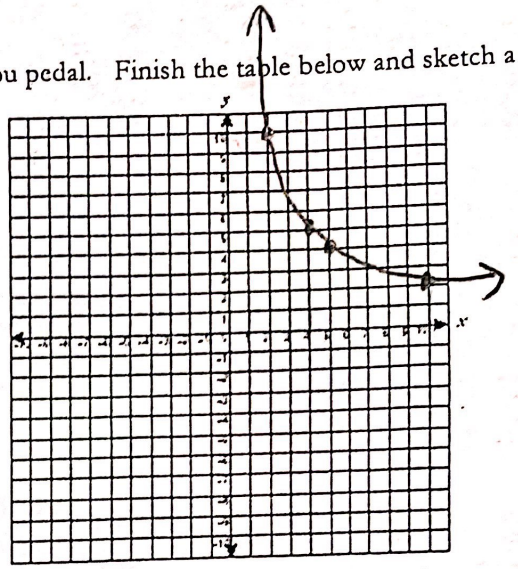
Unit 9 Lesson 2: Inverse Variation

The time it takes to pedal 20 miles varies inversely with the rate at which you pedal. Finish the table below and sketch a graph of the situation.

Rate (mi/hr)	Time (h)	xy
2	10	$= 20$
4	5	$= 20$
5	4	$= 20$
10	2	$= 20$
15	1.3	



- How long would it take you to pedal at 15 mi/hr?

$(15)(x) = 20$ $\quad x = 1.3$ Hours

- Write an equation to represent the scenario given in the problem.

$y = \frac{20}{x}$ $\quad x(y) = 20$

Inverse Variation: a relationship between 2 variables where the PRODUCT is Constant.

Any equation that fits the form: $y = \frac{k}{x}$ where $k \neq 0$. Therefore, $k =$ xy

k is called the constant of variation.

In this situation, as the variable x increases, the variable y decreases (or vice versa)

Sample wording: "y varies inversely as x" OR "y is inversely proportional to x"

EXAMPLES:

1. If y varies inversely as x, and y = 3 when x = 4, find y when x = 18.

$(y)(x) = k$

$(3)(4) = k$

$12 = k$

$\frac{y(18)}{18} = \frac{12}{18}$

$y = 2/3$

2. If x and y vary inversely, find the missing value. (−9, 4) and (x, −12)

$(x)(y) = k$

$(-9)(4) = k$

$-36 = k$

$\frac{(x)(-12)}{-12} = \frac{-36}{-12}$

$x = 3$

3. The ordered pairs (2, 6) and (4, y) are from an inverse variation. Find the missing value.

$(2)(6) = 12$ $\quad \frac{(4)(y)}{4} = \frac{12}{4}$

$y = 3$

4. The number of songs that an iPod can store varies inversely with the average size of a song file. An iPod Touch can store 2500 songs when the average size of a song is 4mb. Find the number of songs that can be stored if the average song is 8mb.

(avg size)(#songs)
(4)(2500) = 10,000

$\frac{(8)(\#songs)}{8} = \frac{10000}{8}$

#songs = 1250

5. The volume V of gas varies inversely to the pressure P. The volume of a gas is 200 cm^3 under pressure of 32 kg/cm^2. What will be its volume under pressure of 40 kg/cm^2?

(volume)(pressure)
(200)(32) = 6400

$\frac{(V)(40)}{40} = \frac{6400}{40}$

$V = 160\ cm^3$

6. The time it takes to fly from Los Angeles to New York varies inversely as the speed of the plane. If the trip takes 6 hours at 900 km/h, how long would it take at 800 km/h?

(time)(speed)
(6)(900) = 5400

$\frac{(time)(800)}{800} = \frac{5400}{800}$

Time = 6.75 Hrs

7. Jenny has learned the volume of gas in a container at a constant temperature varies inversely with the pressure. If the volume of her bottle is 32 cm^3 at a pressure of 8 pounds, find the volume when the pressure is 10 pounds.

(volume)(pressure)
(32)(8) = 256

$\frac{(volume)(10)}{10} = \frac{256}{10}$

volume = 25.6 cm^3

8. The time it takes Alex and his team of painters to complete a job varies inversely with the number of painters. If a painting job took 3 painters 2 hours, how many minutes would the job have taken 8 painters?

(time)(#painters)
(2)(3) = 6

$\frac{(time)(8)}{8} = \frac{6}{8}$

time = .75 → 45 MIN.

9. The intensity of a sound (measured in watts per square meter) varies inversely with the square of the distance from the sound's source (measured in meters). At a distance of 1.5 meters from the stage, the intensity of the sound at a rock concert is about 9 watts per square meter. If your grandpa would prefer to hear the concert at an intensity of no more than 0.04 watts per square meter, what is the closest distance he can stand from the stage?

(I)(d^2)
(9)$(1.5)^2$ = 20.25

$(.04)(d)^2 = 20.25$

$\sqrt{d^2} = \sqrt{506.25}$

d = 22.5

* need to stand at least 22.5 meters from the stage.