1 If the quantities x and y are related by the equation $y = 3x$, then we say that y is ---Select--- to x and the constant of ---Select--- is 3.

Directly proportional

Proportionality

$y = kx$

2 If the quantities x and y are related by the equation $y = \frac{6}{x}$, then we say that y is ---Select--- to x and the constant of ---Select--- is 6.

inversely proportional

proportionality

3 If the quantities x, y, and z are related by the equation $z = 6\frac{x}{y}$, then we say that z is ---Select--- to x and ---Select--- to y.

directly proportional

Inversely proportional

4 If z is directly proportional to the product of x and y and if z is 6 when x is 3 and y is 4, then x, y, and z are related by the equation $z =$ [ ] .

$6xy$

$z = kxy$

Given $z=6, x=3, y=4$

$\rightarrow 6 = k(3)(4) = 12k$

$\frac{1}{2} = \frac{6}{12} \Rightarrow k = \frac{1}{2}$

$z = \frac{1}{2}xy$

5 In each equation, is y directly proportional, inversely proportional, or not proportional to x?

(a) $y = 9x$

- directly proportional
- inversely proportional
- not proportional

(b) $y = 9x + 7$

- directly proportional
- inversely proportional
- not proportional

6 In each equation, is y directly proportional, inversely proportional, or not proportional to x?

(a) $y = \frac{8}{x + 7}$

- directly proportional
- inversely proportional
- not proportional

(b) $y = \frac{8}{x}$

- directly proportional
- inversely proportional
- not proportional

7 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

T varies directly as y.

$T = Ky$ for some K

8 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

z is inversely proportional to v.

$z = \frac{K}{v}$ for some K.

9 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

w is proportional to the product of x and y.

$w = Kxy$ for some K

10 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

z is proportional to s and inversely proportional to t.

$z = K \cdot \frac{s}{t}$ for some K.

11 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

P varies inversely as D.

12 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

z is proportional to the square root of w.

$z = k\sqrt{w}$ for some k

13 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

A is proportional to the square of x and inversely proportional to the cube of u.

$A = k \cdot \frac{x^2}{u^3} = \frac{kx^2}{u^3}$

14 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

A is proportional to the product of q, r, and s.

15 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

S is proportional to the product of the squares of t and θ.

16 Write an equation that expresses the statement. (Use k as the constant of proportionality.)

Q is proportional to the product of the squares of M and u and inversely proportional to the cube of a.

17 Hooke's Law states that the force F needed to keep a spring stretched x units beyond its natural length is directly proportional to x. Here the constant of proportionality is called the **spring constant**.

(a) Write Hooke's Law as an equation. (Use k for the constant of proportionality.)

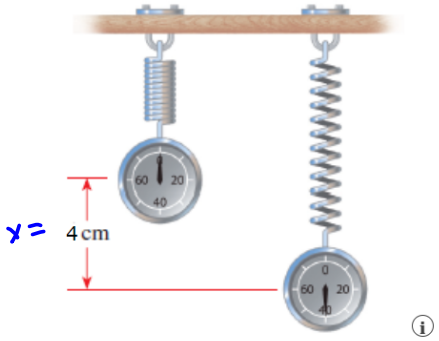
$F = kx$ (for some k)

(b) If a spring has a natural length of 7 cm and a force of 45 N is required to maintain the spring stretched to a length of 11 cm, find the spring constant (in N/cm).

11 cm means we stretched for 7 to 11 cm, i.e., $x = 11-7 = 4$ cm

$F = kx$

$45 = k(4) \Rightarrow k = \frac{45}{4}$ N/cm



$k =$ _____ N/cm $\frac{45}{4}$

(c) What force (in N) is needed to keep the spring stretched to a length of 15 cm?

$L = 15$ cm

$15 - 7 = 8$ cm stretched $= x$

$F = kx$

$F = \frac{45}{4} \cdot 8 = 45 \cdot 2 = 90$ N