

Direct Proportion

t is directly proportional to r

$$t \propto r, \quad t = kr$$

As t increases r increases and vice versa

Example : More air blown into a balloon
greater is the size of the balloon

Inverse Proportion

b is inverse proportional to m

$$b \propto \frac{1}{m}, \quad b = \frac{k}{m}$$

As b increases m decreases and vice versa

Example : more workers on a job would
reduce the time to complete the task

1. $y \propto x - 4$.

When $x = 16$, $y = 3$.

Find y in terms of x . [2]

0580/22/F/M/19 Q9)

2. A ball falls d metres in t seconds.

d is directly proportional to the square of t .

The ball falls 44.1m in 3 seconds.

(a) Find a formula for d in terms of t . [2]

(b) Calculate the distance the ball falls in 2 seconds. [1]

0580/22/M/J/18 Q18)

3. The braking distance, d , of a car is directly proportional to the square of its speed, v .

When $d = 5$, $v = 10$.

Find d when $v = 70$ [3]

0580/21/O/N/09 Q10)

4. y is proportional to the square of $(x - 7)$.

When $x = 12$, $y = 2$.

Find y when $x = 17$.

0580/23/O/N/22 Q17)



5. y is directly proportional to $(x - 1)^2$

When $x = 5$, $y = 4$.

Find y when $x = 7$. [3]

0580/21/M/J/18 Q15)

6. y is directly proportional to $(x - 1)^2$

When $x = 3$, $y = 24$.

Find y when $x = 6$. [3]

0580/23/M/J/18 Q19)

7. y is directly proportional to the square root of x

When $x = 9$ $y = 6$, .

Find y when $x = 25$. [3]

0580/23/O/N/18 Q17)

8. y is directly proportional to the positive square root of x .

When $x = 9$, $y = 12$.

Find y when $x = 1/4$ [3]

0580/21/M/J/16 Q21)

9. y is directly proportional to the square root of $(x + 2)$.

When $x = 7$, $y = 2$.

Find y when $x = 98$. [3]

0580/21/O/N/16 Q14)



10. $y \propto \frac{1}{\sqrt{x}}$

When $y = 8$, $x = 4$.

Find y when $x = 49$. [3]

0580/02/SP/25 Q20)

11. y is inversely proportional to x and

$y = 8$ when $x = 2$.

Find,

(i) an equation connecting y and x , [2]

(ii) y when $x = 1/2$ [1]

0580/41/O/N/10 Q8(b)

12. y is inversely proportional to x .

When $x = 9$, $y = 8$.

Find y when $x = 6$ [3]

0580/22/F/M/18 Q10)

13. y is inversely proportional to x^3 .

When $x = 2$, $y = 0.5$.

Find y in terms of x . [2]

0580/21/O/N/18 Q7)

14. y is inversely proportional to $(x + 1)^2$

$y = 50$ when $x = 0.2$.

(a) Write y in terms of x . [2]

(b) Find the value of y when $x = 0.5$. [1]

0580/21/O/N/17 Q17)



15. The speed, v , of a wave is inversely proportional to the square root of the depth, d , of the water.

$v = 30$ when $d = 400$. Find v when $d = 25$. [3]

0580/22/O/N/13 Q11)

16. y is inversely proportional to the square of $(x + 1)$.

$y = 0.875$ when $x = 1$.

Find y when $x = 4$. [3]

0580/23/M/J/19 Q18)

17. y is inversely proportional to x^2 .

When $x = 4$, $y = 2$.

Find y when $x = 1/2$ [3]

0580/21/O/N/19 Q15)

18. p is inversely proportional to the square of $(q + 4)$.

$p = 2$ when $q = 2$.

Find the value of p when $q = -2$ [3]

0580/21/M/J/15 Q12)

19. y is inversely proportional to the square root of $(x + 1)$.

When $x = 8$, $y = 2$.

Find y when $x = 99$. [3]

0580/21/M/J/19 Q16)



20. t is inversely proportional to the square of $(x + 1)$.

When $x = 2$, $t = 5$.

(a) Write t in terms of x . [2]

(b) When $t = 1.8$, find the positive value of x [2]

0580/23/O/N/19 Q20)

21. The force of attraction, F Newtons, between two magnets is inversely proportional to the square of the distance, d cm, between the magnets.

When $d = 1.5$, $F = 48$.

(a) Find an expression for F in terms of d . [2]

(b) When the distance between the two magnets is doubled the new force is n times the original force.

Work out the value of n . [1]

0580/22/M/J/21 Q21)

22. (a) y is directly proportional to the cube root of $(x + 1)$.

When $x = 7$, $y = 1$.

Find the value of y when $x = 124$. [3]

(b) F is inversely proportional to the square of d .

Explain what happens to F when d is halved. [1]

0580/22/M/J/22 Q18)

23. The energy of a moving object is directly proportional to the square of its speed.

The speed of the object is increased by 30%.

Calculate the percentage increase in the energy of the object. [2]

0580/42/O/N/21



24. g is inversely proportional to the square of d .
When d is halved, the value of g is multiplied by
a factor n . Find n . [2]

0580/42/O/N/22 Q6(f)(ii)

25. y is inversely proportional to \sqrt{x} and x is
directly proportional to w^2 .

When $w = 12, y = 12$.

Find y in terms of w .

0580/21/O/N/22 Q23)

Answers on next page

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Answers

Q1) 0580/22/F/M/19 Q9) $y = (x - 4)/4$

Q2) 0580/22/M/J/18 Q18)(a) $d = 4.9t^2$ (b) 19.6

Q3) 0580/21/O/N/09 Q10) 245

Q4) 0580/23/O/N/22 Q17) 8

Q5) 0580/21/M/J/18 Q15) 9

Q6) 0580/23/M/J/18 Q19) 150

Q7) 0580/23/O/N/18 Q17) 10

Q8) 0580/21/M/J/16 Q21) 2

Q9) 0580/21/O/N/16 Q14) $6\frac{2}{3}$

Q10) 0580/02/SP/25 Q20) $2\frac{2}{7}$ or $\frac{16}{7}$

Q11) 0580/41/O/N/10 Q8(b)(i) $y = 16/x$ (ii) 32

Q12) 0580/22/F/M/18 Q10) 12

Q13) 0580/21/O/N/18 Q7) $4/x^3$

Q14) 0580/21/O/N/17 Q17)(a) $y = 72/(x + 1)^2$
(b) 32

Q15) 0580/22/O/N/13 Q11) 120

Q16) 0580/23/M/J/19 Q18) 0.14

Q17) 0580/21/O/N/19 Q15) 128

Q18) 0580/21/M/J/15 Q12) 18

Q19) 0580/21/M/J/19 Q16) $[\pm] 0.6$

Q20) 0580/23/O/N/19 Q20)(a) $45/(x + 1)^2$ (b) 4

Q21) 0580/22/M/J/21 Q21)

(a) $[F =] \frac{108}{d^2}$ (b) $[n =] \frac{1}{4}$

Q22) 0580/22/M/J/22 Q18)

(a) $\frac{x+8}{7}$ (b) 4

Q23) 0580/42/O/N/21 69%

Q24) 0580/42/O/N/22 Q6(f)(ii) 4

Q25) 0580/21/O/N/22 Q23) $\frac{144}{w}$