

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.  
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

..... grams  
**(Total 2 marks)**

2. A ball falls vertically after being dropped.  
The ball falls a distance  $d$  metres in a time of  $t$  seconds.  
 $d$  is directly proportional to the square of  $t$ .

The ball falls 20 metres in a time of 2 seconds.

- (a) Find a formula for  $d$  in terms of  $t$ .

$d = \dots\dots\dots$  **(3)**

- (b) Calculate the distance the ball falls in 3 seconds.

..... m **(1)**

- (c) Calculate the time the ball takes to fall 605 m.

..... seconds **(3)**  
**(Total 7 marks)**

3. The time,  $T$  seconds, it takes a water heater to boil some water is directly proportional to the mass of water,  $m$  kg, in the water heater.

When  $m = 250$ ,  $T = 600$

- (a) Find  $T$  when  $m = 400$

$$T = \dots\dots\dots (3)$$

The time,  $T$  seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power,  $P$  watts, of the water heater.

When  $P = 1400$ ,  $T = 360$

- (b) Find the value of  $T$  when  $P = 900$

$$T = \dots\dots\dots (3)$$

**(Total 6 marks)**

4.  $D$  is proportional to  $S^2$ .

$D = 900$  when  $S = 20$

Calculate the value of  $D$  when  $S = 25$

$$D = \dots\dots\dots (Total 4 marks)$$

5. In a spring, the tension ( $T$  newtons) is directly proportional to its extension ( $x$  cm).

When the tension is 150 newtons, the extension is 6 cm.

(a) Find a formula for  $T$  in terms of  $x$ .

$$T = \dots\dots\dots \quad (3)$$

(b) Calculate the tension, in newtons, when the extension is 15 cm.

$$\dots\dots\dots \text{ newtons} \quad (1)$$

(c) Calculate the extension, in cm, when the tension is 600 newtons.

$$\dots\dots\dots \text{ cm} \quad (1)$$

**(Total 5 marks)**

6.  $d$  is directly proportional to the square of  $t$ .

$$d = 80 \text{ when } t = 4$$

(a) Express  $d$  in terms of  $t$ .

..... (3)

(b) Work out the value of  $d$  when  $t = 7$

$d =$  ..... (1)

(c) Work out the positive value of  $t$  when  $d = 45$

$t =$  ..... (2)

**(Total 6 marks)**

7. The distance,  $D$ , travelled by a particle is directly proportional to the square of the time,  $t$ , taken.

When  $t = 40$ ,  $D = 30$

- (a) Find a formula for  $D$  in terms of  $t$ .

$$D = \dots\dots\dots$$

- (b) Calculate the value of  $D$  when  $t = 64$

.....

**(1)**

- (c) Calculate the value of  $t$  when  $D = 12$   
Give your answer correct to 3 significant figures.

.....

**(2)**

**(Total 6 marks)**

8.  $M$  is directly proportional to  $L^3$ .

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

Find the value of  $M$  when  $L = 3$

.....

**(Total 4 marks)**

9.  $p$  is inversely proportional to  $m$ .

$p = 48$  when  $m = 9$

Calculate the value of  $p$  when  $m = 12$

.....

**(Total 2 marks)**

10.  $r$  is inversely proportional to  $t$ .  
 $r = 12$  when  $t = 0.2$

Calculate the value of  $r$  when  $t = 4$ .

.....  
**(Total 3 marks)**

11.  $f$  is inversely proportional to  $d$ .

When  $d = 50$ ,  $f = 256$

Find the value of  $f$  when  $d = 80$

$f =$  .....  
**(Total 3 marks)**

12.  $y$  is inversely proportional to  $x^2$ .

Given that  $y = 2.5$  when  $x = 24$ ,

(i) find an expression for  $y$  in terms of  $x$

$$y = \dots\dots\dots$$

(ii) find the value of  $y$  when  $x = 20$

$$y = \dots\dots\dots$$

(iii) find a value of  $x$  when  $y = 1.6$

$$x = \dots\dots\dots$$

**(Total 6 marks)**

13.  $P$  is inversely proportional to  $d^2$ .

$P = 10\,000$  when  $d = 0.4$

Find the value of  $P$  when  $d = 0.8$

$$P = \dots\dots\dots$$

**(Total 3 marks)**



14. The shutter speed,  $S$ , of a camera varies inversely as the square of the aperture setting,  $f$ .

When  $f = 8$ ,  $S = 125$

(a) Find a formula for  $S$  in terms of  $f$ .

.....

**(3)**

(b) Hence, or otherwise, calculate the value of  $S$  when  $f = 4$

$S =$  .....

**(1)**

**(Total 4 marks)**

15.  $q$  is inversely proportional to the square of  $t$ .

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

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

$q = \dots\dots\dots$

**(3)**

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

$\dots\dots\dots$

**(1)**

**(Total 4 marks)**

16.  $P$  is inversely proportional to  $V$ .

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

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

$P = \dots\dots\dots$   
(3)

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

$\dots\dots\dots$   
(1)

**(Total 4 marks)**

17. The force,  $F$ , between two magnets is inversely proportional to the square of the distance,  $x$ , between them.

When  $x = 3$ ,  $F = 4$ .

- (a) Calculate  $F$  when  $x = 2$ .

$\dots\dots\dots$   
(4)

- (b) Calculate  $x$  when  $F = 64$ .

$\dots\dots\dots$   
(2)

**(Total 6 marks)**