Direct Variation:

When two quantities have a constant ratio.

Variation Constant: $k = \frac{y}{x}$

Direct Variation Equations:

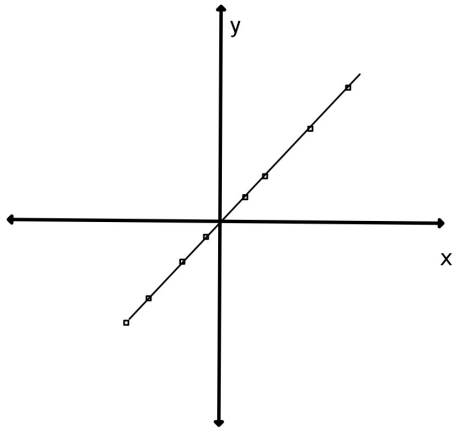
$$k = \frac{y}{x} \quad \text{or} \quad y = kx$$

The graph of Direct Variation.

A line passing through the origin.

The table below shows a Direct Variation relationship.
Make a scatter plot of this data.

x	y
−8	−12
−6	−9
−3	−4.5
−1	−1.5
2	3
4	6
7	10.5
10	15



Sec 9-1

Inverse Variation:

When two quantities have a constant product.

Variation Constant: $k = xy$

Inverse Variation Equations:

$$k = xy \quad \text{or} \quad y = \frac{k}{x} \qquad x \neq 0$$

1. The table below shows an inverse variation relationship.

x	y
−2	−32
4	16
25	2.56
80	0.8

a. Find the variation constant. $k = 64$

b. Write a direct variation equation. $64 = xy$ or $y = \frac{64}{x}$

c. Find y when x = 24 $64 = 24y$ $y = 2.7$

d. Find x when y = 100 $64 = 100x$ $x = .64$

Real life examples of Inverse Variation:

- The relationship between the speed traveled and the time traveled for a given distance.
- The relationship between the length and width of a rectangle for a given area.

For each table determine if it represents Direct Variation, Inverse Variation, or Neither

If it is either Direct or Inverse Variation do the following:

a. Find the variation constant
b. Write a variation equation
c. Find the value of x when y is 10
d. Find the value of y when x is 25

1.

X	Y
−8	−18
9	16
15	9.6
24	6

Inv. Var

a $k=144$

b $xy=144$, $y=\frac{144}{x}$

c 14.4

d 5.76

2.

X	Y
4	13.2
5	16.5
9	31.5
22	74.8

a

b

c

d

$\frac{y}{x}$: 3.3, 3.3, 3.5, 3.4

Neither

3.

X	Y
−9	64.8
5	−36
12	−86.4
28	−201.6

$\frac{y}{x}=-7.2$

−7.2, −7.2, −7.2, −7.2

Direct Var.

a $k=-7.2$

b $y=-7.2x$

c −1.39

d −186

4.

X	Y
6	10
8	12
10	14
12	16

a

b

c

d

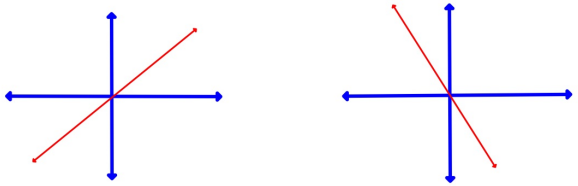
$\frac{y}{x}$

Neither

In general:

Direct Variation: As one quantity increases the other quantity increases

Graphs of Direct Variation



Inverse Variation: As one quantity increases the other quantity decreases.

The speed you drive varies inversely with the amount of time you drive.
Zeinab drove 52 mph for 6 hours.

Write an inverse variation equation for this situation.

$xy = k$

$xy = 312$ mi

Find the time required if she drove 65 mph.

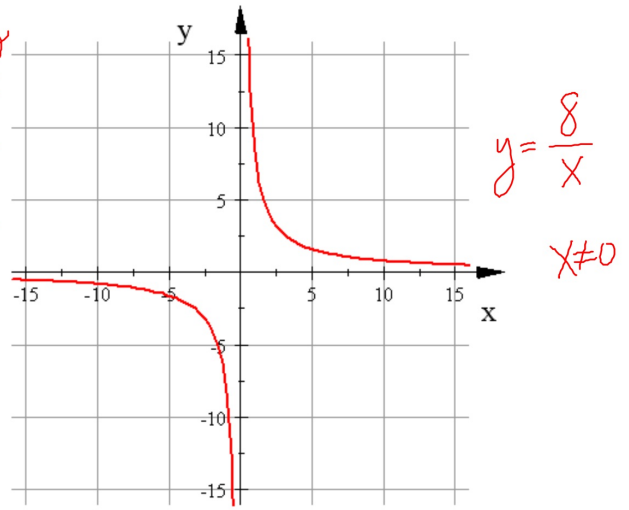
$x65 = 312$

$x = 4.8$ hrs

The graph of Inverse Variation. A curve called a Hyperbola

x	y	xy
0.5	16	8
1	8	8
2	4	8
4	2	8
8	1	8
10	0.8	8
16	0.5	8

-1 -8



$y = \frac{8}{x}$ $x \neq 0$

Suppose that A and B vary directly. A=3 when B=5

- Write a function that models this
- Find B when A=20.

$y = .6x$

$\frac{y}{x} = \frac{3}{5} = .6$

$20 = .6x$

$33.3 = x$ or $\frac{3}{5} = \frac{20}{x}$

Suppose that A and B vary inversely. A=3 when B=5

- Write a function that models this
- Find B when A=20.

$xy = 15$

$B = 15/20 = .75$

The point (9,4) is on the graph of ....

1. of a Direct Variation relationship.
   Find the variation constant.

$k = \frac{y}{x} = \frac{4}{9} = .44$

2. of an Inverse Variation relationship.
   Find the variation constant.

$x \cdot y = k = 36$