Algebra 2 8.5 *Alg 1 Ch. 3

Recognize and solve direct* and joint variation problems

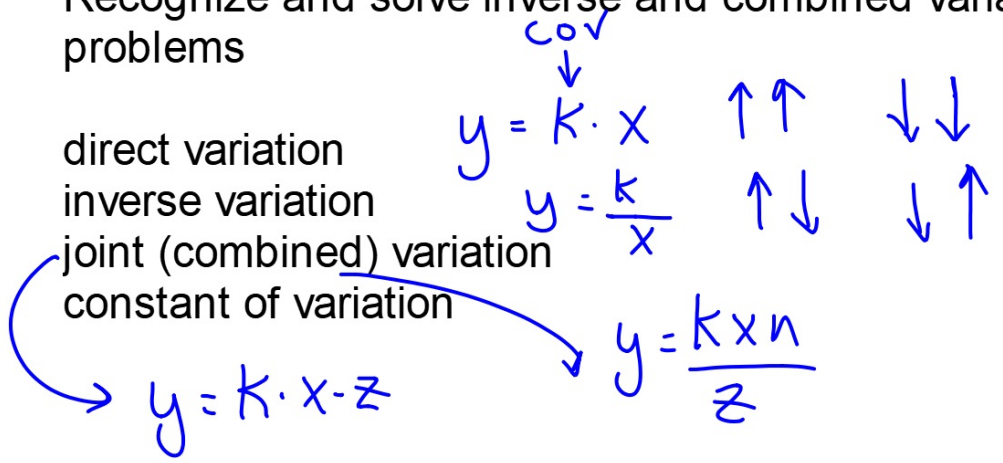
Recognize and solve inverse and combined variation problems

direct variation

inverse variation

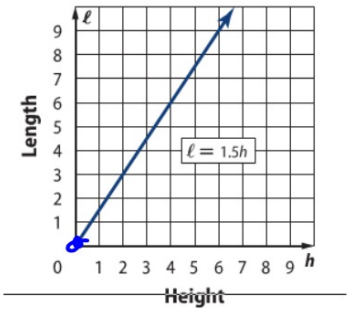
joint (combined) variation

constant of variation



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
Number of noses

y=mx

y=kx

Example 1 Direct Variation

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

$y = kx$

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

$k = -3$

$y = -3x$

$y = -3 \cdot 7$

$= -21$

$(-5, 15)$

$(7, ?)$

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 $y = K \cdot x \cdot z$

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 $x = 5$.

$(5, 20, 3)$ $\quad$ $(9, ?, 2)$

$y = k \cdot x \cdot z$

$20 = k \cdot 5 \cdot 3$

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

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

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

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

$y = 24$

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

GuidedPractice $(70, 4, 10)$ (r, t, v)

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

$r = k \cdot v \cdot t$

$\frac{70}{40} = \frac{k \cdot 4 \cdot 10}{40}$

$k = \frac{7}{4}$

$r = \frac{7}{4} \cdot v \cdot t$

$r = \frac{7}{4} \cdot 2 \cdot 8$

$r = 28$

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

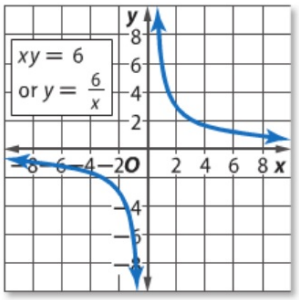
KeyConcept Inverse Variation

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

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



Speed & time
Leftovers & diners
Workers & time

Example 3 Inverse Variation

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

$(28, -2)$

$a = \frac{k}{b}$

$28 = \frac{k}{-2}$

$k = -56$

$a = \frac{-56}{b}$

$a = \frac{-56}{-10} = 5.6$

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

GuidedPractice

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

$f = \frac{k \cdot g^2}{h}$ $(6, 24, 2)$

$\frac{6}{1} = \frac{k \cdot 24}{2}$ $12 = 24k$ $\frac{12}{24} = \frac{24k}{24}$

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

$f = \frac{\frac{1}{2}g}{h}$ $\frac{18}{1} = \frac{\frac{1}{2}g}{-3}$

$2 \cdot -54 = \frac{1}{2}g \cdot 2$

$-108 = g$

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