8.4 Variation & Problem Solving DAY TWO

OBJECTIVE 3: Solving Problems Involving Joint Variation

Joint Variation

If the ratio of a variable y to the product of two or more variables is constant, then y varies jointly as, or is jointly proportional to, the other variables. If

$$y = kxz$$

then the number k is the constant of variation or the constant of proportionality.

CONCEPT CHECK

Which type of variation is represented by the equation $xy = 8$? Explain.

a. Direct variation b. Inverse variation c. Joint variation

$y = kx$ $y = kxz$

$\frac{xy}{x} = \frac{8}{x}$

$y = \frac{8}{x}$

Example 5: Expressing Surface Area

The lateral surface area of a cylinder varies jointly as its radius and height. Express this surface area S in terms of radius r and height h.

$S = k(r)(h)$

$S = krh$ Pull

Practice 5:

The area of a regular polygon varies jointly as its apothem and its perimeter. Express the area in terms of the apothem a and the perimeter p.

$A = k(a)(p)$

Pull $A = kap$

OBJECTIVE 4: Solving Problems Involving Combined Variation

Some examples of variation involve combinations of direct, inverse, and joint variation. When they are put together we call these combined variation.

Example 6:

Suppose that y varies directly as the square of x. If y is 24 when x is 2, find the constant of variation and the variation equation.

$y = kx^2$

$\frac{24}{4} = \frac{k(2)^2}{4}$

$6 = k$ $\quad y = 6x^2$

Practice 6:

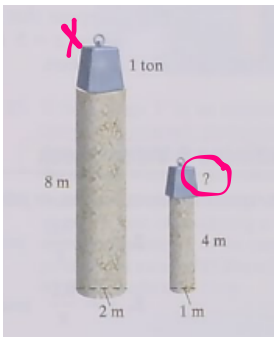
Suppose the y varies inversely as the cube of x. If y is $\frac{1}{2}$ when x is 2, find the constant of variation and the variation equation.

$y = \frac{k}{x^3}$ $\quad 8 \cdot \frac{1}{2} = \frac{k}{(2)^3} \cdot 8$

$4 = k$ $\quad y = \frac{4}{x^3}$

Example 7: Finding Column Weight

The maximum weight that a circular column can support is directly proportional to the fourth power of its diameter and is inversely proportional to the square of its height. A 2-meter-diameter column that is 4 meters in height can support.



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$\frac{1}{4}$

$w = \frac{k(d^4)}{h^2}$

$1 = \frac{k(2)^4}{8^2}$

$1 = \frac{k(16)}{64}$

$4 \cdot 1 = \frac{k}{4} \cdot 4$

$k = 4$

$d = 2$
$h = 8$
$w = 1$

$d = 1$
$h = 4$
$w = ?$

$? = \frac{4(1)^4}{4^2} = \frac{4}{16} = \frac{1}{4}$

$w = \frac{1}{4}$ ton

Vocabulary, Readiness & Video Check

State whether each equation represents direct, inverse, or joint variation.

1. $y = 5x$ direct
2. $y = \frac{700}{x}$ inverse
3. $y = 5xz$ joint
4. $y = \frac{1}{2}abc$ joint
5. $y = \frac{9.1}{x}$ inverse
6. $y = 2.3x$ direct
7. $y = \frac{2}{3}x$ direct
8. $y = 3.1st$ joint

8.4 DAY TWO HW Assignment

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