Lesson 6

Proportionality : GCSE

6.1 Exam Questions

Question 1

Paper 3H, 7th June 2010

The light intensity, E, at a surface is inversely proportional to the square of the distance, r, of the surface from the light source.

$E = 4$ when $r = 50$

(a) Express E in terms of r.

[3 marks]

(b) Calculate the value of E when $r = 20$

[1 mark]

(c) Calculate the value of r when $E = 1600$

[2 marks]

Question 2

Paper 3H, 5th November 2009

t is proportional to the square root of d.

$t = 12$ when $d = 4$

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

[3 marks]

(b) Calculate the value of t when $d = 9$

[2 marks]

Question 3

Specimen Paper, 2003

The distance, d km, it is possible to see on a clear day is proportional to the square root of the height, h m, above sea level.

Standing on a pier, 4 m above sea level, it is possible to see a distance of 10 km.

(a) Find a formula for d in terms of h.

[2 marks]

(b) Standing on top of the cliffs I can see a distance of 35 km.
How high are the cliffs ?

[2 marks]

Question 4

Paper 4H, 9th May 2006

A ball is dropped from a tower.

After t seconds, the ball has fallen a distance x metres.

x is directly proportional to t^2.

When $t = 2$, $x = 19.6$

(a) Find an equation connecting x and t.

[3 marks]

(b) Find the value of x when $t = 3$

[2 marks]

(c) Find how long the ball takes to fall 10 m

[3 marks]

Question 5

Paper 3H, 15th May 2008

The distance, d kilometres, of the horizon from a person is directly proportional to the square root of the person's height, h metres, above sea level.

When $h = 225$, $d = 54$

(a) Find a formula for d in terms of h.

[3 marks]

(b) Calculate the distance of the horizon from a person whose height above sea level is 64 metres.

[1 mark]

(c) Calculate the height above sea level of a person, when the distance of the horizon is 61.2 kilometres.

[2 marks]

Question 6

Paper 4H, 16th November 2010

P is inversely proportional to V.

$P = 18$ when $V = 24$

(a) Express P on terms of V.

[3 marks]

(b) Find the positive value of V when $P = 3V$.

[2 marks]

Question 7

Paper 3H, 17th May 2007

The frequency, *f* kilohertz, of a radio wave is inversely proportional to its wavelength *w metres.*

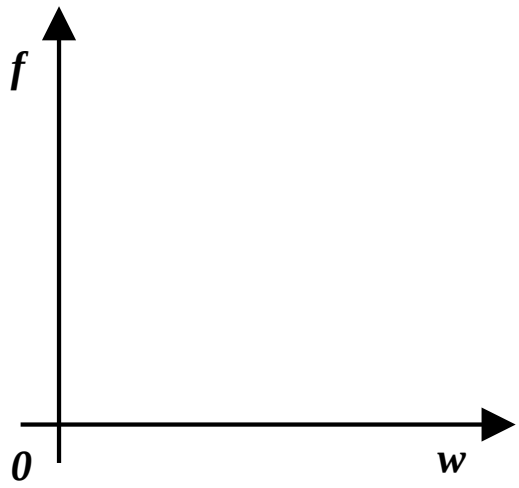
When $w = 200$, $f = 1500$

(a) **(i)** Express *f* in terms of *w*.

[3 marks]

(ii) On the axes, sketch the graph of *f* against *w*.

[1 mark]



(b) The wavelength of a radio wave is 1250 m.
Calculate its frequency.

[2 marks]

Question 8

Paper 3H, 5th November 2007

A wind turbine generates a power of P kilowatts when the wind speed is w m/s.

P is proportional to w^3.

$P = 300$ when $w = 12$.

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

[3 marks]

(b) Calculate the value of P when $w = 7.5$

Give your answer correct to 3 significant figures.

[2 marks]

(c) When the wind speed is x m/s, the wind turbine generates twice as much power as it does when the wind speed is 10 m/s.

Calculate the value of x.

Give your answer correct to 3 significant figures.

[4 marks]

Question 9

Paper 3H, 11th January 2012

Two small magnets attract each other with a force, F newtons.

F is inversely proportional to the square of the distance, d cm, between them.

When $d = 2$, $F = 12$.

(a) Express F in terms of d.

[3 marks]

(b) Calculate the value of F when $d = 5$

[1 mark]

(c) Calculate the value of d when $F = 3$

[2 marks]

Question 10
Paper 4H, 9th June 2016, Q13

M is directly proportional to p^3
$M = 128$ when $p = 8$

(a) Find a formula for M in terms of p

[3 marks]

(b) Find the value of M when $p = 5$

[1 mark]