Section 2.5 Variation

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

1) W varies directly as the square of x

(W is some number times the square of x)

$W = kx^2$

3) Y varies inversely as the cube of x

(Y is some number times the cube of x)

$Y = \frac{k}{x^3}$

5) Q is directly proportional to the square of x

(Q is some number times the square of x)

$Q = kx^2$

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

(M is some number times the product of the square of x and the cube of y)

$M = kx^2y^3$

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

(Distance (D) is some number times the square of the time (T))

$D = kT^2$

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

(Maximum weight (W) is some number divided by its length (L))

$W = \frac{k}{L}$

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

(time (t) it takes to drive to campus is some number divided by speed (s))

$t = \frac{k}{s}$

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

These are two step problems.

1) Create an equation with a “k”.
2) Use the numbers provided to solve for “k”.

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

1)

(y is some number times the square of x)

$y = kx^2$

2) $45 = k(3)^2$

$\frac{45}{9} = \frac{9k}{9}$

$\boxed{k = 5}$

These are two step problems.

1) Create an equation with a “k”.
2) Use the numbers provided to solve for “k”.

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

(T is some number divided by Q)

① $T = \frac{k}{Q}$

② $10 = \frac{k}{5}$

~~$\frac{10}{1} = \frac{k}{5}$~~

$k = 50$

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

(N is some number times the product of x and y)

① $N = kxy$

② $42 = K(2)(3)$

$\frac{42}{6} = \frac{6K}{6}$

$K = 7$

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

#21 - 32 Solve.

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

(Y is some number times the cube of x)

① $Y = kx^3$

② $24 = k(2)^3$

$\frac{24}{8} = \frac{8k}{8}$

$3 = k$

③ $Y = 3(5)^3$

$\boxed{Y = 375}$

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

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

1) *(W is some number divided by q)*

$W = \frac{k}{q}$

2) $10 = \frac{k}{5}$

$\frac{10}{1} = \frac{k}{5}$

$k = 50$

3) $W = \frac{50}{3}$

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

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.

① *(Y is some number times the product of x and the square of z)*

$Y = kxz^2$

② $48 = k(3)(2)^2$

$\frac{48}{12} = \frac{12k}{12}$

$4 = k$

③ $Y = 4(3)(4)^2$

$Y = 192$

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

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.

(Demand (D) is some number divided by the price (p))

(1) $D = \frac{k}{p}$

(2) $200 = \frac{k}{2.75}$

$\frac{200}{1} = \frac{k}{2.75}$

$1 \cdot k = 200(2.75)$

$k = 550$

(3) $D = \frac{550}{5.00}$

110 bags of candy

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

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?

(Distance (D) is some number times the square of the time (t) it rolls)

① $D = kt^2$

② $8 = k(1)^2$

$8 = 1k$

$8 = k$

③ $D = 8(3)^2$

$D = 8(9)$

72 feet

These are three step problems.

1) Create an equation with a “k”.
2) Use the numbers in the second sentence to solve for “k”.
3) Use the numbers in the last sentence to finish and solve the problem.

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?

(Diameter (D) is some number times the square of the velocity (V))

(1) $D = kV^2$

(2) $0.02 = k\left(\frac{1}{4}\right)^2$

$\frac{0.02}{1/16} = \frac{\frac{1}{16}k}{1/16}$

$0.32 = k$

(3) $D = 0.32(2)^2$

$D = 1.28$

Stream can move 1.28 inch particle