R28...Direct- Inverse Proportion Formula

OCR

(b) *q* is directly proportional to *r*.
     q is 68 when *r* is 20.

     Work out *q* when *r* is 25.

(b) .... **[2]**

(b) q is directly proportional to r.
q is 68 when r is 20.

Work out q when r is 25.

$q \propto r$

$q = kr$
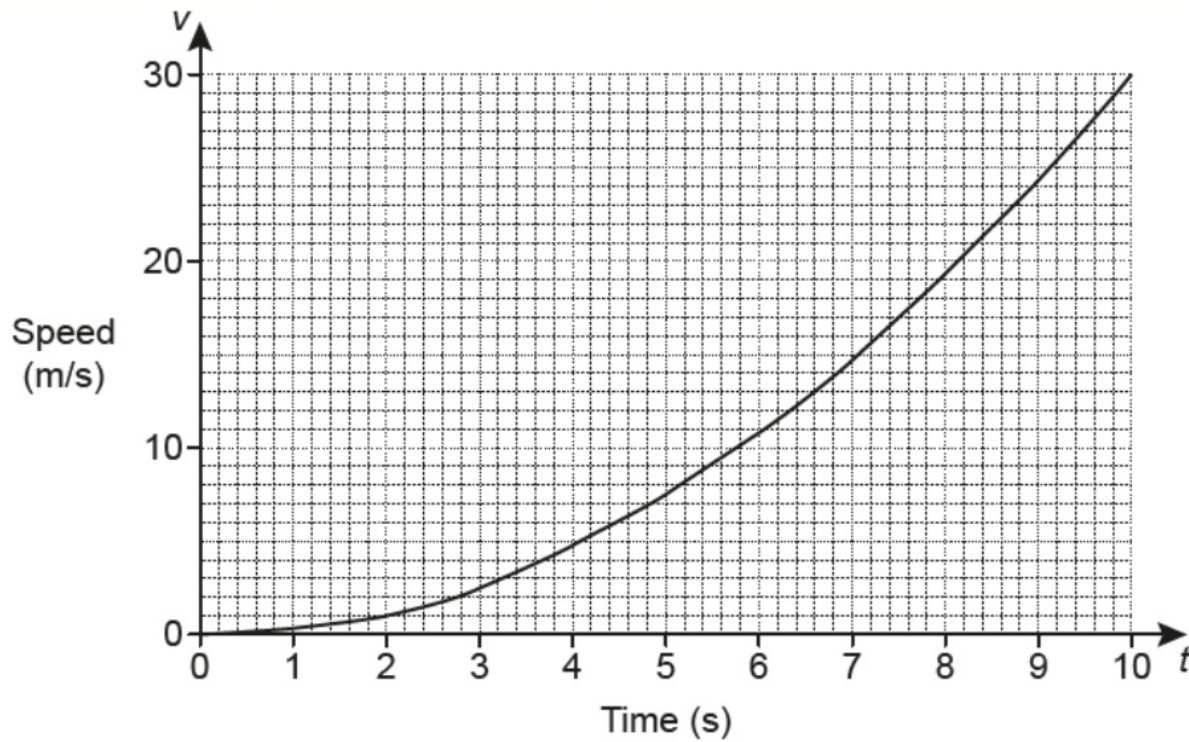
$68 = k20$

$\dfrac{68}{20} = k$

$3.4 = k$

$q = 3.4r$

$q = 3.4 \times 25 \div 20$

$q = 85$ ✓

$\cancel{68} = €20$ $\Big) \div 20$
$€1$ $\Big) \div 20$
$\times 25$ 85 $€25$ $\Big\downarrow \times 25$

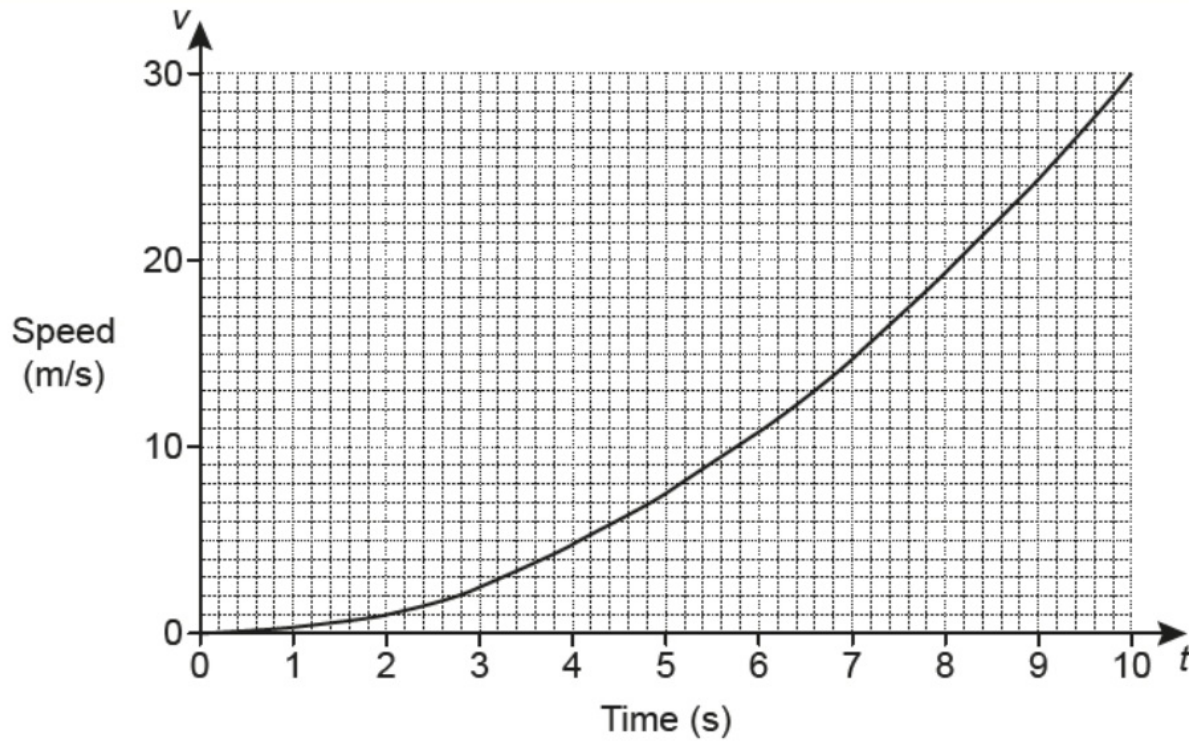**(b)** .... **85** .... **[2]**

(d) The speed of this car is directly proportional to the square of the time.

Find a formula linking v and t.

(d) .... **[3]**

$$v \propto t^2$$

$$v = kt^2$$

(d) The speed of this car is directly proportional to the square of the time.

R28

Find a formula linking v and t.

(d) .... **[3]**

12 y is inversely proportional to the square of x.

Complete the table.

x	10	6	
y	9		4

[4]

12 *y* is inversely proportional to the square of *x*.

R28 Complete the table.

x	10	6	±15
y	9	25	4

[4]

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

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

$$9 = \frac{K}{10^2}$$

$$9 = \frac{K}{100} \quad \cdots \quad 9(100) = k$$

$$900 = k$$

$$y = \frac{900}{x^2} \checkmark$$

$$x = 6 \quad \cdots \quad y = \frac{900}{6^2} \quad \cdots \quad y = 25$$

$$y = 4 \quad \cdots \quad 4 = \frac{900}{x^2} \quad x^2 = 225$$

$$x = \sqrt{225}$$

$$x = \pm 15$$

11 y is inversely proportional to x^2 and $y = 5$ when $x = 4$.

R28 Find a formula linking x and y.

.... **[3]**

11 y is inversely proportional to x^2 and $y = 5$ when $x = 4$.

R28 Find a formula linking x and y.

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

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

$$5 = \frac{K}{4^2}$$

$$5 = \frac{K}{16}$$

$$5(16) = K$$

$$80 = K$$

Ans

$$y = \frac{80}{x^2}$$

.... **[3]**

11 y is directly proportional to the square of x.

Find the percentage increase in y when x is increased by 15%.

.... % **[4]**

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11 *y* is directly proportional to the square of *x*.

Find the percentage increase in *y* when *x* is increased by 15%.

$\times 1.15$

$y \propto x^2$

$y \propto (x \times 1.15)^2$

$(2x)^2 = 4x^2$

$y \propto x(1.3225)$

y is increased by 0.3225

32.25 ....% **[4]**

6 *y* is inversely proportional to *x*.

$y = 0.04$ when $x = 80$.

Find the value of *y* when $x = 32$.

.... **[3]**

6 *y* is inversely proportional to *x*.

R28 $y = 0.04$ when $x = 80$.

Find the value of *y* when $x = 32$.

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

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

$$0.04 = \frac{K}{80}$$

$$0.04(80) = K$$

$$3.2 = K$$

$$y = \frac{3.2}{x}$$

$$y = \frac{3.2}{32}$$

$$y = 0.1$$

$$0.1$$

.... **[3]**

14 *y* is inversely proportional to the square root of *x*.
y is 40 when *x* is 9.

R28

Find a formula linking *x* and *y*.

.... **[3]**

14 y is inversely proportional to the square root of x.
y is 40 when x is 9.

R28

Find a formula linking x and y.

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

$$y = \frac{K}{\sqrt{x}}$$

$$40 = \frac{K}{\sqrt{9}}$$

$$40 = \frac{K}{3}$$

$$120 = K$$

$$y = \frac{120}{\sqrt{x}} \checkmark$$

.... [3]

Edexcel

11 P is inversely proportional to the square root of m.

$P = 10$ when $m = \dfrac{1}{4}$

Work out the value of m when $P = 2$

....

(Total for Question 11 is 3 marks)

11 P is inversely proportional to the square root of m.

$P = 10$ when $m = \dfrac{1}{4}$

Work out the value of m when $P = 2$

$$\sqrt{\tfrac{1}{4}} = \dfrac{\sqrt{1}}{\sqrt{4}} = \tfrac{1}{2}$$

$$P \propto \dfrac{1}{\sqrt{m}}$$

$$P = \dfrac{K}{\sqrt{m}}$$

$$10 = \dfrac{K}{\sqrt{\tfrac{1}{4}}}$$

$$10 = \dfrac{K}{\tfrac{1}{2}}$$

$$10 = \dfrac{K}{0.5}$$

$$10 \times 0.5 = K$$

$$5 = K$$

$$P = \dfrac{5}{\sqrt{m}}$$

$$2 = \dfrac{5}{\sqrt{m}}$$

$$2\sqrt{m} = 5$$

$$\sqrt{m} = \dfrac{5}{2}$$

$$m = \left(\dfrac{5}{2}\right)^2 = \dfrac{25}{4} \checkmark$$

$$\dfrac{25}{4} = 6\tfrac{1}{4} \checkmark$$

(Total for Question 11 is 3 marks)

16 y is inversely proportional to the square of x.

$y = 1$ when $x = 10$

Find the value of y when $x = 5$

R28

$y =$ ....

(Total for Question 16 is 3 marks)

16 y is inversely proportional to the square of x.
$y = 1$ when $x = 10$

Find the value of y when $x = 5$

R28

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

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

$$1 = \frac{k}{10^2}$$

$$100 = k$$

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

$$x = 5$$

$$y = \frac{100}{5^2}$$

$$y = \frac{100}{25}$$

$y =$ ____4____ ✓

(Total for Question 16 is 3 marks)

13 The table shows a set of values for x and y.

x	1	2	3	4
y	9	$2\frac{1}{4}$	1	$\dfrac{9}{16}$

y is inversely proportional to the square of x.

(a) Find an equation for y in terms of x.

(b) Find the positive value of x when $y = 16$

(2)

13 The table shows a set of values for x and y.

x	1	2	3	4
y	9	$2\frac{1}{4}$	1	$\frac{9}{16}$

y is inversely proportional to the square of x.

(a) Find an equation for y in terms of x.

$$y \propto \frac{1}{x^2} \qquad y = \frac{k}{x^2} \qquad 9 = \frac{k}{1^2}$$

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

$$9 = k$$

$$y = \frac{9}{x^2}$$

(b) Find the positive value of x when $y = 16$

$$y = \frac{9}{x^2}$$

$$16 = \frac{9}{x^2} \quad \dots \quad 16x^2 = 9$$

$$x^2 = \frac{9}{16}$$

$$x^2 = \frac{9}{16}$$

$$x = \sqrt{\frac{9}{16}} = \frac{3}{4}$$

$$\frac{3}{4} \checkmark$$

(2)

16 y is directly proportional to $\sqrt[3]{x}$

$y = 1\dfrac{1}{6}$ when $x = 8$

Find the value of y when $x = 64$

....

(Total for Question 16 is 3 marks)

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16 y is directly proportional to $\sqrt[3]{x}$

$y = 1\frac{1}{6}$ when $x = 8$

Find the value of y when $x = 64$

$\frac{7}{6} \div 2 = \frac{7}{12}$

$y \propto \sqrt[3]{x}$

$y = K\sqrt[3]{x}$ ✓

$\frac{7}{6} = K\sqrt[3]{8}$

$\frac{7}{6} = 2k$

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

$y = \frac{7}{12}\left(\sqrt[3]{x}\right)$

$y = \frac{7}{12}\left(\sqrt[3]{64}\right)$

$y = \frac{7}{12}(4)$

$\frac{7}{12} \times \frac{4}{1} = \frac{28}{12} = \frac{7}{3}$

$y = \frac{7}{3}$ or $2\frac{1}{3}$ ✓

(Total for Question 16 is 3 marks)

14 y is inversely proportional to d^2

When $d = 10$, $y = 4$

R28

d is directly proportional to x^2

When $x = 2$, $d = 24$

Find a formula for y in terms of x.

Give your answer in its simplest form.

....

_____ **(Total for Question 14 is 5 marks)**

14 y is inversely proportional to d^2

When $d = 10$, $y = 4$ ✓

R28

d is directly proportional to x^2

When $x = 2$, $d = 24$

Find a formula for y in terms of x.

Give your answer in its simplest form.

$6x^2 \times 6x^2$

$= 36x^4$

$y = \dfrac{400}{d^2}$

$d = 6x^2$

$y = \dfrac{400}{(6x^2)^2}$

$y = \dfrac{400}{36x^4}$

$y = \dfrac{K}{d^2}$

$4 = \dfrac{K}{10^2}$

$4 = \dfrac{K}{100}$

$400 = K$

$y = \dfrac{400}{d^2}$

$d = Kx^2$

$24 = K4$

$\dfrac{24}{4} = K$

$6 = K$

$d = 6x^2$

$y = \dfrac{100}{9x^4}$ ✓

(Total for Question 14 is 5 marks)

14 y is inversely proportional to x^3

R28 $y = 44$ when $x = a$

Show that $y = 5.5$ when $x = 2a$

(Total for Question 14 is 3 marks)

$$2a \times 2a \times 2a = 8a^3$$

14 y is inversely proportional to x^3

R28 $y = 44$ when $x = a$

Show that $y = 5.5$ when $x = 2a$

$$y \propto \frac{1}{x^3}$$

$$y = \frac{K}{x^3}$$

$$44 = \frac{K}{a^3}$$

$$44a^3 = k$$

$$y = \frac{44a^3}{x^3}$$

$$5.5 = \frac{44a^3}{(2a)^3}$$

$$5.5 = \frac{44a^3}{8a^3}$$

$$5.5 = \frac{44}{8} \checkmark$$

(Total for Question 14 is 3 marks)

AQA

24

R28

y is inversely proportional to x and k is a constant.

Circle the correct equation.

[1 mark]

$$y = \frac{k}{x} \qquad\qquad y = kx \qquad\qquad y = \frac{x}{k} \qquad\qquad y = x - k$$

24

R28

y is inversely proportional to x and k is a constant.

Circle the correct equation.

[1 mark]

$$y = \frac{k}{x}$$ (circled)

$$y = kx$$

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

$$y = x - k$$

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

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

22

R28

A ball, dropped vertically, falls d metres in t seconds.

d is directly proportional to the square of t.

The ball drops 45 metres in the first 3 seconds.

How far does the ball drop in the **next** 7 seconds?

[4 marks]

Answer _____ metres

22

R28

A ball, dropped vertically, falls d metres in t seconds.

d is directly proportional to the square of t.

The ball drops 45 metres in the first 3 seconds.

How far does the ball drop in the **next** 7 seconds?

[4 marks]

t

at 3 second

next 7 seconds .... 10 seconds

$$d \propto t^2$$

$$d = \underline{k}t^2$$

$$45 = k\, 3^2$$

$$45 = k\, 9$$

$$\frac{45}{9} = k$$

$$5 = k$$

$$d = 5t^2$$

$$d = 5t^2$$

$$d = 5(10)^2$$

$$d = 500 \quad \text{at } \underline{10 \text{ seconds}}$$

at 3 seconds = 45m

10 seconds = 500m

Answer _____450_____ metres

14 $xy = c$ where c is a constant.

R28 Circle the correct statement.

[1 mark]

y is directly proportional to x y is directly proportional to $\dfrac{1}{x}$

y is inversely proportional to $\dfrac{1}{x}$ x is directly proportional to y

14 $xy = c$ where c is a constant.

R28 Circle the correct statement.

$xy = K$

$y = \dfrac{K}{x}$ $\Rightarrow$ $y = K\dfrac{1}{x}$

[1 mark]

y is directly proportional to x y is directly proportional to $\dfrac{1}{x}$

y is inversely proportional to $\dfrac{1}{x}$ x is directly proportional to y

20

R28

A stone is thrown upwards with a speed of v metres per second.

The stone reaches a maximum height of h metres.

h is directly proportional to v^2

When $v = 10$, $h = 5$

Work out the maximum height reached when $v = 24$

[4 marks]

Answer _____ m

20

R28

A stone is thrown upwards with a speed of v metres per second.

The stone reaches a maximum height of h metres.

h is directly proportional to v^2

When $v = 10$, $h = 5$

Work out the maximum height reached when $v = 24$

[4 marks]

$h \propto v^2$

$h = Kv^2$

$5 = k10^2$

$5 = k100$

$\dfrac{5}{100} = k$

$0.05 = k$

$h = 0.05v^2$

$h = 0.05(24)^2$

$h = 28.8$

Answer _____ 28.8 ✓ _____ m

21

R28

The mass of an ornament is m grams.

The height of the ornament is h centimetres.

m is directly proportional to the cube of h.

m = 1600 when h = 8

21 (a)   Work out an equation connecting m and h.

[3 marks]

R28

Answer _____

21 (b) Work out the mass of an ornament of height 12 centimetres.

[2 marks]

R28

_____

_____

_____

Answer _____ grams

21

R28

The mass of an ornament is m grams.

The height of the ornament is h centimetres.

m is directly proportional to the cube of h.

m = 1600 when h = 8

21 (a) Work out an equation connecting m and h.

[3 marks]

R28

$$m \propto h^3$$

$$m = kh^3$$

$$1600 = k \, 8^3$$

$$\frac{1600}{8^3} = k$$

$$k = 3.125$$

Answer $\underline{\quad m = 3.125h^3 \quad}$

21 (b) Work out the mass of an ornament of height 12 centimetres.

[2 marks]

R28

$$M = 3.125h^3$$

$$m = 3.125 \times 12^3$$

Answer 5400 ✓ grams