

# Inverse Variation

Two variables  $x$  and  $y$  show inverse variation if they are related as follows:

$$y = \frac{a}{x}, \quad a \neq 0$$

Two variables  $x$  and  $y$  show direct variation if they are related as follows:

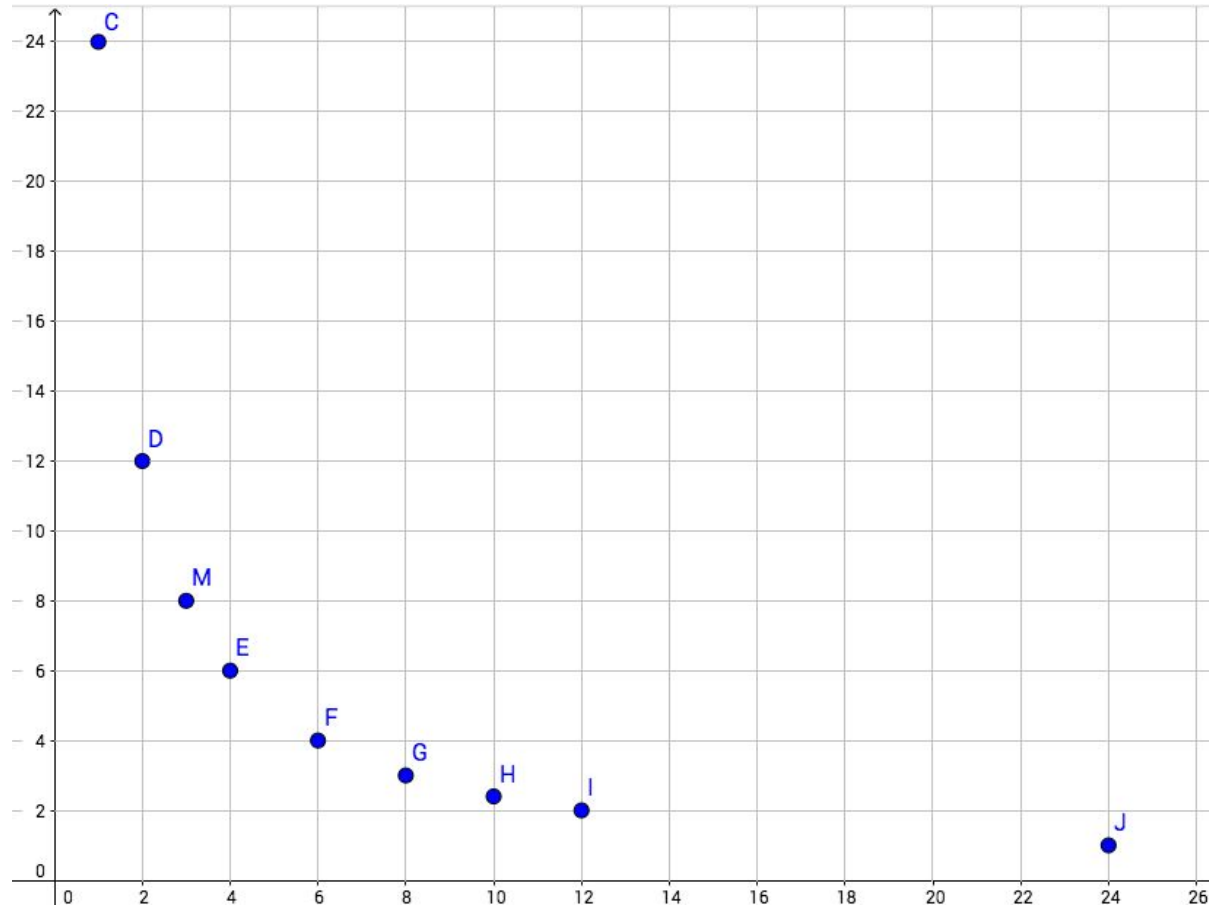
$$y = xk$$



# Rectangular Garden

Length	.1	.5	1	2	3	4	6	8	12
Width	240	48	24	12	8	6	4	3	2

# Graph of garden dimensions:



Determine if  $x$  and  $y$  show inverse or direct variation

a.  $xy = 4$

b.  $y = x - 2$

c.  $x = \frac{y}{4}$

If  $x$  and  $y$  vary inversely, and  $y = 7$  when  $x = 4$ . Write an equation that relates  $x$  and  $y$ .

Write an equation that relates  $x$  and  $y$  here.

Length ( $x$ )	.1	.5	1	2	3	4	6	8	12
Width ( $y$ )	240	48	24	12	8	6	4	3	2

Professor Jenkins has finished a manuscript that he's written by hand. It will take four typists nine days to type the entire manuscript.

The number of days it takes to type the entire manuscript varies inversely with the number of typists working on it.

Write an equation that models the relationship between the number of typists ( $x$ ) and the number of days it takes to type the manuscript ( $y$ ).

How many typists would Professor Jenkins need in order to for the manuscript to be typed up in 1 day?

Driving time between two locations varies inversely with the average driving speed. The driving distance between New York City and Boston is 350 km.

Write a model that shows driving time in  $t$  hours between Boston and New York as a function of average driving speed,  $r$  in km/hour.



Moving cartons are manufactured in a variety of sizes and shapes. This table compares the area  $A$  of the bottom of a rectangular carton with the height  $h$  of four available cartons.

$A$	50	100	120	150
$h$	24	12	10	8

Before you test the data, how do you know that this table is not showing variables that vary directly?

How can we test the data to determine if the data varies inversely?

Does this set of data vary directly, inversely, or neither?

$x$	32	40	50	60
$y$	12.5	10	8	6.667

Write a model that represents this data set.

# Joint Variation

Joint Variation is direct variation between a variable and the *product* of two or more other variables.

$$z = axy$$

In this case,  $z$  varies jointly with  $x$  and  $y$ , and  $a$  is a *nonzero* constant.



If the variable  $z$  varies jointly with  $x$  and  $y$ , and  $z = -75$  when  $x = 3$  and  $y = -5$ . Write an equation that relates  $x$ ,  $y$  and  $z$ . Then find  $z$  when  $x = 2$  and  $y = 6$ .