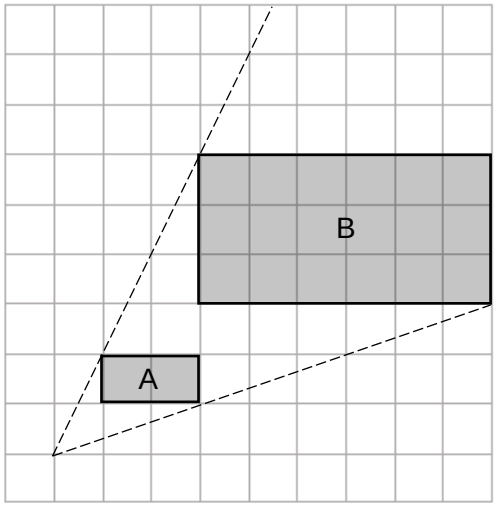
Quadratic Graphs (Level 3)

x	⁻3	⁻2	⁻1	0	1	2	3
y	6	1	⁻2	⁻3	⁻2	1	6



Enlargement: Area and Perimeter

- If the scale factor is 3, the perimeter of the enlarged shape will be 3 times longer.
- the area of the enlarged shape will be 9 times larger (3^2)



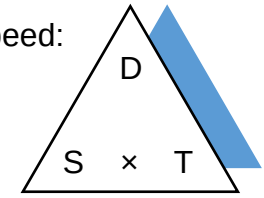
Q. Triangle F is an enlargement of triangle E using a scale factor of 3.
If triangle F has an area of 72 cm^2, find the area of triangle E.

Area of E = $72 \div 3^2$
= $72 \div 9$
= <u>$8\ cm^2$</u>

Speed, Distance and Time

The formula to calculate speed:

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



- Work out the speed of a car travelling 180 miles in 3 hours and 20 minutes:

Time in hours = 3.33333333… or $3\frac{20}{60}$

Speed = distance ÷ time

= 180 ÷ 3.333333333 $(3\frac{20}{60})$

= <u>54 mph</u>

- Work out the time taken to travel 96 km at a speed of 40 km/h:

Time = distance ÷ speed
= 96 ÷ 40
= 2.4 hours = $2\frac{4}{10}$ = $2\frac{24}{60}$

= <u>2 hours 24 minutes</u>

- Change 4 m/s into km/h

× 3600 ← 4 metres in 1 second → × 3600

14400 m in 1 hour

= <u>14.4 km/h</u>

- Change 72 km/h into metres per second:

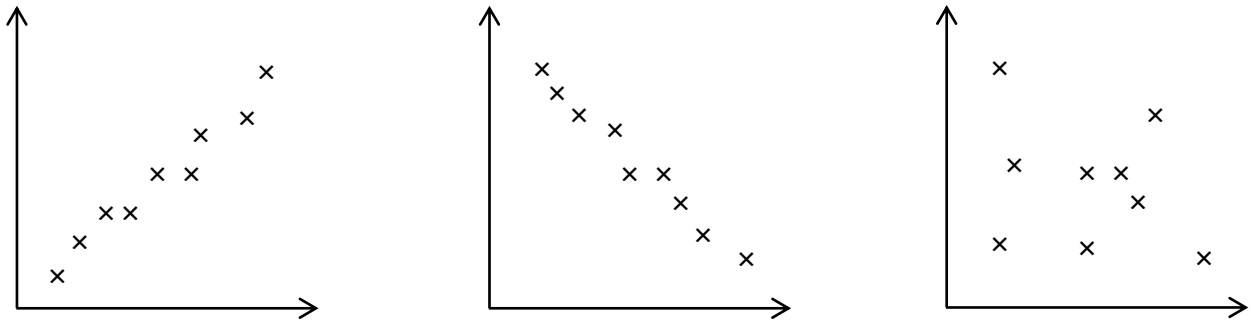
speed = $\frac{\text{distance}}{\text{time}}$

= $\frac{72000\ m}{3600\ s}$

= <u>20 m/s</u>

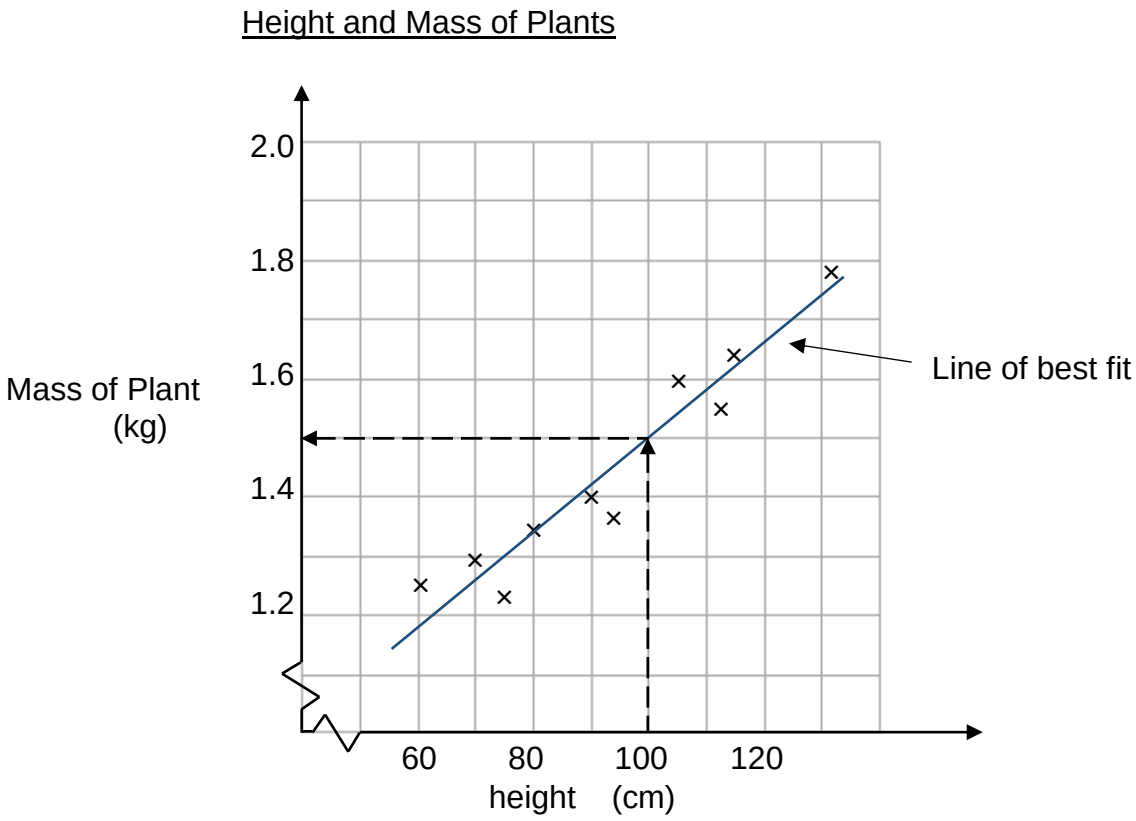
*Remember: 1 hour = 60 × 60 = 3600 seconds

Scatter Graphs and Correlation



Positive Correlation | Negative Correlation | No Correlation

Example: Molly grows some plants and measures their height and mass. She then plots her results on a scatter graph as shown below.



Question: Use the line of best fit to predict the mass of a 100 cm plant.

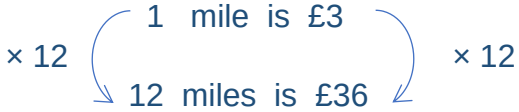
Answer: Show your working on the graph using dotted lines (see above).
If the plant has a height of 100 cm, it will weigh approximately 1.5 kg

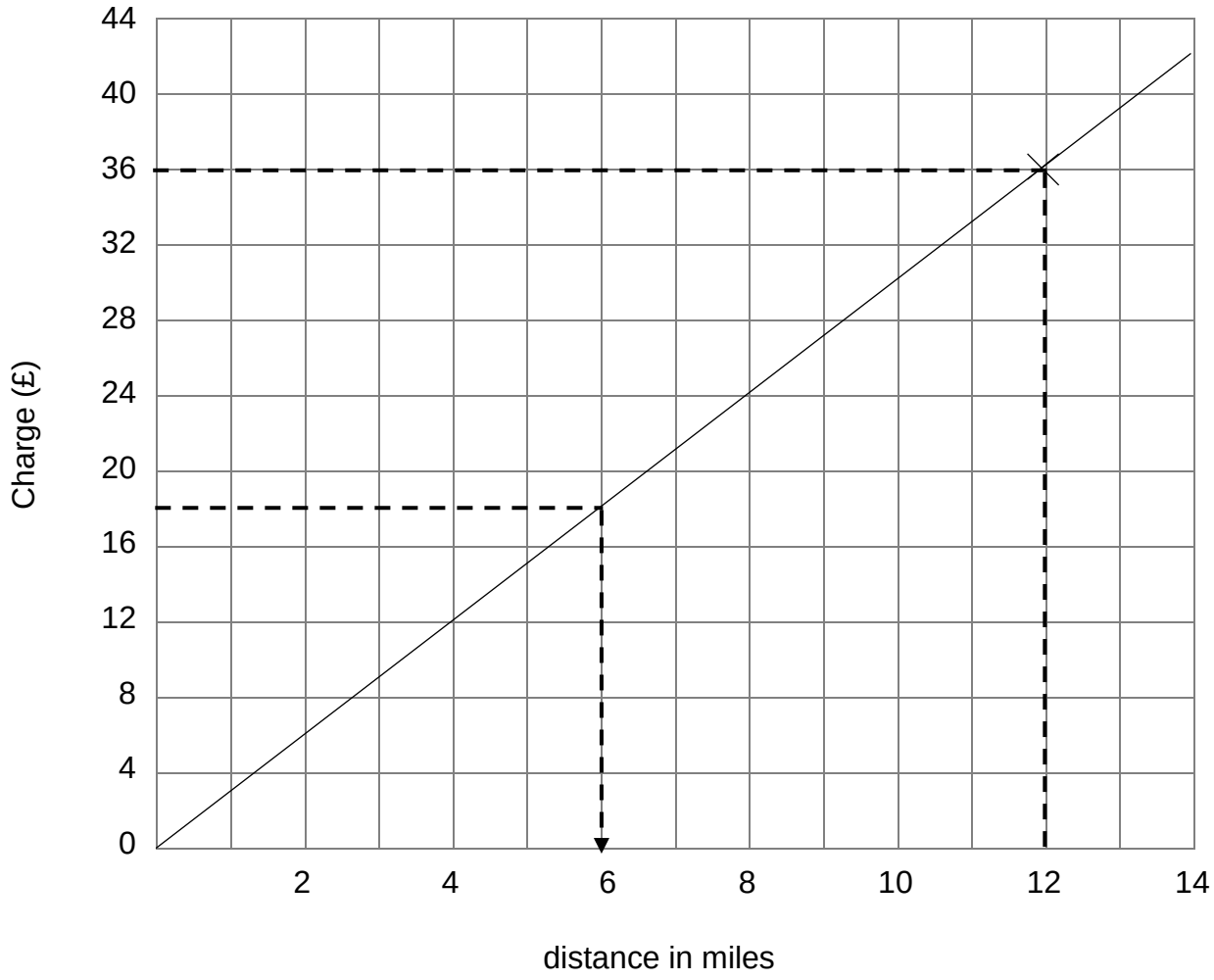
Conversion Graphs

Example:

Easycab taxi company charge passengers £3 per mile.
How much would they charge a passenger for a 12 mile journey?

Answer :





If a passenger pays £18 for a journey, how far was the journey? Show your working on the graph above.

Answer: 6 miles.

Algebra

Simplification Examples:

(a)

$$\frac{3t + 18}{6}$$

$$= \frac{\overset{1}{\cancel{3}}t}{\underset{2}{\cancel{6}}} + \frac{18}{6}$$

$$= \frac{t}{2} + 3$$

(b)

$(4y^3)^2$

$= 4y^3 \times 4y^3$

$= 4 \times 4 \times y \times y \times y \times y \times y \times y$

$= \underline{16y^6}$

(c) $^-15ab^2 \div 35a^2b^3$

$$= \frac{^-15ab^2}{35a^2b^3}$$

$$= \frac{^-\overset{3}{\cancel{15}} \times \cancel{a} \times \cancel{b} \times \cancel{b}}{\underset{7}{\cancel{35}} \times \cancel{a} \times a \times \cancel{b} \times \cancel{b} \times b}$$

$$= -\frac{3}{7ab}$$

Using Factorisation:

(a) Fully factorise $8n + 36$

$= \underline{4(2n + 9)}$

(b) A square has a perimeter of $8n + 36$
Find the length of one side in terms of n

Use factorised expression: $4(2n + 9)$

Perimeter of a square = 4 × length of side
= $4 \times (2n + 9)$

Length of one side = $\underline{2n + 9}$

Substitution Examples:

(i) If $p = 3$, $r = 4$, $s = ^-2$, $t = 6$

Substitute:

(a) $2r - s$
$= 2 \times 4 - (^-2)$
$= 8 + 2$
$= \underline{10}$

(b) $5p - r^2$
$= 5 \times 3 - 4^2$
$= 15 - 16$
$= \underline{^-1}$

(c) $r(6s - p)$
$= 4(6 \times ^-2 - 3)$
$= 4(^-12 - 3)$
$= 4 \times (^-15)$
$= \underline{^-60}$

(d) $\frac{pr - 8}{3t + s}$

$$= \frac{3 \times 4 - 8}{18 + ^-2}$$

$$= \frac{12 - 8}{18 - 2}$$

$$= \frac{4}{16}$$

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

(ii) If $v = \sqrt{5gh}$, work out the value of g when $v = 20$ and $h = -10$

$v = \sqrt{5gh}$

$20 = \sqrt{5 \times g \times -10}$

$400 = -50g$ *(square both sides)*

$g = -8$

Equations Examples:

(a) $x + 3 = 1$
$-3 \quad -3$

$x = -2$

(b) $y - 4 = 6$
$+4 \quad +4$

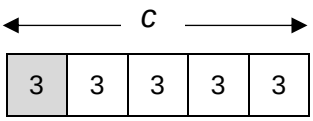
$y = 10$

(c) $3y = 12$

$\frac{3y}{3} = \frac{12}{3}$

$y = 4$

(d) $\frac{c}{5} = 3$ (or $\frac{1}{5}c = 3$)



$c = 5 \times 3 = 15$

(e) $2a - 5 = 11$
$+5 \quad +5$

$2a = 16$

$\frac{2a}{2} = \frac{16}{2}$

$a = 8$

(f) $4 - 2x = 5 + x$

(take x's to side with biggest x)

$4 - 2x = 5 + x$
$+2x \qquad +2x$

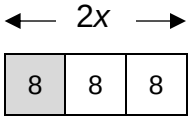
$4 = 5 + 3x$
$-5 \quad -5$

$-1 = 3x$

$-\frac{1}{3} = \frac{3x}{3}$

$x = -\frac{1}{3}$

(g) $\frac{2x}{3} = 8$



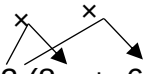
$2x = 3 \times 8$

$2x = 24$

$\frac{2x}{2} = \frac{24}{2}$

$x = 12$

Brackets



(a) $2(8x + 6y)$

$= \underline{16x + 12y}$

(b) $5 - 3(4a + 2)$

$= 5 - 12a - 6$

$= \underline{^{-}1 - 12a}$

(c) $3(2m - 4n) - 2(m - 5n)$

$= 6m - 12n - 2m + 10n$

$= \underline{4m - 2n}$

Factorising

(a) $15f + 20$

$= \underline{5(3f + 4)}$

(b) $16a^2b - 24ab^3$

$= \underline{8ab(2a - 3b^2)}$

Algebra: Writing Expressions

On a train, there are m men, twice as many boys as men, 11 less girls than men, and three times as many women as girls.

In terms of m:

Men	Boys	Girls	Women
m	$2m$	$(m - 11)$	$3(m - 11)$

(a) Write an expression for the total number of people.

$m + 2m + (m - 11) + 3(m - 11)$

$= m + 2m + m - 11 + 3m - 33$

$= \underline{7m - 44}$

(b) There are a total of 68 people on the train.
Write down and solve an equation to find the value of m.

$7m - 44 = 68$

$+44 \quad +44$

$7m = 112$

$\frac{7m}{7} = \frac{112}{7}$

$\underline{m = 16}$

(c) How many women are on the train?

$3(m - 11)$
$= 3(16 - 11)$
$= 3 \times 5$
$= \underline{15 \text{ women}}$

Number Patterns

Examples

Sequence	Rule	nth Term	20th Term
7, 11, 15, 19, 23, …	Add 4 each time (4 times table) ***See example at the bottom of the page***	$4n + 3$	$4n + 3$ $= 4 \times 20 + 3$ $= 83$
40, 35, 30, 25, 20, ..	Subtract 5 each time (based on -5 × table)	$-5n + 45$	$-5n + 45$ $= {}^{-}5 \times 20 + 45$ $= {}^{-}100 + 45$ $= {}^{-}55$
1, 4, 9, 16, 25, …	Square numbers	n^2	n^2 $= 20^2$ $= 400$
3, 6, 11, 18, 27, …	Square then add 2	$n^2 + 2$	$n^2 + 2$ $= 20^2 + 2$ $= 402$
9, 16, 25, 36, ….	Add 2 then square	$(n + 2)^2$	$(n + 2)^2$ $= (20 + 2)^2$ $= 22^2$ $= 484$
2, 4, 8, 16, 32, …	Doubling	2^n	8th term: 2^n $= 2^8$ $= 256$
10, 100, 1000, …	Multiply previous term by 10	10^n	8th term: 10^n $= 10^8$ $= 100\ 000\ 000$

+4 +4 +4 +4

7, 11, 15, 19, 23, …. → **$4n + 3$**

(4, 8, 12, 16, 20, …) → **$4n$**

The top sequence is the 4 times table but 3 more for each term,
i.e. $4n + 3$

Percentages

Find 35% of 360 m

Method 1:

35% of 360 m

$$\frac{35}{100} \times \frac{360}{1}$$

$$= \frac{\overset{7}{\cancel{35}} \times \overset{18}{\cancel{360}}}{\underset{5}{\cancel{100}}\ \underset{1}{}}$$

$$= \frac{7 \times 18}{1}$$

$$= \underline{126\text{ m}}$$

Method 2:

$10\% = \frac{1}{10}$

$\frac{1}{10}$ of 360 = 36 m

10% → 36 m

5% → 18 m

30% = 3 × 36
= 108 m

35% = 30% + 5%
= 108 + 18
= <u>126 m</u>

Method 3 (Calculator)

35 ÷ 100 × 360
= <u>126 m</u>

Method 4 (Calculator)

Buttons on calculator:
[3] [5] [%] [×] [3] [6] [0]

Pie Charts

<u>Angle for 1 Person</u>

30 people surveyed.
Angle for 1 person = 360° ÷ 30
= <u>12°</u>

<u>Percentage pie charts:</u>

$1\% = \frac{360}{100} = \underline{3.6°}$

Bearings

You must use 3 figures.

042°, 009°, 316°
↑ ↑↑

Write the bearings and real life distances on the diagrams.

<u>Scales</u>

1 : 10 000 1 : 500

to change these do: -

1 cm : 10 000 cm	1 cm : 500 cm
<u>1 cm : 100 m</u>	<u>1 cm : 5 m</u>