Ratios, Proportions, and Direct and Inverse Variation DRILL

If 3 teaspoons are in 1 tablespoon, how many teaspoons are in 4 tablespoons?
If the U.S. dollar exchanges for 71 Indian rupees, how many dollars will be needed to purchase a toy that costs 426 rupees?
A town requires that in every new development, there are 2 acres of park for every 3 acres that are zoned for residential and/or commercial purposes. How many acres of park would be required in a new development that is 50 acres total?
When a car is traveling 40 kilometers per hour, how fast will it be going in meters per second (to the nearest tenth)? Note: There are 1,000 meters in a kilometer.
The physics equation that describes the relationship among pressure (*p*), force (*F*), and surface area (*A*) is $p = \frac{F}{A}$. Based on this equation, pressure is directly proportional and is inversely related to which variables?
Variables *a* and *b* are related by the equation *b* = *ka*, in which *k* is the constant of proportionality. If *b* is 5 when *a* is 10, what is the value of *k*?

Solutions

Set up a proportion to solve the problem:

$$\frac{3 \text{ teaspoons}}{1 \text{ tablespoon}} = \frac{x \text{ teaspoons}}{4 \text{ tablespoons}}$$

Cross multiply:

$$3 \times 4 = 12 \text{ teaspoons}$$

Solve using a proportion:

$$\frac{1 \text{ dollar}}{71 \text{ rupees}} = \frac{x \text{ dollars}}{426 \text{ rupees}}$$

Cross multiply:

$$426 = 71x$$
$$\frac{426}{71} = 6 \text{ dollars}$$

For a given development, there will be 2 park acres for every 5 total acres since 2 park acres + 3 non-park acres = 5 total acres. Solve this question using a proportion:

$$\frac{2 \text{ park acres}}{5 \text{ total acres}} = \frac{x \text{ park acres}}{50 \text{ total acres}}$$

Cross multiply:

$$50 \times 2 = 5x$$
$$\frac{100}{5} = 20 \text{ park acres}$$

There are 1,000 meters in 1 kilometer and 3,600 seconds in an hour

$(60 \text{ minutes} \times 60 \text{ seconds} = 3{,}600)$. Solve by converting the units:

$$40\frac{\text{kilometers}}{\text{hour}} \times 1{,}000\frac{\text{meters}}{\text{kilometer}} \times \frac{\text{hour}}{3{,}600 \text{ seconds}}$$

$$40\frac{\cancel{\text{kilometers}}}{\cancel{\text{hour}}} \times 1{,}000\frac{\text{meters}}{\cancel{\text{kilometer}}} \times \frac{\cancel{\text{hour}}}{3{,}600 \text{ seconds}} = \frac{40 \times 1{,}000}{3{,}600} = 11.1\frac{\text{meters}}{\text{second}}$$

In this equation, $p = \frac{F}{A}$, p and F are both in the numerator. So pressure (p) and force (F) are directly proportional to one another—as p increases, F also increases. Surface area (A) is in the denominator while p is in the numerator. So A and p are inversely related to one another—as A increases, p decreases.
Plug the values for a and b into the equation to solve for k:

$$b = ka$$
$$5 = k(10)$$
$$\frac{5}{10} = k$$
$$\frac{1}{2} = k$$

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