

Direct Variation is when there is a **Constant Ratio**,
a line through the origin.

The two Direct Variation Equations are:

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

k is

- the Variation Constant
- Slope of the line

Neither of these tables of values represents Direct Variation. However, there is a relationship between X and Y that is true in both tables. What is this relationship?

X	Y	$\frac{X}{Y}$
-8	-3	24
-6	-4	24
1.5	16	24
2	12	24
16	1.5	24

X	Y	$\frac{X}{Y}$
-36	-8	288
-24	-12	"
-4.5	-64	"
3	96	"
15	19.2	"

In both tables x and y have a constant product

When two quantities have a constant product this is called
INVERSE VARIATION

Three equations for Inverse Variation are:

$$\underline{xy = k}, \quad \underline{y = \frac{k}{x}}, \quad \text{and} \quad \underline{x = \frac{k}{y}}$$

k is called the Variation Constant

For Direct Variation (ignoring Pos/Neg), as one quantity increases, the other also increases

For Inverse Variation (ignoring Pos/Neg), as one quantity increases, the other quantity **DECREASES**.

1. Is each table below an example of Direct Variation (DV), Inverse Variation (IV), or neither (N)?
If yes, state the variation constant and write a direct variation equation.

a) DV, IV or neither? DV

X	Y	$\frac{Y}{X}$
-6	7.5	-1.25
4	-5	-1.25
8	-10	-1.25
14	-17.5	-1.25

If a variation, $k = -1.25$

If Yes, equation is:

$$y = -1.25x$$

b) DV, IV or neither? IV

X	Y	XY
-8	-15	120
-2.5	-48	120
24	5	120
32	3.75	120

If a variation, $k = 120$

If Yes, equation is:

$$xy = 120$$

c) DV, IV or neither? Neither

X	Y
-3	-7.2
5	12
8	19.2
18	7.5

these two rows will NOT have the same product, so it's not Inverse Variation

these two rows will NOT have the same ratio, so it's not Direct Variation

If a variation, $k =$ _____

If Yes, equation is:

d) DV, IV or neither? Neither

X	Y
-15	-12
-6	-4.8
12	-9.6
25	20

All xy products and y/x ratios are positive except the one circled, therefore, this table is Neither.

If a variation, $k =$ _____

If Yes, equation is:

2. This table demonstrates a Direct Variation relationship.

X	Y	$\frac{Y}{X}$
-5	-13.5	2.7
21	56.7	
33	Y	

$$y = 2.7x$$

$$x = \frac{13}{35.1} = 2.7x$$

$$y = \frac{89.1}{y} = 2.7(33)$$

You could have arrived at the same answers using a proportion:

$$\frac{56.7}{21} = \frac{35.1}{x}$$

$$\frac{56.7}{21} = \frac{y}{33}$$

3. This table demonstrates an Inverse Variation relationship.

X	Y	XY
-15	-19.2	288
7.5	38.4	
24	Y	

$$xy = 288$$

$$xy = 288$$

$$x = \frac{-8}{x(-36)} = 288$$

$$y = \frac{12}{(24)y} = 288$$

The number of men it takes to complete a job varies inversely with the number of days it takes to complete the job. At a jobsite, 10 men can do the job in 30 days.

a) Write an Inverse Variation equation. Define your variables.

EQ:

$$D \cdot M = 300$$

Variables:

$$D = \# \text{ days}$$
$$m = \# \text{ men}$$

b) How many days it will take if 15 men do the same job?

$$\frac{D(15)}{15} = \frac{300}{15} \quad D = 20 \text{ days}$$

For a given amount of Force, mass is inversely proportional to acceleration. You accelerated an 8 pound weight 12 ft/sec².

$$m = \frac{k}{a} \quad \text{or} \quad m \cdot a = k$$

1. Write an inverse variation equation. Define your variables.

$$8 = \frac{k}{12} \quad k = 96$$

m = mass
a = acceleration

2. Find the acceleration needed to produce the same force on a 15 pound weight.

$$96 = 15a = \boxed{a = 6.4 \text{ ft/sec}^2}$$

These points form a direct variation relationship. Find the missing value.

(8,4) & (20,?)

You could use a proportion for Direct Variation:

$$\frac{4}{8} = \frac{?}{20} \quad \boxed{? = 10}$$

Find the missing value if these two points are part of an inverse variation relationship.

Find the variation constant first: $k = (4)(8) = 32$

Then write an Inverse Variation EQ: $xy = 32$

replace x with 20 and solve: $20y = 32$

$$\boxed{y = \frac{32}{20} = 1.6}$$

You can now finish Hwk #2. Sec 9-1

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Problems 6-8, 12, 13, 32, 35, 41, 42, 44, 45

Due Tomorrow