

Name:

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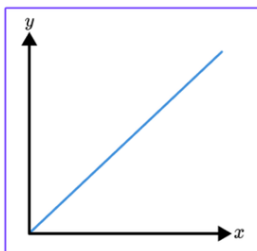
Direct & Inverse Proportion



Direct Proportion

$$x = ky$$

where k is a constant

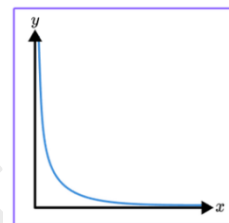


when x increases, y increases

Inverse Proportion

$$x = \frac{k}{y}$$

where k is a constant



when x increases, y decreases.

Steps to Solve Direct and Inverse Proportion Problems

1. Always start by writing out the equation.

Example 1:

If x is directly proportional to y **cube**, the eqn is $x = ky^3$.

Example 2:

If x is directly proportional to **cube root of** y , the eqn is $x = k\sqrt[3]{y}$

2. Use the given values in the qns to calculate the constant k .
3. Substitute the value of k back into the equation. Use this updated equation with the new given value in the question to find the unknown variable.

[Example 1]

V is inversely proportional to n . When $V = 12$, $n = 4$.
Complete the table in the answer space.

| | | | |
|-----|----|---|---|
| n | 4 | 8 | |
| V | 12 | | 3 |

Ans: $V =$ _____, $n =$ _____ [2]

Challenging AND Common Question Type



MUST KNOW

Exam questions may ask things like:

Percentage change when x is doubled, halved, or increased by a 50%/100%/200% percentage. Therefore, it's helpful to recall the following percentage change formula.

$$\text{Percent change} = \frac{\text{new value} - \text{old value}}{\text{old value}} \times 100$$

It is also worth noting the following expressions and what they mean for x :

| |
|--|
| When x is doubled: $2x$ |
| When x is halved: $0.5x$ |
| When x increases by 50%: $1.5x$ |
| When x increases by 500%: $6x$ |
| When x decreases by 60%, it becomes $0.4x$. |

[Example 2 – 2025 MARIS STELLA HIGH S4 PRELIM P1 Q11B]

A is inversely proportional to B^2 . If B increases by 20%, find the percentage decrease in A .

$$A = \frac{k}{B^2}$$

$$k = AB^2$$

$$B_{\text{new}} = 1.2B$$

$$A_{\text{new}} = \frac{AB^2}{(1.2B)^2}$$

$$A_{\text{new}} = \frac{25}{36}A$$

Percentage decrease

$$\frac{A - \frac{25}{36}A}{A} \times 100\%$$

$$= 30\frac{5}{9}\%$$

Practice on
Applying **Direct**
and Inverse
Proportion
Formula

(Basic)

1. 2025 Catholic High S4 Prelim P1 Q20 [3Marks]

In this table, p is inversely proportional to q^2 .

| | | | |
|-----|------|-----|-----|
| p | 0.08 | 0.5 | b |
| q | a | 4 | 2 |

Calculate the value of a and of b .

Answer $a = \dots\dots\dots$

$b = \dots\dots\dots$

2.

It is given that y is inversely proportional to the square of x .
When $x = 1$, $y = 64$.

Find the value(s) of x when $y = 25$.

Answer $x = \dots\dots\dots$ [3]

3. x is inversely proportional to the cube of y . Given that $x = 3$ and $y = 8$, find the value of x when $y = 64$ [2]

4. 2022 KRANJI SECONDARY SCHOOL S4 PRELIM P1 Q5 [2 Marks]

The length of a blade, L , is directly proportional to the square of its flat surface area, A . Given that the length of a particular blade is 15 cm for a flat surface area of 3 cm^2 , form an equation connecting L and A , expressing L in terms of A .

Ans: _____ [2]

Ans: $\frac{5}{3}A^2$

5. 2022 BOON LAY SECONDARY S3 EOY P1 Q8

The volume, $V \text{ cm}^3$, of a solid is directly proportional to the cube of its radius, $r \text{ cm}$. When the radius of the solid is 8 cm, its volume is 192 cm^3 .

- (i) Find a formula for V in terms of r .
- (ii) Calculate the percentage increase in V when **r is doubled**

Ans: (b) 700%

Application Questions

2020 BUKIT PANJANG GOVERNMENT HIGH SCHOOL S4 PRELIM P1 Q9

1

I is inversely proportional to the square of r .

- (a) When $r = \frac{1}{5}$, $I = 500$. Find I when $r = \frac{1}{10}$.

Answer _____ [2]

- (b) When the value of r is tripled, find the percentage decrease in the value of I .

Answer _____ % [2]

Ans: 2000 and $88\frac{8}{9}\%$

2024 SWISS COTTAGE SECONDARY SCHOOL S4 PRELIM P1 Q18B [2 Marks]

2

The period, T seconds, of a pendulum is proportional to the square root of the length, l metres, of the pendulum.

The length of a pendulum is increased by 50% of its original value.

Calculate the percentage increase in the period of the pendulum.

Answer _____ % [2]

Ans: $22.5\frac{8}{9}\%$