While [direct variation](https://www.varsitytutors.com/hotmath/hotmath_help/topics/direct-variation.html)describes a linear relationship between two [variables](https://www.varsitytutors.com/hotmath/hotmath_help/topics/variables.html), inverse variation describes another kind of relationship.

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

For example, when you travel to a particular location, as your speed increases, the time it takes to arrive at that location decreases. When you decrease your speed, the time it takes to arrive at that location increases. So, the quantities are inversely proportional.

An inverse variation can be represented by the equation xy=kxy=k or y=kxy=kx .

That is, yy varies inversely as xx if there is some nonzero constant kk such that, xy=kxy=k or y=kxy=kx where x≠0,y≠0x≠0,y≠0 .

Suppose yy varies inversely as xx such that xy=3xy=3 or y=3xy=3x . That graph of this equation shown.

Since kk is a positive value, as the values of xx increase, the values of yy decrease.

Note: For direct variation equations, you say that yy varies directly as xx . For inverse variation equations, you say that yy varies inversely as xx .

**Product Rule for Inverse Variation**

If (x1,y1)(x1,y1) and (x2,y2)(x2,y2) are solutions of an inverse variation, then x1y1=kx1y1=k and x2y2=kx2y2=k .

Substitute x1y1x1y1 for kk .

x1y1=x2y2x1y1=x2y2 or x1x2=y2y1x1x2=y2y1

The equation x1y1=x2y2x1y1=x2y2 is called the product rule for inverse variations.

**Example:**

In a factory, 1010 men can do the job in 3030 days. How many days it will take if 2020 men do the same job?

Here, when the man power increases, they will need less than 3030 days to complete the same job. So, this is an inverse variation.

Let xx be the number of men workers and let yy be the number of days to complete the work.

So, x1=10,  x2=20x1=10,  x2=20 and y1=30y1=30 .

By the product rule of inverse variation,

(10)(30)=(20)(y2)         300=20y2(10)(30)=(20)(y2)         300=20y2

Solve for y2y2 .

y2=30020      =15y2=30020      =15

Therefore, 2020 men can do the same job in 1515 days