14 F is inversely proportional to the square of v.

Given that $F = 6.5$ when $v = 4$

find a formula for F in terms of v.

$$F \propto \frac{1}{v^2}$$

$$F = \frac{k}{v^2}$$

$$6.5 = \frac{k}{(4)^2}$$

$$6.5 \times 4^2 = k$$

$$104 = k$$

$$F = \frac{104}{v^2}$$

(Total for Question 14 is 3 marks)

Turn over ▶

Algebra Page 1

14 B is inversely proportional to the square of d

$B = 0.25$ when $d = 12$

Find a formula for B in terms of d

$B = \dfrac{1}{d^2}$

$0.25 = \dfrac{k}{12^2}$

$12^2 \times 0.25 = k$

$k = 36$

$B = \dfrac{36}{d^2}$

(Total for Question 14 is 3 marks)

P 7 5 9 3 4 A 0 1 6 2 8

15 A is inversely proportional to C^2

$A = 40$ when $C = 1.5$

Calculate the value of C when $A = 1000$

$A \propto \dfrac{1}{C^2}$

$A = \dfrac{k}{C^2}$

$40 = \dfrac{k}{1.5^2}$

$40 \times 1.5^2 = k$

$90 = k$

$A = \dfrac{90}{C^2}$

$1000 = \dfrac{90}{C^2}$

$1000 \times C^2 = 90$

$C^2 = \dfrac{90}{1000}$

$C = \sqrt{\dfrac{90}{1000}}$

$C =$ ....0·3........

(Total for Question 15 is 3 marks)

P 6 9 1 9 6 A 0 1 6 2 8

16 A is inversely proportional to the square of r

$A = 5$ when $r = 0.3$

(a) Find a formula for A in terms of r

$$A \propto \frac{1}{r^2}$$

$$A = \frac{k}{r^2}$$

$$5 = \frac{k}{0.3^2}$$

$$5 \times 0.3^2 = k$$

$$k = 0.45$$

$$A = \frac{0.45}{r^2}$$

(3)

(b) Find the value of A when $r = 7.5A$

$$A = \frac{0.45}{(7.5A)^2}$$

$$A = \frac{0.45}{56.25A^2}$$

$$A \times 56.25A^2 = 0.45$$

$$A^3 = \frac{0.45}{56.25}$$

$$A^3 = \frac{1}{125}$$

$$A = \sqrt[3]{\frac{1}{125}}$$

$$A = \frac{1}{5}$$

$A =$ ....

(3)

(Total for Question 16 is 6 marks)

P 6 5 9 1 8 A 0 1 8 2 8

16 The following table gives values of x and y where y is inversely proportional to the square of x.

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

x	1.5	2	3	4
y	16	9	4	2.25

(a) Find a formula for y in terms of x.

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

$9 = \frac{k}{2^2}$

$9 \times 2^2 = k$

$k = 36$

$y = \frac{36}{x^2}$

(3)

Given that $x > 0$

(b) find the value of x when $y = 144$

$144 = \frac{36}{x^2}$

$144 \times x^2 = 36$

$x^2 = \frac{36}{144}$

$x = \pm\sqrt{\frac{36}{144}} = \frac{6}{12}$

(2)

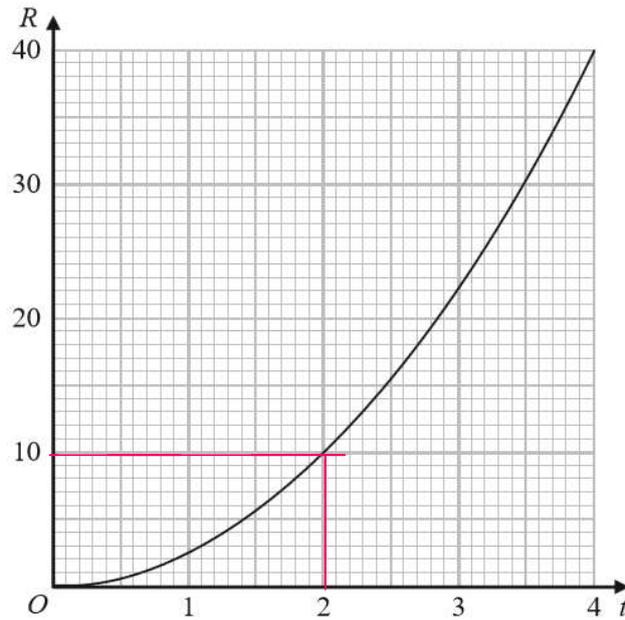**(Total for Question 16 is 5 marks)**

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

P 6 0 2 6 1 A 0 1 4 2 4

$R \propto t^2$ $R = k \times t^2$

16 R is proportional to t^2

The graph shows the relationship between R and t for $0 \leqslant t \leqslant 4$

(a) Find a formula for R in terms of t.

$R = k \times t^2$

$10 = k \times (2)^2$

$\dfrac{10}{(2)^2} = k$

$k = 2.5$

$R = 2.5 \times t^2$

(3)

P 5 4 6 9 5 A 0 1 6 2 4

Given also that $R = \dfrac{8}{5x}$

$R = 2.5 \times t^2$

$R = \dfrac{8}{5x}$

(b) show that t is inversely proportional to $\sqrt{x}$ for $t > 0$

$$2.5 \times t^2 = \dfrac{8}{5x}$$

$$5x \times 2.5 \times t^2 = 8$$

$$12.5 \times x \times t^2 = 8$$

$$x \times t^2 = \dfrac{8}{12.5}$$

$$x \times t^2 = \dfrac{16}{25}$$

$$t^2 = \dfrac{16}{25x}$$

(2)

(Total for Question 16 is 5 marks)

$$t^2 = \dfrac{16}{25} \times \dfrac{1}{x}$$

$$t = \sqrt{\dfrac{16}{25} \times \dfrac{1}{x}}$$

$$t = \dfrac{4}{5} \times \dfrac{1}{\sqrt{x}}$$

$$t = \dfrac{0.8}{\sqrt{x}}$$

Algebra Page 7

17 F is inversely proportional to the square of r

$F = 36$ when $r = 4$

(a) Find a formula for F in terms of r

$$F \propto \frac{1}{r^2}$$

$$F = \frac{k}{r^2}$$

$$36 = \frac{k}{4^2}$$

$$36 \times 4^2 = k$$

$$k = 576$$

$$F = \frac{576}{r^2}$$

(3)

(b) Work out the value of F when $r = 48$

$$F = \frac{576}{48^2}$$

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

(1)

(Total for Question 17 is 4 marks)

17 y is inversely proportional to $\sqrt{x}$

$y = c^4$ when $x = c^2$ where c is a positive constant.

Find a formula for y in terms of x and c
Give your answer in its simplest form.

$$y \propto \frac{1}{\sqrt{x}} \qquad y = \frac{k}{\sqrt{x}}$$

$$c^4 = \frac{k}{\sqrt{c^2}}$$

$$c^4 = \frac{k}{c}$$

$$c^4 \times c = k$$

$$k = c^5$$

$$y = \frac{c^5}{\sqrt{x}}$$

(Total for Question 17 is 3 marks)

P 7 2 4 3 7 R A 0 1 9 3 2