

Date \_\_\_\_\_

The number **k** is called the **constant of variation or constant of proportionality**

**Direct variation**

If  $y = kx$  for some positive constant  $k$ , we say that **y varies directly** as  $x$ , or that **y is directly proportional to x**

**Inverse variation**

If  $y = \frac{k}{x}$  for some positive constant  $k$ , we say that **y varies inversely** as  $x$ , or **y is inversely proportional to x**

**Steps to solve variation problems**

1. Underline the sentence that you will be translating
2. Identify the type of variation
3. Clearly define your variables
4. Identify facts
5. Translate the underlined sentence into symbols.
6. Solve for  $k$  and give the general formula.

The **amount of gas that a helicopter uses is directly proportional to the number of hours spent flying**. The helicopter flies for 2 hours and uses 18 gallons of fuel.

<b>Type of variation:</b>	direct variation ( $y = kx$ )
<b>Variables:</b>	Let $g$ = amount of gas that a helicopter uses Let $h$ = number of hours spent flying
<b>Facts:</b>	Helicopter flies for 2 hours ( $h = 2$ ) Helicopter uses 18 gallons of fuel ( $g = 18$ )
<b>Translation:</b>	amount of gas that a helicopter uses is directly proportional to the number of hours spent flying $g = kh$
<b>Solve for k:</b>	$18 = k \cdot 2$ $\frac{18}{2} = \frac{k \cdot 2}{2}$ <b><math>k = 9</math></b>
<b>General Formula:</b>	$g = 9h$

When the temperature stays the same, the **volume of a gas is inversely proportional to the pressure of the gas**. A balloon is filled with 250 cubic inches of a gas at a pressure of 14 pounds per square inch.

<b>Type of variation:</b>	inverse variation ( $y = \frac{k}{x}$ )
<b>Variables:</b>	Let $v$ = volume of gas Let $p$ = pressure of gas
<b>Facts:</b>	Balloon is filled with 250 cubic inches of gas ( $v = 250$ ) Pressure is 14 pounds per square inch ( $p = 14$ )
<b>Translation:</b>	<b><u>volume of a gas is inversely proportional to the pressure of the gas</u></b> $v = \frac{k}{p}$
<b>Solve for k:</b>	$250 = \frac{k}{14}$ $14 \cdot 250 = \frac{k}{14} \cdot 14$ <b><math>k = 3500</math></b>
<b>General Formula:</b>	$v = \frac{3500}{p}$

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The amount of time it takes a swimmer to swim a race is inversely proportional to the average speed of the swimmer. A swimmer finishes a race in 120 seconds with an average speed of 5 feet per second.

<b>Type of variation:</b>	
<b>Variables:</b>	
<b>Facts:</b>	
<b>Translation:</b>	
<b>Solve for k:</b>	
<b>General Formula:</b>	

The distance that an object falls when it is dropped is directly proportional to the square of the amount of time since it was dropped. An object falls 288 feet in 3 seconds.

<b>Type of variation:</b>	
<b>Variables:</b>	
<b>Facts:</b>	
<b>Translation:</b>	
<b>Solve for k:</b>	
<b>General Formula:</b>	