

Algebra I

8-9

Direct Variation

(Day 2)

Translate the following: y varies directly as x .

$$y = kx$$

Solve for the constant of variation.

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

Substitute (x_1, y_1) into your answer. Then substitute (x_2, y_2) .

$$\frac{y_1}{x_1} = k \quad \frac{y_2}{x_2} = k$$

Direct Variation as a Proportion

$$\frac{y_1}{x_1} = \frac{y_2}{x_2} \quad \left. \begin{array}{l} \\ \end{array} \right\} \text{we can use without knowing } k$$

Given that (x_1, y_1) and (x_2, y_2) are ordered pairs of the same direct variation; $y = k \cdot x$.

- 1) Find the missing value for $(12, 3)$
 $(x_2, 7)$

a) using the k method. $y = kx \rightarrow y = \frac{1}{4}x$
 $(12, 3) \quad \frac{3}{12} = \frac{k(12)}{12} \quad 4(7 = \frac{1}{4}x_2) \quad (x_2, 7)$
 $\frac{1}{4} = k \quad \boxed{28 = x_2}$

- b) using the Proportion method.

$$\frac{y_1}{x_1} = \frac{y_2}{x_2} \quad \frac{3}{12} = \frac{7}{x_2} \rightarrow \left(\frac{4}{1} = \frac{x_2}{7} \right) \quad \boxed{28 = x_2}$$

I've noticed in all my experience; though the k method is more work, students make less mistakes than with the proportion method. Most mistakes with the proportion method are the result of writing the wrong fractions.

For each of the following:

- a) write as a ratio equal to the constant of variation,
 b) and write the constant as a fraction in lowest terms or as a decimal rounded to the nearest thousandth.
- 2) The height of a tree, in feet, is directly proportional to the radius of its trunk in inches. A tree with a radius of 9 inches is 24 feet tall.

a) $\frac{h}{r} = k \quad (h, r) \quad (24, 9)$

b) $\frac{24}{9} = k \quad \frac{8}{3} = k$

Solve.

- 3) At Extreme Tool and Engineering, the amount of vacation time, in hours, an employee earns varies directly with the amount of time, in weeks, he or she works. If an employee works two weeks to earn 3 hours of vacation time, how many hours of vacation are earned in 52 weeks?

$$v = kw \quad (w, v) \quad (2, 3), (52, v_2)$$

k method: $v = kw \rightarrow v = \frac{3}{2}w$
 Remember, 1st find k , then solve for the unknown. $(2, 3) \quad \frac{3}{2} = \frac{k(2)}{2} \quad v_2 = \frac{3}{2}(52) = 78$
 $\frac{3}{2} = k \quad \boxed{v_2 = 78 \text{ hours}}$

Proportion method:

The "x" is always the variable with the k . In this case, w is x .

$$\frac{v_1}{w_1} = \frac{v_2}{w_2} \quad \left(\frac{3}{2} = \frac{v_2}{52} \right) \quad 78 = v_2 \quad \boxed{78 \text{ hours}}$$

Assignment:

Handout 1-24 all

You may choose to work with either the k method or the proportion method. You do not need to use both.