

Name: _____ Date: _____

1. Variable M varies *directly* with p . If $M = 75$ when $p = 10$, find M when $p = 16$.
2. R varies *inversely* with variable T . If R is 168 when $T = 24$, find R when $T = 30$.
3. Variable Y varies *jointly* with P and Q . If $Y = 144$ when $P = 12$ and $Q = 8$, find Y when $P = 15$ and $Q = 25$.
4. The volume, V , of a gas varies *inversely* as the pressure, p , in a container. If the volume of a gas is 200cc when the pressure is 1.6 liters per square centimeter, find the volume (to the *nearest tenth*) when the pressure is 2.8 liters per sq centimeter.
5. Variable T varies *directly* with the square of m . If T is 8 when $m = 2$, find T when $m = 4$.
6. In science, one theory of life expectancy states that the lifespan of mammals varies *inversely* to the number of heartbeats per minute of the animal. If a gerbil's heart beats 360 times per minute and lives an average of 3.5 years, what would be the life expectancy of a human with an average of 72 beats per minute? Does this theory appear to hold for humans?
7. In building a brick wall, the amount of time it takes to complete the wall varies *directly* with the number of bricks in the wall and varies *inversely* with the number of bricklayers that are working together. A wall containing 1200 bricks, using 3 bricklayers, takes 18 hours to build. How long would it take to build a wall of 4500 bricks if 5 bricklayers worked on it?

8. A video store rents DVDs, and the weekly total number varies **directly** with the total inventory, and varies **inversely** with the cost of each rental tape. The store in Acme, NY, last week rented a total of 3000 DVDs when its inventory was 9600 and the cost per rental was \$2.40. If its inventory does not change, what would be the effect on the weekly total number of increasing the cost per rental to \$3.00?

9. A car's stopping distance varies **directly** with the speed it travels, and **inversely** with the friction value of the road surface. If a car takes 60 feet to stop at 32 mph, on a road whose friction value is 4, what would be the stopping distance of a car traveling at 60 mph on a road with a friction value of 2?

10. A ball is dropped from a window of a building. The distance it falls varies **directly** with the square of the time it falls. If a ball can fall 8 feet in 0.5 seconds, how far will it fall if it takes 2.5 seconds for it to hit the ground?

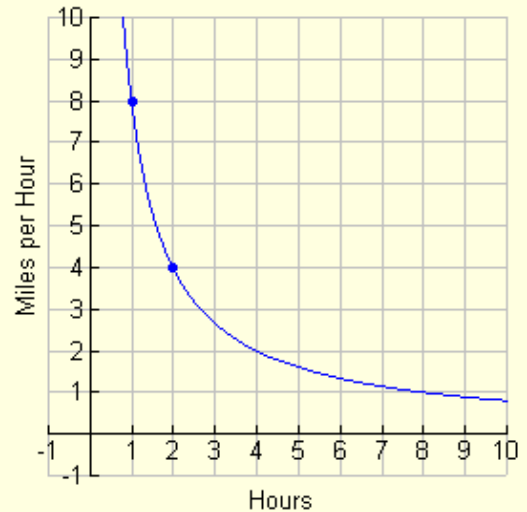
11. In a power plant, the power produced varies **directly** with the amount of water available, and varies **inversely** with the temperature of the water. The plant has a power rating of 100,000 when there is a flow of 40,000 gallons of water per hour, and the temperature of the water is 41° . Find the power rating produced if the amount of water drops to 30,000 gallons per hour, and the temperature rises to 60° .

Inverse Variation (The Opposite of Direct Variation)

In an **inverse variation**, the values of the two variables change in an opposite manner - as one value increases, the other decreases.

For instance, a biker traveling at 8 mph can cover 8 miles in 1 hour. If the biker's *speed decreases* to 4 mph, it will take the biker 2 hours (*an increase of one hour*), to cover the same distance.

Inverse variation: when one variable *increases*, the other variable *decreases*.



As speed decreases, the time increases.

Notice the shape of the graph of inverse variation.

If the value of x is increased, then y decreases.

If x decreases, the y value increases. We say that **y varies inversely as the value of x .**

An **inverse variation** between 2 variables, y and x , is a relationship that is expressed as:

$$y = \frac{k}{x}$$

where the variable k is called the *constant of proportionality*.

As with the direct variation problems, the k value needs to be found using the first set of data.

Find the Constant, k :

The number of hours, h , it takes for a block of ice to melt varies inversely as the temperature, t . If it takes 2 hours for a square inch of ice to melt at 65° , find the constant of proportionality.

Start with the formula: $h = \frac{k}{t}$

Typical Inverse Variation Problem:	In a formula, Z varies inversely as p . If Z is 200 when $p = 4$, find Z when $p = 10$.
	Use the same three process steps that were used in direct variation problems:

Inverse Variation Example:	In kick boxing, it is found that the force, f , needed to break a board, varies inversely with the length, l , of the board. If it takes 5 lbs of pressure to break a board 2 feet long, how many pounds of pressure will it take to break a board that is 6 feet long?
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Combination Variation Example:	Variable M varies directly as variable t and inversely as variable s . If $M = 24$ when $t = 3$ and $s = 2$, find M when $t = 5$ and $s = 8$. (In combination problems, there is only one constant value, k , used with the direct and inverse variables.)
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