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Algebra 2

Chapter 10 Lessons 13-14

Algebra 1

Chapter 6 Lessons 8-9

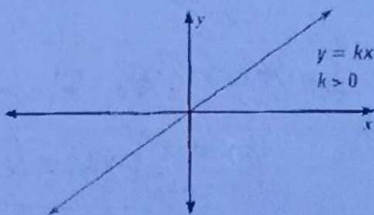
Direct Variation and Inverse Variation

Direct Variation

"y varies directly as x"

$$y = kx$$

A line passing through the origin with a positive slope ($y = mx + b$, where $b = 0$)



k is the constant of variation and $\neq 0$

To find k and determine if a table represents a direct variation:

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

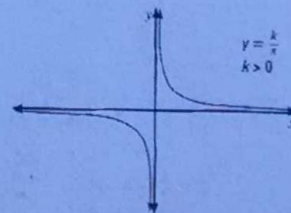
Inverse Variation

"y varies inversely as x"

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

} rational function !!

A curve that approaches the x-axis as x increases, and approaches the y-axis as x gets closer to 0



k is the constant of variation and $\neq 0$

To find k and determine if a table represents an inverse variation:

$$k = xy$$

$$y = kx$$

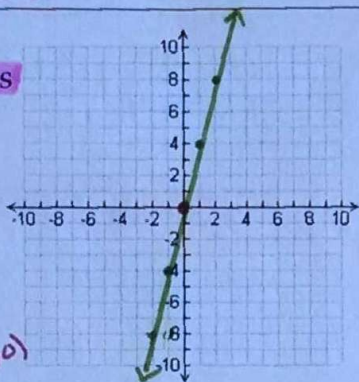
GRAPH

Given: y varies directly as x , and $y = 14$ when $x = 3.5$.

$$y = kx$$

$$14 = k(3.5)$$

$$k = 4$$



$$y = 4x$$

y-int (0,0)
slope 4

TABLE Is "k" constant? ($\frac{y}{x}$)

x	3	8	10
y	9	24	30

$$\frac{y}{x} \quad \frac{9}{3} \quad \frac{24}{8} \quad \frac{30}{10}$$

$$\boxed{3 \quad 3 \quad 3} \rightarrow k$$

Direct Variation $\rightarrow y = 3x$

APPLICATION OF DIRECT VARIATION

The circumference, C , of a circle varies directly as the radius r , and $C = 7\pi$ ft when $r = 3.5$ ft. Find r when $C = 4.5\pi$ ft.

$$y = kx$$

$$C = kr$$

$$7\pi = k(3.5)$$

$$k = 2\pi$$

$$C = 2\pi r$$

$$\frac{4.5\pi}{2\pi} = \frac{2\pi \cdot r}{2\pi}$$

$$\boxed{r = 2.25 \text{ ft}}$$

JOINT VARIATION

The relationship among 3 variables

$$y = kxz, \text{ where } y \text{ varies jointly as } x \text{ and } z \text{ and } k \text{ is the constant of variation}$$

The area A of a triangle varies jointly as the base b and height h and $A = 12 \text{ m}^2$ when $b = 6$ and $h = 4$. Find b when $A = 36 \text{ m}^2$ and $h = 8 \text{ m}$

$$y = k \cdot x \cdot z$$

$$A = k \cdot b \cdot h$$

$$12 = k \cdot 6 \cdot 4$$

$$k = \frac{1}{2}$$

$$A = \frac{1}{2}bh$$

$$36 = \frac{1}{2}b(8)$$

$$\boxed{b = 9 \text{ m}}$$

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

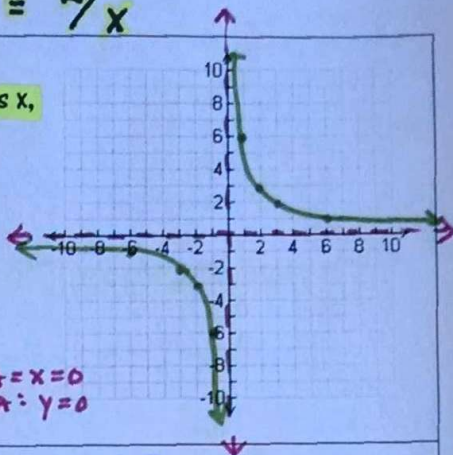
Graph

Given: y varies inversely as x , and $y = 3$ when $x = 2$.

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

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

$$k = 6$$



$$y = \frac{6}{x}$$

VA: $x = 0$
HA: $y = 0$

Table Is "k" constant? ($y \cdot x$)

x	4.5	12	2
y	8	3	18

$$y \cdot x \quad 8(4.5) \quad 12(3) \quad 2(18)$$

$$\boxed{36 \quad 36 \quad 36} \rightarrow k$$

Inverse Variation $\rightarrow y = \frac{36}{x}$

APPLICATION OF INVERSE VARIATION

The time, t , that it takes for a group of volunteers to construct a house varies inversely as the number of volunteers, v . If 20 volunteers can build a house in 62.5 hours, how many volunteers would be needed to build a house in 50 hours?

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

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

$$62.5 = \frac{k}{20}$$

$$k = 1250$$

$$t = \frac{1250}{v}$$

$$50 = \frac{1250}{v}$$

$$\boxed{v = 25}$$

COMBINED VARIATION

A relationship that contains both direct and indirect variation

$$y = \frac{kx}{z}, \text{ where } y \text{ varies directly as } x \text{ and inversely as } z \text{ and } k \text{ is the constant of variation}$$

The volume V of a gas varies inversely as the pressure P and directly as the temperature T . A certain gas has a volume of 10 L, a temperature of 300 K and a pressure of 1.5 atm. If the gas is compressed to a volume of 7.5 L and is heated to 350K, what will the new pressure be?

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

$$V = \frac{k \cdot T}{P}$$

$$10 = \frac{k(300)}{1.5}$$

$$k = .05$$

$$V = \frac{.05T}{P}$$

$$7.5 = \frac{.05(350)}{P}$$

$$\boxed{P = 2\frac{1}{3} \text{ atm}}$$