

Trig 3.8

Solve problems involving direct*, inverse**, joint** combined variation

* Alg 1 Ch. 5

** Alg 2 Ch. 9

*direct variation $A \uparrow B \uparrow e = ap$

inverse variation $A \uparrow B \downarrow t = \frac{k}{a}$

constant of variation $k = ?$

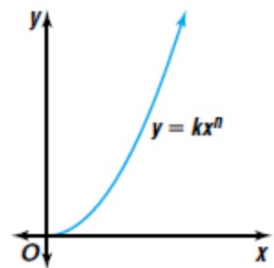
*directly proportional $A = k \cdot B$

inversely proportional $A = \frac{k}{B}$

joint variation $A = k \cdot B \cdot C$

combined variation $A = k \frac{B}{C}$

activity: whiteboards (if time)



$k = \text{constant}$

$(6, 27)$

1 Suppose y varies directly as x and $y = 27$ when $x = 6$.

- a. Find the constant of variation and write an equation of the form $y = kx^n$.
b. Use the equation to find the value of y when $x = 10$.

$$y = k \cdot x$$

$$\begin{array}{r} 27 = \frac{k \cdot 6}{6} \\ 4.5 = k \end{array}$$

a $y = 4.5x$

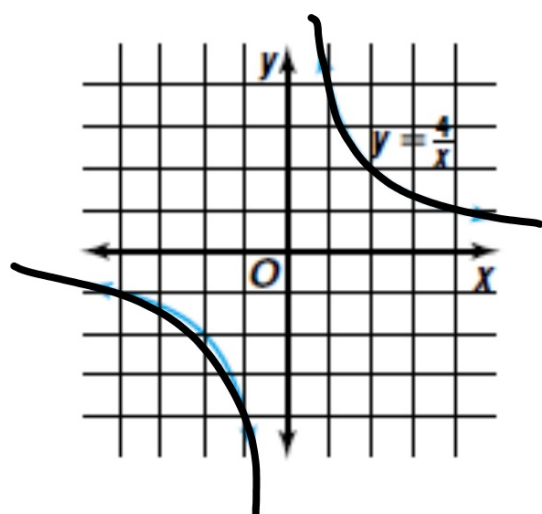
b $y = 4.5 \cdot 10$
 $= 45$

- 3 If y varies directly as the cube of x and $y = -67.5$ when $x = 3$, find x when $y = -540$.

$$y = k \cdot x^3$$
$$\frac{-67.5}{27} = \frac{k \cdot 27}{27}$$
$$-2.5 = k$$

②

$$y = -2.5x^3$$
$$-540 = -2.5x^3$$
$$\sqrt[3]{216} = \sqrt[3]{x^3}$$
$$(216)^{\frac{1}{3}} = x$$
$$\frac{216}{3} = 6$$
$$x = 6$$



inverse variation
driving
leftovers
homework

4 If y varies inversely as x and $y = 21$ when $x = 15$, find x when $y = 12$.

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

$$\frac{21}{1} = \frac{k}{15}$$

$$k = 315$$

$$y = \frac{315}{x}$$

$$\frac{12}{1} = \frac{315}{x}$$

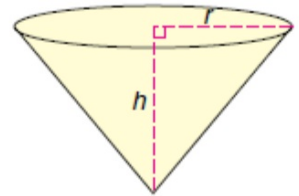
$$12x = 315$$

$$x = 26.25$$

Joint Variation

y varies jointly as x^n and z^n if there is some nonzero constant k such that $y = kx^n z^n$, where $x \neq 0$, $z \neq 0$, and $n > 0$.

Example 5 GEOMETRY The volume V of a cone varies jointly as the height h and the square of the radius r of the base. Find the equation for the volume of a cone with height 6 centimeters and base diameter 10 centimeters that has a volume of 50π cubic centimeters.



$$\begin{aligned} V &= k \cdot h \cdot r^2 \\ 50\pi &= k \cdot 6 \cdot 25 \\ \frac{50\pi}{150} &= \frac{150k}{150} \\ \frac{1}{3}\pi &= k \end{aligned}$$

$$V = \frac{\pi}{3} h \cdot r^2$$

$$\begin{aligned} V &= \frac{1}{3} B \cdot h \\ &= \frac{1}{3} \pi r^2 \cdot h \end{aligned}$$

whiteboards

Find the constant of variation for each relation and use it to write an equation for each statement. Then solve the equation.

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

5. If y varies inversely as x and $y = 3$ when $x = 4$, find y when $x = 15$.

6. If y varies directly as the square of x and $y = -54$ when $x = 9$, find y when $x = 6$.

$$y = kx^2$$

7. If y varies jointly as x and the cube of z and $y = 16$ when $x = 4$ and $z = 2$, find y when $x = -8$ and $z = -3$.

$$y = k \cdot x z^3$$

y varies directly as x and z^2
and inversely as b^3

$$y = \frac{k \cdot x z^2}{b^3}$$

13-23 only
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