

**DIRECT VARIATION**

Learning Targets

1. Identify direct variation from an equation, a table, and a graph.
2. Write linear equations from context (including direct variation).

*Example 1:* The price of a movie is \$8 for a general admission ticket. Write an equation that shows the total price of admission for a group as a function of the number of tickets.

*Example 2:* Each time your heart beats, it pumps approximately 0.06 liter of blood from your heart. Write an equation that shows the Volume of blood (in liters) pumped from your heart is a function of the number of times your heart beats.

Two quantities (we'll use  $x$  and  $y$ ) *vary directly* when there is a nonzero number (let's use  $k$ ) such that

where  $k$  = the constant of variation, and we say that \_\_\_\_\_.  
 ... A Direct Variation Equation is just an equation of a line in slope-intercept form with a  $y$ -intercept of 0.

*Identifying Direct Variation*

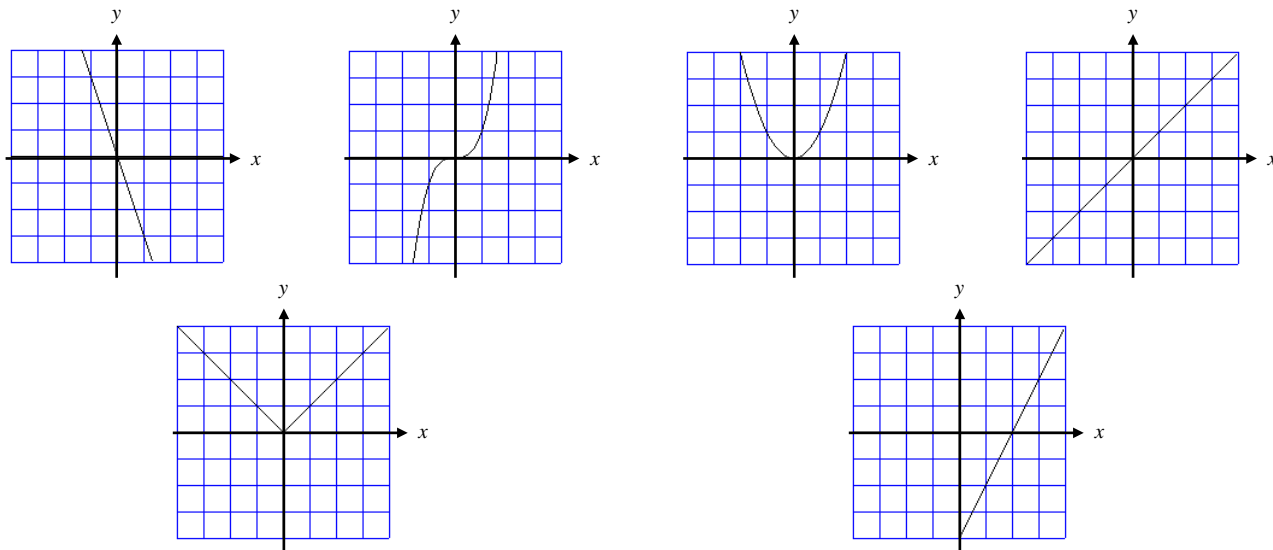
An equation for direct variation looks like \_\_\_\_\_, or if you solve for the constant of variation, \_\_\_\_\_.

*Example 3:* Which equations below show two variables that vary directly. If they do, what is the constant of variation?

- |                |                   |                           |                       |
|----------------|-------------------|---------------------------|-----------------------|
| a) $y = x$     | b) $a = 4d$       | c) $y = \frac{1}{2}x - 8$ | d) $p = \frac{2}{5}q$ |
| e) $y = x - 4$ | f) $m - 0.1n = 0$ | g) $\frac{e}{v} = -2$     | h) $y = 3x^2$         |

*Example 4:* What does the graph of the equation  $y = kx$  (where  $k$  is a constant) look like.

*Example 5:* Identify which of the following graphs show that “ $y$  varies directly with  $x$ ”. How do you know?



*Example 6:* Solve the equation  $y = kx$  for  $k$ .

*Example 7:* Using the solution from the last example, determine whether or not “ $y$  varies directly with  $x$ ” in each table below. Let the left-hand side of each table represent  $x$ , and the right-hand side represent  $y$ .

If the values in the table vary directly, what is the constant of variation? Write the equation that models the situation.

Age of a tree (yrs)	Trunk diameter (in)
2	1.3
4	2.6
5	3.25
7	4.55
10	6.5

Speed (mi/hr)	Wind resistance of a bicyclist (lb)
12	0.41
16	0.72
18	0.91
20	1.12
22	1.36

*Example 8:* Because of refraction, an object 4 cm below the surface of a lake appears to be 3 cm below the surface. The apparent depth varies directly with the actual depth.

- Find the constant of variation.
- Write an equation that models this situation.
- What is the actual depth of a rock that appears to be 5 m below the surface?

*Example 9:* The speed of an object falling from rest is directly proportional to the time it has fallen. After an object has fallen for 2.5 seconds, its speed is 24.5 m/s. What is its speed after it has fallen for 4 seconds?