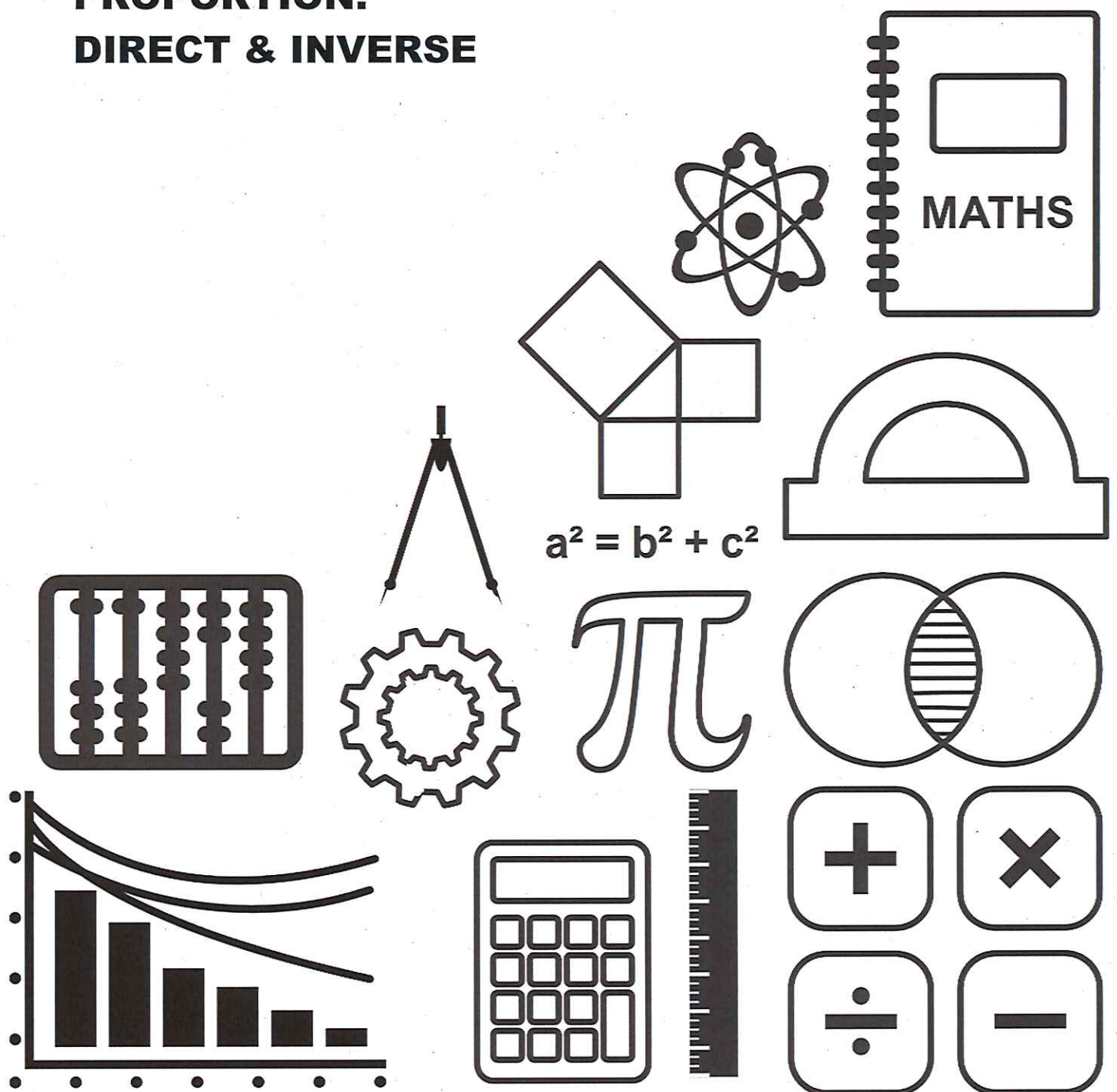


GCSE TOPIC BOOKLET
PROPORTION:
DIRECT & INVERSE



1. Given that g is proportional to h^2 , and that $g = 1$ when $h = 3$,

(a) find an expression for g in terms of h ,

$$g \propto h^2$$

$$g = kh^2$$

$$1 = k(3)^2$$

$$1 = k \times 9$$

$$\underline{\underline{\frac{1}{9} = k}}$$

$$\underline{\underline{g = \frac{1}{9} h^2}}$$

[3]

(b) find g when $h = 2$.

$$g = \frac{1}{9} (2)^2$$

$$\underline{\underline{g = \frac{4}{9}}}$$

[1]

2. Given that y is proportional to x^2 , and that $y = 4$ when $x = 0.5$,

(a) find an expression for y in terms of x ,

$$y \propto x^2$$

$$y = kx^2$$

$$4 = k(0.5)^2$$

$$4 = 0.25k$$

$$\frac{4}{0.25} = k$$

$$\underline{\underline{k = 16}}$$

$$\underline{\underline{y = 16x^2}}$$

[3]

(b) use the expression you found in (a) to complete the following table.

x	0.5	3	20
y	4	144	6400

If $x = 3$, $y = 16x^2$, $y = 16 \times 3^2$, $y = 144$

If $y = 6400$, $6400 = 16x^2$
 $6400 \div 16 = x^2$
 $400 = x^2$

$$x = \sqrt{400}, x = 20$$

[2]

3. Given that y is inversely proportional to x^2 , and that $y = 4$ when $x = 10$,

(a) find an expression for y in terms of x .

$$y \propto \frac{1}{x^2}$$

$$y = \frac{k}{x^2}$$

$$4 = \frac{k}{10^2}$$

$$\underline{k = 400}$$

$$\underline{y = \frac{400}{x^2}}$$

[3]

(b) calculate

(i) the value of y when $x = 20$,

$$y = \frac{400}{20^2}$$

$$y = \frac{400}{400}$$

$$\underline{y = 1}$$

[1]

(ii) a value of x when $y = \frac{1}{100}$.

$$\frac{1}{100} = \frac{400}{x^2}$$

$$\frac{x^2}{100} = 400$$

$$x^2 = 400 \times 100$$

$$x^2 = 40,000$$

$$\underline{x = 200}$$

[2]

4. Given that y is proportional to x^2 , and that $y = 12$ when $x = 2$, calculate

a) the value of y when $x = 5$.

$$y \propto x^2$$

$$y = kx^2, \quad 12 = k(4), \quad k = 3$$

$$\underline{y = 3x^2}$$

$$\text{If } x = 5, \quad y = 3(5)^2 \quad \underline{y = 75}$$

b) the value of x when $y = 48$.

$$\text{If } y = 48 \quad 48 = 3x^2$$

$$\frac{48}{3} = x^2, \quad x^2 = 16, \quad \underline{x = 4}$$

(5)

5. Given that y is inversely proportional to x , and that $y = 4$ when $x = 6$,

(a) find an expression for y in terms of x ,

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x}$$

$$4 = \frac{k}{6}$$

$$4 \times 6 = k$$

$$k = 24$$

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

[3]

(b) complete the following table for values of x and y .

x	$\frac{1}{2}$	6	8
y	48	4	3

$$\text{If } x = \frac{1}{2} \quad y = \frac{24}{\frac{1}{2}} = 48$$

$$\text{If } y = 3 \quad 3 = \frac{24}{x} \quad 3x = 24 \quad x = 8$$

[2]

6. Given that y is proportional to x^3 , and that $y = 4$ when $x = 1$, calculate

a) the value of y when $x = 2$.

$$y \propto x^3$$

$$y = kx^3$$

$$4 = k(1^3)$$

$$k = 4$$

$$y = 4x^3$$

$$\text{If } x = 2 \quad y = 4(2)^3 \quad y = 32$$

b) the value of x when $y = 256$.

$$256 = 4x^3$$

$$64 = x^3$$

$$x = \sqrt[3]{64} \quad x = 4$$

(5)

7.

You are given that y is inversely proportional to x^2 , and that $y = 100$ when $x = 2$.

- (i) Find an expression for y in terms of x . $y \propto \frac{1}{x^2}$, $y = \frac{k}{x^2}$

$$100 = \frac{k}{2^2}$$

$$400 = k$$

$$y = \frac{400}{x^2}$$

- (ii) Use the expression you found in (i) to complete the following table.

x	2	10	40
y	100	4	$\frac{1}{4}$

If $x = 10$, $y = \frac{400}{10^2} = 4$

If $y = \frac{1}{4}$, $\frac{1}{4} = \frac{400}{x^2}$

$$\frac{1}{4}x^2 = 400$$

$$x^2 = 1600, x = 40$$

[5]

8.

Given that y is inversely proportional to x^2 , and that $y = 10$ when $x = 12$, find an expression for y in terms of x .

$$y \propto \frac{1}{x^2}$$

$$y = \frac{k}{x^2}$$

$$10 = \frac{k}{12^2}$$

$$k = 1440$$

$$y = \frac{1440}{x^2}$$

[3]

9. Given that y is inversely proportional to x , and that $y = 3$ when $x = 8$,

(a) find an expression for y in terms of x ,

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x}$$

$$3 = \frac{k}{8}$$

$$\underline{24 = k}$$

$$\underline{y = \frac{24}{x}}$$

[3]

(b) complete the following table for values of x and y .

x	$\frac{1}{2}$	6	8
y	48	4	3

If $\underline{x = \frac{1}{2}}$

$$y = 24 \div \frac{1}{2}, \underline{y = 48}$$

If $\underline{y = 4}$

$$4 = \frac{24}{x}$$

$$4x = 24$$

$$x = \frac{24}{4}, \underline{x = 6}$$

[2]

10. Given that y is inversely proportional to x , and that $y = 3$ when $x = 2$,

(a) find an expression for y in terms of x ,

$$y \propto \frac{1}{x}$$

$$y = \frac{k}{x}$$

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

$$\underline{6 = k}$$

$$\underline{y = \frac{6}{x}}$$

[3]

(b) use the expression you found in (a) to complete the following table.

x	-1	2	60
y	-6	3	0.1

If $\underline{x = -1}$, $y = \frac{6}{-1}$, $\underline{y = -6}$

If $\underline{y = 0.1}$, $0.1 = \frac{6}{x}$

$$0.1x = 6$$

$$x = \frac{6}{0.1} \Rightarrow \underline{x = 60}$$

[2]

11. Given that y is inversely proportional to x^2 , and that $y = 2$ when $x = 15$,

(a) find an expression for y in terms of x .

$$y \propto \frac{1}{x^2}$$

$$y = \frac{k}{x^2}$$

$$2 = \frac{k}{15^2}$$

$$2 \times 15^2 = k$$

$$k = 450$$

$$y = \frac{450}{x^2}$$

[3]

(b) calculate

(i) y when $x = 10$,

$$y = \frac{450}{10^2}$$

$$y = 4.5$$

[1]

(ii) x when $y = 50$.

$$50 = \frac{450}{x^2}$$

$$50x^2 = 450$$

$$x^2 = \frac{450}{50}$$

$$x^2 = 9$$

$$x = 3$$

[2]