

TOPIC: DIRECT & INVERSE VARIATION

Direct Variation

◆ **Direct Variation:** When 2 quantities are related to that as 1 quantity increases/decreases, the other does the _____.

▶ This *linear* relationship between variables is often stated as: *y varies directly as x* OR *y is directly proportional to x*.

EXAMPLE

If y varies directly as x and if $y = 10$ when $x = 2$, find the following.

(A) Find the equation that relates x and y .

Constant of Variation

$y = kx$

Plug in given values:

Solve for k :

Rewrite:

(B) What is y when $x = 6$?

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PRACTICE

If y varies directly as x , and $y = 18$ when $x = 6$, find y when $x = 10$.

PRACTICE

The distance d a car travels varies directly as the time t . If the car travels 180 km in 3 hours, find how far it will travel in 5 hours.

EXAMPLE

A bakery sells eggs at \$3 per dozen. The price varies directly with the quantity purchased.

(A) Write a variation model using k as the constant of variation.

(B) How much would 5 dozen eggs cost?

(C) If a local restaurant spent \$39 on eggs at this bakery, how many dozen did they purchase?

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Inverse Variation

◆ Recall: Direct variation is when 2 quantities are related so that as 1 quantity inc/dec, the other does the *same*.

▶ **Inverse Variation:** As 1 quantity increases/decreases, the other does the _____.

▶ This relationship between variables is often stated as: y varies *inversely* as x OR y is *inversely proportional* to x .

Recall Direct Variation	New Inverse Variation
<p>If y varies directly as x and $y = 10$ when $x = 2$, find the equation that relates x and y.</p> $y = kx$ <p>Plug in given values: $10 = k(2)$</p> <p>Solve for k: $k = 5$</p> <p>Rewrite: $y = 5x$</p>	<p>If y varies inversely as x and $y = 8$ when $x = 4$, find the equation that relates x and y.</p> $y = \frac{k}{x}$ Note: $x \neq 0$ <p>Plug in given values:</p> <p>Solve for k:</p> <p>Rewrite:</p>

EXAMPLE

Using the inverse variation equation from above, find y when $x = 2$.

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PRACTICE

p varies inversely as q , and $p = 18$ when $q = 9$. If $q = 12$, what is the value of p ?

PRACTICE

The time t (in hours) required to travel a fixed distance varies inversely as the speed s (in mi/hr). If it takes 6 hours to travel a certain distance at 50 mi/hr, how long will it take to travel the same distance at 75 mi/hr?

EXAMPLE

The volume of a gas in a container varies inversely as pressure on the gas. A container of helium has a volume of 370 cubic inches under a pressure of 15 psi.

(A) Write the equation that relates the volume to the pressure.

(B) What would be the volume of this gas if the pressure was increased to 20 psi?