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

The two Direct Variation Equations are:

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

k is
- the Variation Constant
- Slope of the line

Inverse Variation Inverse Variation is when x and y have a constant product.

$k = xy$ this is called the variation constant.

Three equations for Inverse Variation are $xy = k$ $y = \frac{k}{x}$ and $x = \frac{k}{y}$

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	"
14	−17.5	"

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: $xy = 120$, $y = \frac{120}{x}$

c)DV, IV or neither? Neither

X	Y
−3	−7.2
5	12
8	19.2
18	7.5

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

If a variation, $k =$ _____

If Yes, equation is:

Direct Variation Problems can be solved using

One of the Direct Variation Equations
or
A Proportion

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

For Inverse Variation, as one quantity

increases the other quantity Decreases.

2. This table demonstrates a Direct Variation relationship.

X	Y
−5	−13.5
X	35.1
21	56.7
33	Y

$K = \frac{Y}{X} = \frac{-13.5}{-5} = 2.7$

$y = 2.7x$

X = 13

$\frac{-13.5}{-5} = \frac{35.1}{x}$

Y = 89.1

$\frac{-13.5}{-5} = \frac{Y}{33}$

3. This table demonstrates an Inverse Variation relationship.

X	Y
−15	−19.2
X	−36
7.5	38.4
24	Y

X = −8

$K = XY = 288$

$(x)(36) = 288$

$x = -8$

Y = 12

$XY = 288$

$24y = 288$

$y = 12$

Why doesn't it matter whether you say

y varies inversely with x

or

x varies inversely with y

Since the variation constant is found by multiplying x and y you will get the same answer regardless of which way you multiply them.

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.

$K = (10)(30) = 300$

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

EQ:

$XY = 300$

Variables:

X = # men

y = # days

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

$\frac{15 \cdot y}{15} = \frac{300}{15}$ $y = 20$ days

For a given amount of Force, mass is inversely proportional to acceleration. You accelerated an 8 pound weight 12 ft/sec^2.

$K = m \cdot a = (8)(12) = 96$

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

$m \cdot a = 96$

m = mass (# lbs)
a = acceleration

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

$\frac{15 \cdot a}{15} = \frac{96}{15}$ $a = 6.4$ ft/s^2

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

(8,4) & (20,?)

$\frac{4}{8} = \frac{y}{20}$ $y = 10$

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

$8.4 = 20 \cdot y$

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

Combined variations.

More than one variation relationship happening at the same time.

Every variation equation has a variation constant, therefore, all variation equations have k.

If the relationship is Direct Variation then the equation is

$y = kx$

If the relationship is Inverse Variation then the equation is

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

Therefore, k is either going to be the leading coefficient
or
the coefficient of the numerator.

Remember the phrase: "Y varies directly with X"

This part of a statement tells you to write

$y =$

Model each statement with a variation equation using k for the variation constant.

1. Q varies directly with W and inversely with G.

$Q = \frac{k \cdot W}{G}$

2. R varies directly with the square of T and inversely with the cube of Z.

$R = \frac{k \cdot T^2}{Z^3}$

3. N varies directly with A and inversely with the product of P and Q.

$N = \frac{k \cdot A}{P \cdot Q}$

R varies jointly with A and the square of E.

Joint Variation means direct variation with more than one variable

R varies jointly with A and the square of E.

$R = kAE^2$

Write a variation equation if R = -90 when A = 2 and E = 3. Include the proper value of k

$-90 = k(2)(3)^2$

$-90 = 18k$

$k = -5$

$R = -5AE^2$

Find A when R=20 and E=10

$20 = -5A(10)^2$

$\frac{20}{-500} = \frac{-500A}{-500}$

$A = -0.04$