

Algebra 2 8.5

*Alg 1 Ch. 3

Recognize and solve direct* and joint variation problems

Recognize and solve inverse and combined variation problems



direct variation

$$y = k \cdot x$$

inverse variation

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

joint (combined) variation

constant of variation

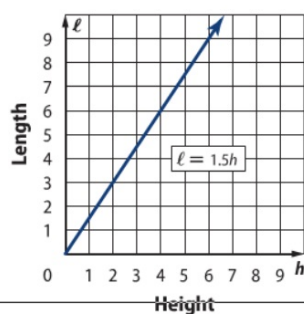
$$y = \frac{k x w}{z}$$

k

KeyConcept Direct Variation

Words y varies directly as x if there is some nonzero constant k such that $y = kx$. k is called the *constant of variation*.

Example If $y = 3x$ and $x = 7$, then $y = 3(7)$ or 21.



Number of eyeballs
Number of toes
Number of ears

$$y=mx$$

Example 1 Direct Variation

If y varies directly as x and $y = 15$ when $x = -5$, find y when $x = 7$.

$$y = kx$$

$$\frac{15}{-5} = \frac{k \cdot -5}{-5}$$

$$-3 = k$$

$$(-5, 15)$$

$$y = -3x$$

$$y = -3 \cdot 7$$

$$y = -21$$

1. Find the COV
2. Write the eq
3. Answer the question

KeyConcept Joint Variation

Words y varies jointly as x and z if there is some nonzero constant k such that $y = kxz$.

Example If $y = 5xz$, $x = 6$, and $z = -2$, then $y = 5(6)(-2)$ or -60 .

Still only one constant

(5, 20, 3)

Example 2 Joint Variation

Suppose y varies jointly as x and z . Find y when $x = 9$ and $z = 2$, if $y = 20$ when $z = 3$ and $x = 5$.

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

$$20 = k \cdot 5 \cdot 3$$

$$\frac{20}{15} = \frac{15k}{15}$$

$$k = \frac{4}{3}$$

$$y = \frac{4}{3} x z$$

$$y = \frac{4}{3} \cdot 9 \cdot 2$$

$$y = 24$$

1. Find the COV
2. Write the eq
3. Answer the question

Guided Practice $(70, 4, 10)$

2. Suppose r varies jointly as v and t . Find r when $v = 2$ and $t = 8$, if $r = 70$ when $v = 10$ and $t = 4$.

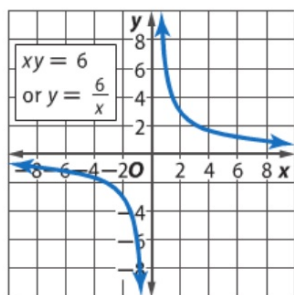
$$\begin{aligned} r &= k \cdot v \cdot t \\ 70 &= k \cdot 4 \cdot 10 \\ \frac{7}{4} &= k \\ r &= \frac{7}{4} v t \\ r &= \frac{7}{4} \cdot 2 \cdot 8 \\ r &= 28 \end{aligned}$$

1. Find the COV
2. Write the eq
3. Answer the question

KeyConcept Inverse Variation

Words y varies inversely as x if there is some nonzero constant k such that
$$y = \frac{k}{x}, \text{ where } x \neq 0 \text{ and } y \neq 0.$$

Example



Speed & time
Leftovers & diners
Sharing portions
Workers & time

Example 3 Inverse Variation

If a varies inversely as b and $a = 28$ when $b = -2$, find a when $b = -10$.

$$\begin{aligned} a &= \frac{k}{b} & a &= \frac{-56}{b} \\ 28 &= \frac{k}{-2} & &= \frac{-56}{-10} \\ -56 &= k & a &= 5.6 \end{aligned}$$

1. Find the COV
2. Write the eq
3. Answer the question

Guided Practice

3. If x varies inversely as y and $x = 24$ when $y = 4$, find x when $y = 12$.

Still only one constant

Example 5 Combined Variation

Suppose f varies directly as g , and f varies inversely as h . Find g when $f = 18$ and $h = -3$, if $g = 24$ when $h = 2$ and $f = 6$.

$$f = \frac{0.5g}{h} \quad 6 = \frac{k \cdot 24}{2}$$

$$\frac{18}{-3} = \frac{0.5g}{1} \quad \frac{24k}{24} = \frac{12}{24}$$

$$-54 = 0.5g$$

$$-108 = g$$

1. Find the COV
2. Write the eq
3. Answer the question

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