

Algebra 1      3.6

$$y = k \cdot x$$

$$y = mx$$

Write an equation for a proportional relationship

Write an equation for a nonproportional relationship

linear

slope

constant of variation

y-intercept

directly proportional  
(direct variation)

nonproportional

*something else*

$$y = mx + b$$

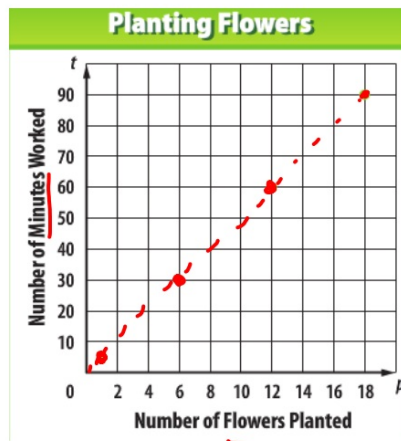
$$y = kx$$

*other*

- Heather is planting flats of flowers. The table shows the number of flowers that she has planted and the amount of time that she has been working in the garden.

Number of flowers planted ( $p$ )	1	6	12	18
Number of minutes working ( $t$ )	5	30	60	90

○  
○



## KeyConcept Proportional Relationship

### Words

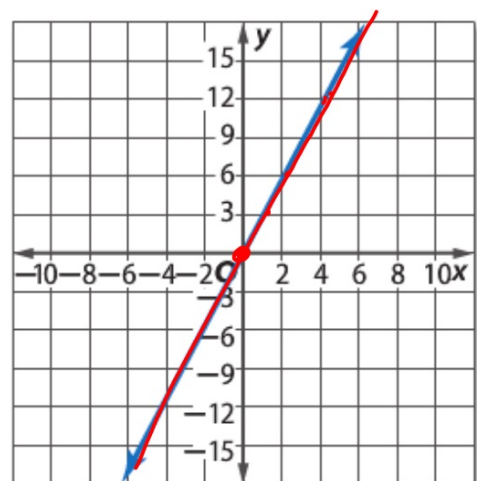
A relationship is proportional if its equation is of the form  $y = kx$ ,  $k \neq 0$ . The graph passes through  $(0, 0)$ .

### Example

$$y = 3x$$

$x$	0	1	2	3	4
$y$	0	3	6	9	12

The ratio of the value of  $x$  to the value of  $y$  is constant when  $x \neq 0$ .



## Real-World Example 1 Proportional Relationships

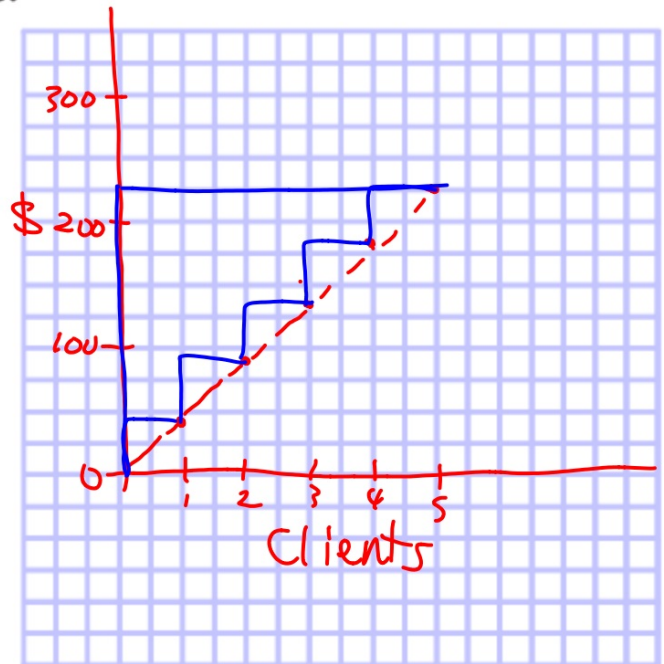


**BONUS PAY** Marcos is a personal trainer at a gym. In addition to his salary, he receives a bonus for each client he sees.

Number of Clients	1	2	3	4	5
Bonus Pay (\$)	45	90	135	180	225

Graph the data. What can you deduce from the pattern about the relationship between the number of clients and the bonus pay?

$$y = 45x$$



## Guided Practice

1. **CHARITY** A professional soccer team is donating money to a local charity for each goal they score.

Number of Goals	1	2	3	4	5
Donation (\$)	75	150	225	300	375

A. Graph the data. What can you deduce from the pattern about the relationship between the number of goals and the money donated?

B. Write an equation to describe this relationship.

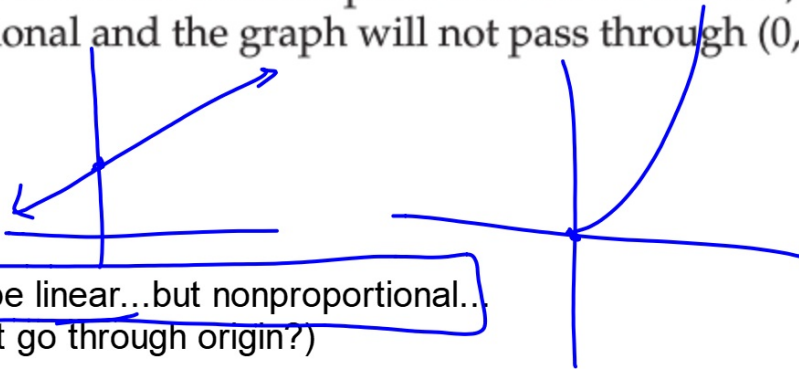
C. Use this equation to predict how much money will be donated for 12 goals.

$$y = 75 \cdot 12 \\ = \$900$$



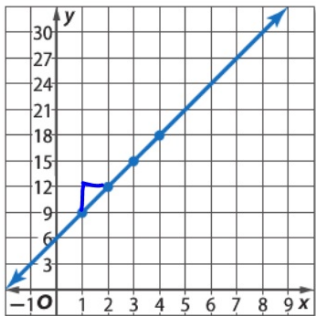
**2 Nonproportional Relationships** Some linear equations can represent a nonproportional relationship. If the ratio of the value of  $x$  to the value of  $y$  is different for select ordered pairs that are on the line, the equation is nonproportional and the graph will not pass through  $(0, 0)$ .

wor



### Example 2 Nonproportional Relationships

Write an equation in function notation for the graph.



$$y = mx + b$$

$$y = 3x + 6$$

$$f(x) = 3x + 6$$

$$y = mx + b$$

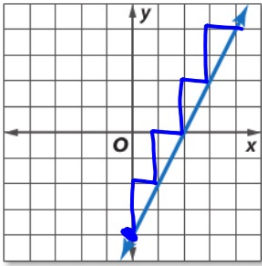
graph

slope

y-intercept

Nonproportional: It can still be a line; it just doesn't pass through (0,0).

B. Write an equation in function notation for the graph.



$$y = mx + B$$
$$\frac{2}{1}x - 4$$
$$f(x) = 2x - 4$$

$$y = mx + b$$



**Guided Practice**

2. Write an equation in function notation for the relation shown in the table.

graph  
slope  
y-intercept

A.

x	1	2	3	4
y	3	2	1	0

$$y = mx + B$$
$$-\frac{1}{1}x + 4$$
$$-1x + 4$$

∴  $f(x) = -x + 4$

