

Name: \_\_\_\_\_

Date: \_\_\_\_\_

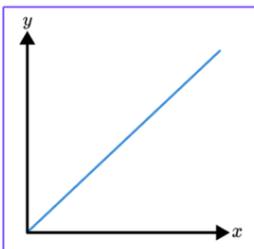
## Direct & Inverse Proportion



ATTENTION

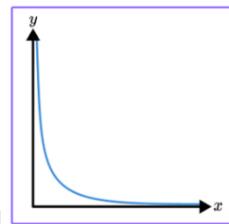
### Direct Proportion

$$x = ky$$

where  $k$  is a constantwhen  $x$  increases,  $y$  increases

### Inverse Proportion

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

where  $k$  is a constantwhen  $x$  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

## 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

$$\begin{aligned} & \frac{A - \frac{25}{36} A}{A} \times 100\% \\ & = 30\frac{5}{9}\% \end{aligned}$$

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  $3 \text{ cm}^2$ , form an equation connecting  $L$  and  $A$ , expressing  $L$  in terms of  $A$ .

Ans: \_\_\_\_\_ [2]

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

**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  $192 \text{ cm}^3$ .

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