

13 The time, T seconds, for a hot sphere to cool is proportional to the square root of the surface area, A m², of the sphere.

When $A = 100$, $T = 40$.

Find the value of T when $A = 60$.

Give your answer correct to 3 significant figures.

① Find k ,

$$T \propto \sqrt{A}$$

$$T = k\sqrt{A}$$

$$A = 100, T = 40$$

$$40 = k\sqrt{100}$$

$$40 = k \times 10$$

$$\frac{40}{10} = k$$

$$4 = k$$

$$T = 4\sqrt{A}$$

②

$$T = 4\sqrt{A}$$

$$T = 4 \times \sqrt{60}$$

$$T = 30.9838\dots$$

Round

$$T = 30.9838\dots$$

becomes

$$T = 31.0$$

20. q is inversely proportional to the square of t .

When $t = 4$, $q = 8.5$

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

$$\underline{t=4, q=8.5}$$

Find your formula.

$$q \propto \frac{1}{t}$$

$$q = \frac{k}{t}$$

$$8.5 = \frac{k}{4}$$

$$34 = k \quad \therefore q = \frac{34}{t}$$

$$q = \frac{34}{t}$$

(b) Calculate the value of q when $t = 5$

$$q = \frac{34}{t}$$

$$q = \frac{34}{5}$$

$$q = \underline{\underline{6.8}}$$

Find your formula.

22. D is proportional to S^2 .

$D = 900$ when $S = 20$

Calculate the value of D when $S = 25$

$$D \propto S^2$$

$$D = KS^2$$

$$D=900, S=20$$

$$900 = K \times 20^2$$

$$\frac{900}{20^2} = K$$

$$\underline{2.25} = K$$

$$D = 2.25S^2$$

Use your formula to
find D when $S = 25$

$$D = 2.25S^2$$

$$D = 2.25 \times 25^2$$

$$D = 1406.25$$

$$D = \underline{\underline{1406.25}}$$

(Total)

25. y is directly proportional to x.

When $x = 500$, $y = 10$

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

Find your formula.

$$y \propto x$$

$$y = kx$$

$$10 = k \times 500$$

$$\frac{10}{500} = k \quad \therefore \frac{1}{50} = k$$

$$y = \frac{1}{50} k$$

$$y = \frac{1}{50} k$$

(b) Calculate the value of y when $x = 350$ Substitute

$$y = \frac{1}{50} \times 350.$$

$$y = 7$$

$$y = 7$$

21. M is directly proportional to L³.

When $L = 2$, $M = 160$

Find the value of M when $L = 3$

Find your formula

$$M \propto L^3$$

$$M = KL^3$$

$$160 = K \times 2^3$$

$$160 = K \times 8$$

$$\frac{160}{8} = K$$

$$20 = K$$

$$\therefore M = KL^3$$

$$M = 20L^3$$

$$L = 3,$$

$$M = 20L^3$$

$$M = 20 \times 3^3$$

$$M = 20 \times 27$$

$$M = 540$$

540

26. P is inversely proportional to V .

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V .

Find your formula

$$P \propto \frac{1}{V}$$

$$P = \frac{k}{V}$$

$$5 = \frac{k}{8} \quad \therefore \frac{k = 40}{\underline{\hspace{2cm}}}$$

$$P = \frac{40}{V}$$

$$P = \frac{40}{V}$$

(b) Calculate the value of P when $V = 2$

$$V = 2$$

$$P = \frac{40}{V}$$

$$P = \frac{40}{2}$$

$$\therefore P = 20.$$