Name:

Exam Style Questions

Direct and Inverse Proportion

Corbettmaths

Ensure you have: Pencil, pen, ruler, protractor, pair of compasses and eraser

You may use tracing paper if needed

Guidance

1. Read each question carefully before you begin answering it.
2. Don't spend too long on one question.
3. Attempt every question.
4. Check your answers seem right.
5. Always show your workings

Revision for this topic

www.corbettmaths.com/contents

Video 254

Video 255

1. y is directly proportional to the square of x.
When y = 24, x = 2.

Find the value of y when x = 4.

$y \propto x^2$

$y = kx^2$

$24 = k \times 2^2$

$24 = k \times 4$ so $k = 6$

$y = 6x^2$

$y = 6 \times 4^2$

$y = 6 \times 16$

y = 96

(3)

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2. The cost of a circular table is directly proportional to the square of the radius.
A circular table with a radius of 40cm cost £50.

What is the cost of a circular table with a radius of 60cm?

$C \propto r^2$

$C = kr^2$

$50 = k \times 40^2$

$50 = k \times 1600$

$k = \frac{1}{32}$

$C = \frac{1}{32} r^2$

$C = \frac{1}{32} \times 60^2$

$C = \frac{1}{32} \times 3600$

£ 112.50

(3)

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3. The time taken, t seconds, that it takes a water heater to boil water is inversely proportional to the power, p watts, of the water heater.

When P = 2000W, T = 252 seconds.

Find the time it takes to boil water when P = 800W

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

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

$252 = \frac{k}{2000}$

$k = 504000$

$t = \frac{504000}{p}$

$t = \frac{504000}{800}$

630 seconds

(3)

4. H varies directly to the cube of c.
When H = 40, c = 2.

(a) Express H in terms of c.

$H \propto c^3$

$H = kc^3$

$40 = k \times 2^3$

$40 = k \times 8$

$k = 5$

$H = 5c^3$

$H = 5c^3$

(3)

(b) Find the value of H when c = 5.

$H = 5 \times 5^3$

$H = 625$

H = 625

(1)

(c) Find the value of c when H = 5000.

$5000 = 5c^3$

$1000 = c^3$

$c = 10$

c = 10

(1)

5. The force, F newtons, exerted by a magnet on a metal object is inversely proportional to the square of the distance d cm.

When d = 2 cm, F = 50 N.

$F = \frac{200}{d^2}$

(a) Express F in terms of d.

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

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

$50 = \frac{k}{2^2}$ $50 = \frac{k}{4}$ $k = 200$

F = $\frac{200}{d^2}$

(3)

(b) Find the force when the distance between the magnet and metal object is 10cm

$F = \frac{200}{10^2} = \frac{200}{100} = 2$

F = 2 N

(1)

(c) Find the distance between the magnet and metal object when the force is 8N.

$8 = \frac{200}{d^2}$

$8d^2 = 200$

$d^2 = 25$ $d = 5$

d = 5 cm

(1)

(d) Explain what happens to F when d is halved.

$d = 10$ $F = 2$

$d = 5$ $F = 8$

F is four times larger when d is halved.

(1)

6. A and B are positive numbers.
A is inversely proportional to B.
When A = 4, B = 36.

Find the value of A when B = A.

$A \propto \frac{1}{B}$

$A = \frac{k}{B}$

$4 = \frac{k}{36}$ $k = 144$

$A = \frac{144}{B}$

$A = \frac{144}{A}$

$A^2 = 144$

A = 12

(4)

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7. C is directly proportional to the square root of y.
When C = 12.8, y = 16.

(a) Express C in terms of y.

$C = 3.2\sqrt{y}$

$C \propto \sqrt{y}$

$C = k\sqrt{y}$

$12.8 = k \times \sqrt{16}$

$12.8 = 4k$ $k = 3.2$

C = $3.2\sqrt{y}$

(3)

(b) Find C when y = 400

$C = 3.2 \times \sqrt{400}$

$C = 3.2 \times 20$

$C = 64$

C = 64

(1)

8. The time taken, t, for passengers to be checked-in for a flight is inversely proportional to the square of the number of staff, s, working.

It takes 30 minutes passengers to be checked-in when 10 staff are working.

(a) Find an equation connecting t and s.

$t \propto \frac{1}{s^2}$

$t = \frac{k}{s^2}$

$30 = \frac{k}{10^2}$

$30 = \frac{k}{100}$ $k = 3000$

$t = \frac{3000}{s^2}$

$t = \frac{3000}{s^2}$

.....

(3)

(b) What is the minimum number of staff that must be working so that the time taken is under 60 minutes?

$60 = \frac{3000}{s^2}$

$60s^2 = 3000$

$s^2 = 50$

$s = 7.071...$

so 8 staff needed.

8

.....

(3)

9. a is directly proportional to $\sqrt{c}$.
w is inversely proportional to a^3.

When c = 49, a = 35
When a = 2, w = 16.

Find the value of w when c = 4.

$a \propto \sqrt{c}$

$a = k\sqrt{c}$

$35 = k \times \sqrt{49}$

$35 = k \times 7$

$k = 5$

$\boxed{a = 5\sqrt{c}}$

when $c = 4$

$a = 5 \times \sqrt{4}$

$a = 5 \times 2$

$a = 10$

$w \propto \frac{1}{a^3}$

$w = \frac{k}{a^3}$

$16 = \frac{k}{2^3}$

$16 = \frac{k}{8}$

$k = 128$

$\boxed{w = \frac{128}{a^3}}$

$w = \frac{128}{10^3} = \frac{128}{1000} = 0 \cdot 128$

w = 0.128

(6)

10. The number of days, D, to complete research is inversely proportional to the number of researchers, R, who are working.

The research takes 125 days to complete is 16 people work on it.

Find how many people are needed to complete the research in 40 days.

$D \propto \frac{1}{R}$

$D = \frac{F}{R}$

$125 = \frac{F}{16}$

$2000 = F$

$D = \frac{2000}{R}$

$40 = \frac{2000}{R}$

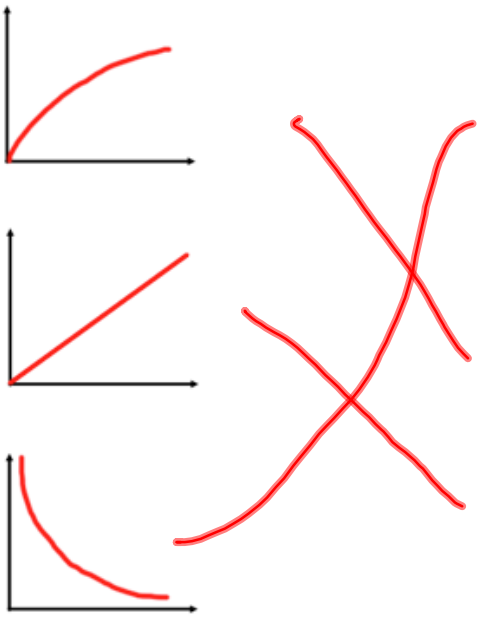
$40R = 2000$

$R = 50$

50

(5)

11. Match each graph to the correct relationship.



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

$y \propto \sqrt{x}$

$y \propto x$

(3)