Inverse/Direct Variation

Inverse and Direct Variation: Equations that describe relationships between 2+ quantities, involving a constant, *k*.

- Direct: $y = kx \quad \frac{y}{x} = k$
  - As one quantity (*x* or *y*) increases, the other increases. Or as one decreases, the other decreases.
- Inverse: $xy = k \quad y = \frac{k}{x} \quad x = \frac{k}{y}$
  - As one quantity (*x* or *y*) decreases, the other increases. Or as one increases, the other decreases.
  - Equation $xy = k$ can easily be used to determine if inverse variation exists.
- Jointly: When one quantity varies *directly* with two or more quantities (can also be inversely with other variables. EX: $z = kxy$

Examples:

1. Is the relationship between the variables a direct variation, inverse or neither?

x	***y***
1	52
2	34
5	4
6	2

x	***y***
0.2	0.80
0.4	0.40
0.5	0.32
1.0	0.16

2. Suppose *x* and *y* vary inversely and *x* = 2 when *y* = 8.
   a. What is the function of the inverse variation?
   b. What is the graph of this function?
   c. What is *y* when *x* = 4?

3. Your employer decides to hire extra help to deliver newspapers during the holidays. The tables shows the number of employees who delivered papers each week and the time needed for deliver.

Number of employees	2	4	10	20
Time in minutes	100	50	20	10

   a. What function models this problem?
   b. How many employees should there be to deliver newspapers in at most 40 minutes each week?

4. The volume of a cone varies jointly with its height and the square of its base radius. A cone has a base radius of 4 ft., height 6 ft., and volume 100.48 ft^3. What is the volume of a cone with a height of 3 ft and a base radius of 3 ft?
    a. 14.13 ft^3 b. 28.27 ft^3 c. 33.56 ft^3 d. 50.25 ft^3

5. The volume of gas varies directly with its temperature and inversely with pressure. Volume is 100 m^3 when the temperature is 150 K and the pressure is 15 lb/cm^2. What is the volume when the temperature is 250 K, and the pressure is 20 lb/cm^2?