HAT
Variation Functions

1/16/18

A ***direct variation*** can be expressed in the form $y = kx$.

Ex#1: If y varies directly as x and $y=15$ when $x=-5$, find y when $x=7$.
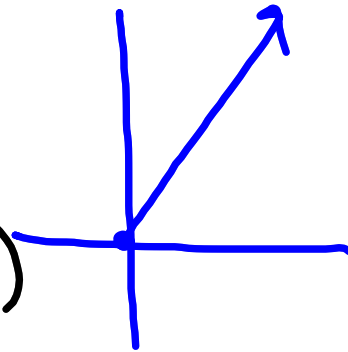
$$Y = kx$$

$$15 = k(-5)$$

$$-3 = k$$

$$\rightarrow y = -3x$$

$$y = -3(7)$$

$$y = -21$$

Joint variation occurs when one quantity
varies directly as the **product** of two or more other quantities.

Ex#2: Suppose y varies jointly as x and z.
If $y=20$ when $z=3$ and $x=5$, find y when $x=9$ and $z=2$.

$$y = \textcircled{k} \, x \cdot z$$

$$20 = k(5)(3)$$

$$\frac{4}{3} = k$$

$$y = \frac{4}{3}(9)(2)$$

$$y = 24$$

If two quantities x and y show *inverse variation*, their **product** is equal to a constant k.

That is, $xy = k$, or $y = \dfrac{k}{x}$.

Ex#3: If y varies inversely as x and y=28 when x=-2, find y when x=-10.

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

$$28 = \frac{k}{-2}$$

$$k = -56$$

$$y = \frac{-56}{x}$$

$$y = \frac{-56}{-10}$$

$$y = 5.6$$

Combined variation occurs when one quantity varies directly and/or inversely as two or more other quantities.

Ex#4: Suppose *y* varies directly as *x*, and *y* varies inversely as *z*. Find *x* when *y*=18 and *z*=-3, if *x*=24 when *z*=2 and *y*=6.

$$y = \frac{kx}{z}$$

$$6 = \frac{k(24)}{2}$$

$$\frac{12}{24} = \frac{k24}{24}$$

$$k = \tfrac{1}{2}$$

$$18 = \frac{\tfrac{1}{2} \cdot x}{-3}$$

$$-54 = \tfrac{1}{2}x$$

$$-108 = x$$

State whether each equation represents a direct, joint, inverse, or combined variation. Then name the constant of variation.

1. $C = 2\pi r$ Direct $k = 2\pi$

   k

2. $p = \dfrac{4}{q}$ Inverse $k = 4$

3. $A = \dfrac{1}{2}bh$ Joint $k = \frac{1}{2}$

4. $rw = 15$ Inverse $k = 15$

   $r = \dfrac{15}{w}$

5. $y = 2rgt$ Joint $k = 2$

If y varies directly as z and inversely as x and y = 27 and
z = -3 when x = 2, find x when y = 9 and z = 5.

$$y = \frac{K\,z}{X}$$

$$27 = \frac{K(-3)}{2}$$

$$54 = K(-3)$$

$$-18 = K$$

$$y = \frac{-18z}{X}$$

$$9 = \frac{-18(5)}{X}$$

$$9X = -90$$

$$\boxed{X = -10}$$

If y varies directly as z and inversely as x and

y = -15 and z = 5 when x = 5, find x when y = -36 and z = -3.

Assignment: page 566 #7, 13, 17, 23, 29, 31, 44, 49

If Time, Try This...

49) If a varies inversely as b, c varies jointly as b and f,
     f varies directly as g, how are a and g related?