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 = ...

(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 = ...

(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 =....................................

(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 = ...

(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 = ...

(3)

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

.... newtons

(1)

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

.... cm

(1)

(Total 5 marks)

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

$d = 80$ 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 = ...

(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 = ...

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

y = ...

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

x = ...
(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 = ...
(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 = ...

(3)

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

....

(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 = ...
(3)

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

....
(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 $x = 2$.

....
(4)

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

....
(2)

(Total 6 marks)