$$\left(3x^2y^{-3}\right)^2 = 9x^4y^{-6} = \frac{9x^4}{y^6}$$

#1. Simplify:
$(3x^2y^{-3})^2$

$16 \qquad 246\sqrt{y^6} \qquad \underline{16}\,(6\cdot16)(6\cdot16)$

$\times 16$

#2. Simplify the following expression to radical form.

$16^{-5/2}$

$\dfrac{1}{16^{5/2}} = \dfrac{1}{\sqrt{16^5}} \qquad \dfrac{1}{16\cdot16\sqrt{16}} = \dfrac{1}{246\sqrt{16}}$

#3. Simplify the following expressions.

$$\dfrac{27x^6y^4}{-54x^2y^{\frac{4}{3}}} \qquad -\dfrac{1x^4y^1}{2} \qquad \left(-\dfrac{x^4y}{2}\right) \qquad \left(\dfrac{1}{884}\right)$$

APPLICATION: Helen drops a ball from 25 feet above a lake. The formula $t = \dfrac{1}{4}\sqrt{25 - h}$ describes the t time in seconds that the ball is h feet above the water.

A) How long is the ball in the air when the ball is at 16 feet?

B) How many feet above the water will the ball be after 1 second?

INVERSE VARIATION

October 6th, 2017

Inverse Variation notes!

While <u>direct</u> variation describes a linear relationship between two variables, <u>inverse</u> variation describes another kind of relationship.

For two quanitities with inverse variation, as one quantity increases, the other quantity decreases.

Inverse Variation notes!

An inverse variation can be represented by the equation $xy = k$ or $y = \frac{k}{x}$.

That is, y varies inversely as x if there is some nonzero constant k such that, $xy = k$ or $y = \frac{k}{x}$ where $x \neq 0, y$

What are some examples of inverse variation found in the real world?

2. If a train travels between two cities in 3 hours at an average speed of 65 miles per hour, how long would it take at an average speed of 80 miles per hour?

$x_1 = 3$ $y_1 = 65$ $\dfrac{195 = 80x_2}{80 \quad 80}$

$x_2 = ?$ $x_2 = 80$ $\boxed{2.44 \text{ hours}}$

$(x_1)(y_1) = (x_2)(y_2)$

$(3)(65) = x_2(80)$

3. A certain project can be completed by 5 workers in 24 days. In order to finish the project sooner, the company plans to hire additional workers. How many workers are needed to finish the project in 15 days?

$x_1 = 5$ $y_1 = 24$

$x_2 =$ $y_2 = 15$

$(5)(24) = x_2(15)$ $\boxed{x_2 = 8 \text{ workers}}$

$\dfrac{120 = 15x_2}{5 \qquad 15}$

Does the table below represent an inverse relationship? How do you know?

x	y
5	15
6	18
7	21
8	24

no, because both x-values and y-values are increasing
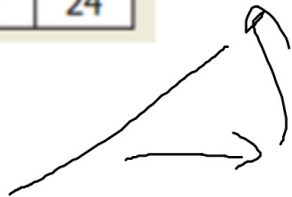
PROBLEM 1: IF Y VARIES INVERSELY AS X AND X=3 WHEN Y=9, THEN WHAT IS X WHEN Y=27?

$x_1 = 3$ $y_1 = 9$ $(3)(9) = x_2(27)$

$x_2 = ?$ $y_2 = 27$ $\dfrac{27}{27} = \dfrac{27 x_2}{27}$

$x_2 = 1$

#2. If y varies inversely to x according to the formula $y = \dfrac{4}{\sqrt{x}}$, find y when $x = 36$

$y = \dfrac{4}{\sqrt{x}}$ $y = \dfrac{4}{\sqrt{36}}$ $= \dfrac{4}{6} = \dfrac{2}{3}$

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5. y varies inversely with x. If y = 40 when x = 16, find x when y = -5.

$x_1 = 16$ $x_1 = 40$

$x_2 = ?$ $y_2 = -5$

a.   What is the value of k (constant of variation)

$(16)(40) = 640$

b.   Solve for x

$\dfrac{-5(x_2)}{-5} = \dfrac{640}{-5}$ $x = -128$

6. y varies inversely with x. If y = 7 when x = -4, find y when x = 5

$x_1 = -4$ $y_1 = 7$

a.   What is the value of k (constant of variation)

$(-4)(7) = -28$ $x_2 = 5$ $y_2 = ?$

b.   Solve for x

$\dfrac{5(y_2)}{5} = \dfrac{-28}{5}$ $y_2 = -5.6$

Stewart is planning to build a rectangular garden in his backyard, and has 72 square feet of space available. He recalls a lesson from his Math 2 class in high school and remembers that for rectangles, the length is inversely proportional to the width. Stewart notices that the lawn in his backyard will restrict how wide his garden can be. He measures the restricted width to be 4.5 feet. What dimensions can his garden have?

$$A = \ell \cdot w$$

$$\frac{72}{4.5} = \frac{(\ell)(4.5)}{4.5}$$

$$\ell = 16 ft$$