



Inverse proportion

About 50 minutes Calculator allowed 54 marks

Date _____

A Do Now

The first question is what today's lesson needs. The others bring back earlier topics.

- A1** Needed today [2 marks] **A2** From chapter 11 [2 marks]
- y is directly proportional to x^2 .
When $x = 4$, $y = 96$. Find y when $x = 2$.
- Sam's eyes are 1.2 m above the ground. Sam stands 15 m from a tree on level ground. The angle of elevation of the top of the tree from Sam's eyes is 45° .
How tall is the tree?

Answer

Answer

- A3** From chapter 18 [2 marks] **A4** From chapter 20 [2 marks]
- In a histogram the class $0 < x \leq 10$ has frequency density 2 and the class $10 < x \leq 60$ has frequency density 0.4. Estimate how many values lie between 5 and 40.
- Two tangents from a point T touch a circle, centre O , at A and B . Angle $ATB = 122^\circ$. Find angle OAB .

Answer

Answer

B Example, then your turn

Your teacher works through each example with you. Then try the one beside it.

EXAMPLE 1

 y is inversely proportional to x . When $x = 9$, $y = 20$. Find y when $x = 12$.**Hint** Write $y = \frac{k}{x}$ and find k first.

- B1** y is inversely proportional to x . When $x = 14$, $y = 30$. Find y when $x = 35$. [3 marks]

Answer

EXAMPLE 2

y is inversely proportional to x^2 . When $x = 5$, $y = 8$. Find the positive value of x when $y = 2$.

Hint $y = \frac{k}{x^2}$, so $k = y \times x^2$.

B2 y is inversely proportional to x^2 . When $x = 3$, $y = 48$. Find the positive value of x when $y = 12$. [3 marks]

Answer

c Practice

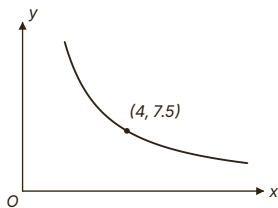
C1 y is inversely proportional to $\sqrt{x}$. When $x = 25$, $y = 18$. Find y when $x = 81$. [3 marks]

Answer

C2 y is inversely proportional to x^3 . [2 marks]
The value of x is doubled. What number is y divided by?

Answer

C3 The sketch shows the graph of $y = \frac{k}{x}$. It passes through the point $(4, 7.5)$. Find y when $x = 10$. [3 marks]



Not drawn accurately

Answer

C4 Values of x and y are $(2, 36)$, $(3, 24)$ and $(8, 9)$. Show that y is inversely proportional to x , and find y when $x = 12$. [3 marks]

Answer

C5 The time to empty a tank is inversely proportional to the number of pumps. 6 pumps empty the tank in 50 minutes. How many pumps are needed to empty it in 20 minutes? [3 marks]

Answer

C6 F is inversely proportional to the square of d . When $d = 3$, $F = 20$. Write a formula for F in terms of d . [3 marks]

Answer

- C7** y is inversely proportional to x . [3 marks]
The value of x is increased by 60%. Work out the percentage decrease in y .

Answer

- C8** Which equation shows y inversely proportional to x^2 ? [1 mark]
Write the letter.

A $y = 5x^2$ **B** $y = \frac{5}{x}$
C $y = \frac{5}{x^2}$ **D** $y = x^2 - 5$

Answer

D Exam-style questions

- D1** P is inversely proportional to V . When $V = 8$, $P = 15$. Leo says, "When $V = 12$, $P = 11$, because V has gone up by 4, so P goes down by 4." [3 marks]

Leo is wrong. Explain why, and work out the correct value of P when $V = 12$.

Answer

- D2** The force, F newtons, between two magnets is inversely proportional to the square of the distance, d cm, between them. When $d = 3$, $F = 80$.

- (a) Find a formula for F in terms of d . [3 marks]

Answer

- (b) Work out the distance between the magnets when the force is 5 newtons. [2 marks]

Answer

- (c) The distance is multiplied by 4. What happens to the force? [2 marks]

Answer

- (d) Explain why the force can never be 0. [1 mark]

Total for D2: 8 marks

- D3** y is inversely proportional to x , and x is directly proportional to z^2 . When $z = 2$, $x = 12$ and $y = 5$. Find y when $z = 4$. You must show your working. [4 marks]

Answer

E Extension

No route is given. The hints are at the end of the sheet. Use one at a time.

E1 y is inversely proportional to x . When $x = p$, $y = 20$. When $x = p + 6$, $y = 8$. Find [4 marks]
the value of p and the value of y when $x = 32$.

Answer

Extension hints

Cover these with paper. Uncover one at a time.

- E1** **Hint 1** $x \times y$ is the same for both pairs.
Hint 2 $20p = 8(p + 6)$.
Hint 3 Solve for p , then $k = 20p$.

How did it go?

Colour one circle on each line: not yet, nearly, yes.

I can write $y = \frac{k}{x}$ or $y = \frac{k}{x^2}$ and find k . ☐ ☐ ☐

I can say what a change in x does to y . ☐ ☐ ☐

I can use inverse proportion in context. ☐ ☐ ☐