Section 2.5 Variation

We will need to translate words to symbols in section 2.5 Here are some common words that we will see in this section and their interpretations.

Square of x   symbol to use x^2 for example the square of 9 would be written as $9^2 = 81$
Square root of x symbol to use $\sqrt{x}$ for example the square root of 9 would be written as $\sqrt{9} = 3$
cube of x   symbol to use x^3 for example the cube of 8 would be written as $8^3 = 512$
Cube root of x symbol to use $\sqrt[3]{x}$ for example the cube root of 8 would be written $\sqrt[3]{8} = 2$

 "Some number"

- "**Some number"**   in this section is called the constant of variation.
- We will use the variable "k" to represent **"some number"**

Most of our work in this section will involve translating sentences into Algebra. The sentences will have key words that will need to be understood in more simple terms.

The key words are:
Varies directly
Directly proportional
Varies inversely
Inversely proportional
Varies jointly

Varies directly and is directly proportional – translates to: **is "some number" times**

- The words y varies directly as x has the same meaning as y is "**some number"** times x $(y = kx)$
- The words y is directly proportional to x has the same meaning as y is "**some number"** times x $(y = kx)$

Varies inversely and is inversely proportional – translates to: **is "some number" divided by** (form a fraction with k in the numerator)

- The words y varies inversely as x has the same meaning as y is "**some number"** divided by x $\left(y = \frac{k}{x}\right)$
- The words y is inversely proportional to x has the same meaning as y is "**some number"** divided by x $\left(y = \frac{k}{x}\right)$

Varies jointly – translates to: **is "some number" times the product of two variables**

- The words y varies jointly as x and z has the same meaning as y is "**some number"** times the product of x and z. $(y = kxz)$

#1 - 14: Write a variation model.   Use k as the constant of variation.

1) W varies directly as the square of x

2) A varies directly as the square root of b

3) Y varies inversely as the cube of x

4) Z varies inversely as the square of y.

5) Q is directly proportional to the square of x.

6) W is directly proportional to the square root of x.

7) M varies jointly as the square of x and the cube of y.

8) B varies jointly as x and the square root of y.

9) The distance (D) an object falls is directly proportional to the square of the time (T) it falls.

10) The monthly payment (P) on a mortgage varies directly as the amount borrowed (B)

11) The maximum weight (W) that can be supported by a two by four piece of wood varies inversely as its length (L).

12)   The demand (D) for candy at a movie theater is inversely related to the price (p).

13) The time (t) it takes me to drive to campus is inversely proportional to my driving speed (s).

14)   The diameter (D) of the largest particle that can be moved by a stream varies directly as the square of the velocity (V) of the stream.

#15 - 20:   Find the constant of variation, k.

15) y varies directly as the square of x and y is 45 when x is 3.

16) M varies directly as the square root of y and M is 12 when y is 16.

17) T varies inversely as Q and when Q is 5, T is 10.

18) Z varies inversely as X and when X is 20, Z is 4.

19) N varies jointly as x and y. When x is 2 and y is 3, N is 42.

20) N varies jointly as y and the square of x. When x is 3 and y is 2, N is 54.

#21 - 32 Solve.

21) Y varies directly as the cube of x. Y is 24 when x = 2. Find Y when x = 5.

22) Z varies directly as the square of x. Z is 54 when x is 3. Find Z when x = -2

23) W varies inversely as q. W is 10 when q is 5. Find W when q is 3.

24) M varies inversely as the square root of n. M is 15 when n is 9. Find M when n is 16.

25) Y varies jointly as x and the square of z. Y is 48 when z is 2 and x is 3. Find Y when x is 3 and z is 4.

26) B varies jointly as (a) and the square root of c. B is 60 when a is 5 and c is 9. Find B when a is 4 and c is 16.

27) Suppose that the demand (D) for candy at a movie theater is inversely related to the price (p). When the price of candy is $2.75 per bag, the theater sells 200 bags of the candy. Determine the number of bags of candy that will be sold if the price is raised to $5.00 per bag.

28) Suppose that the demand (D) for candy at a movie theater is inversely related to the price (p). When the price of candy is $4.00 per bag, the theater sells 150 bags of the candy. Determine the number of bags of candy that will be sold if the price is raised to $5.00 per bag.

29) The distance (D) a ball rolls down an inclined plane is directly proportional to the square of the time (t) it rolls. In 1 second the ball rolls 8 feet. How far will the ball roll in 3 seconds?

30) The distance (D) a ball rolls down an inclined plane is directly proportional to the square of the time (t) it rolls. In 1 second the ball rolls 8 feet. How far will the ball roll in 6 seconds?

31) The diameter (D) of the largest particle that can be moved by a stream varies directly as the square of the velocity (V) of the stream. A stream with a velocity of ¼ mile per hour can move coarse sand particles about 0.02 inch in diameter. How large of a particle can a stream move that has a velocity of 2 mph?

32) The diameter (D) of the largest particle that can be moved by a stream varies directly as the square of the velocity (V) of the stream. A stream with a velocity of ¼ mile per hour can move coarse sand particles about 0.02 inch in diameter. How large of a particle can a stream move that has a velocity of 5 mph?