Get out your homework and start checking your answers.

Classwork - Slope Intercept Form (y = mx + b)

Find the slope (constant rate of change) and then write an equation that represents the situation.

1)

Seconds	Meters
3	15
4	20
7	35
9	45
11	55

+1 +3 +2 | +5 +15 +10 +10

$\frac{15}{3} = \frac{5}{1}$ $\frac{10}{2} = \frac{5}{1}$

$m = \frac{5}{1} = 5$

Equation → $y = 5x$

2)

Days, x	5	10	15	20
Height, y	12.5	25	37.5	50

+5 +5 +5 | +12.5 +12.5 +12.5

$\frac{12.5}{5} = \frac{2.5}{1}$

$m = 2.5$ or $\frac{5}{2}$

Equation → $y = 2.5x$

3)

Hours	Miles
3	9
6	18
9	27
12	36
15	45

+3 +3 +3 +3 | +9 +9 +9 +9

$\frac{9}{3} = \frac{3}{1}$

$m = \frac{3}{1} = 3$

Equation → $y = 3x$

4)

Days	Money
10	15
15	22.50
20	30
30	45
35	52.50

+5 +5 +10 +5 | +7.50 +7.50 +15 +7.50

$\frac{7.50}{5} = \frac{1.5}{1}$ $\frac{15}{10} = \frac{3}{2} = \frac{1.5}{1}$

$m = 1.5$ or $\frac{3}{2}$

Equation → $y = 1.5x$

5) Use table below that shows a family's travel to find the slope (constant rate of change) and then write an equation that represents the situation. Then use your equation to answer the following questions.

A) $m =$ 58 Equation → $y = 58x$

		+1	+1	+1
Hours, x	2	3	4	5
Miles, y	116	174	232	290
		+58	+58	+58

B) If the family has driven 6.5 hours, how far have they driven?

$y = 58(6.5)$ $y = 377$ mi

C) How many hours will it take the family to travel 420.5 miles?

$\frac{420.5}{58} = \frac{58x}{58}$ $x = 7.25$ hours

6) Janice planted ornamental grass seeds. After the grass breaks the soil surface, its height varies directly with the number of days. What is the rate of growth? Use the rate to write an equation.

$m =$ 0.75 or 3/4

Equation → $y = 0.75x$

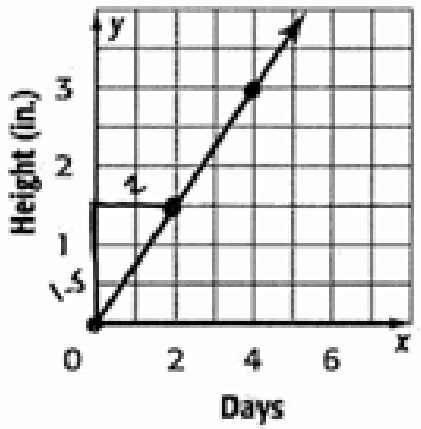
or

$y = \frac{3}{4}x$

$(2, 1.5)$ & $(4, 3)$

$\frac{3 - 1.5}{4 - 2} = \frac{1.5}{2}$

$m = \frac{0.75}{1}$



7) The amount Dusty earns is directly proportional to the number of newspapers he delivers. How much does Dusty earn for each newspaper delivery?

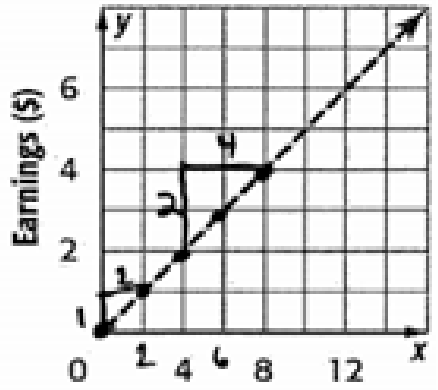
$m =$ 1/2

Equation → $y = \frac{1}{2}x$

or

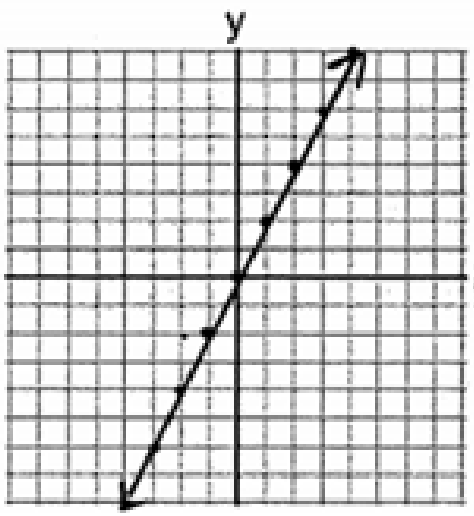
$y = 0.5x$

$m = \frac{2}{4} = \frac{1}{2}$



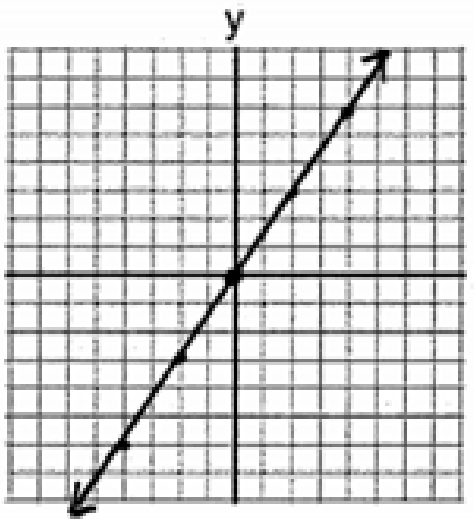
Graph the following equations on the coordinate grid. You can use the table to find points the graph passes through. You can put in positive and negative values for x.

8) $y = 2x$ $m = 2$



x	y
0	0
1	2
2	4
-1	-2
-2	-4
3	6

9) $y = \frac{3}{2}x$ $m = \frac{3}{2}$



x	y
0	0
2	3
-2	-3
4	6
-4	-6
6	9

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Real-World Link

Watch

Football An interception in football is when a defensive player catches a pass made by an offensive player.

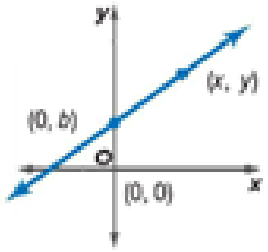
In a nonproportional linear relationship, the graph passes through the point $(0, b)$ or the y-intercept. The **y-intercept** of a line is the y-coordinate of the point where the line crosses the y-axis.

Complete the steps to derive the equation for a nonproportional linear relationship by using the slope formula.

$\frac{\square}{\square} = \square$ Slope formula

$\frac{y - b}{x - 0} = m$ $(x_1, y_1) = (0, b)$

$(x_2, y_2) = (x, y)$



$\frac{\square}{\square} = m$ Simplify.

$y - b = \square \cdot \square$ Multiplication Property of Equality

$y = \square + \square$ Addition Property of Equality

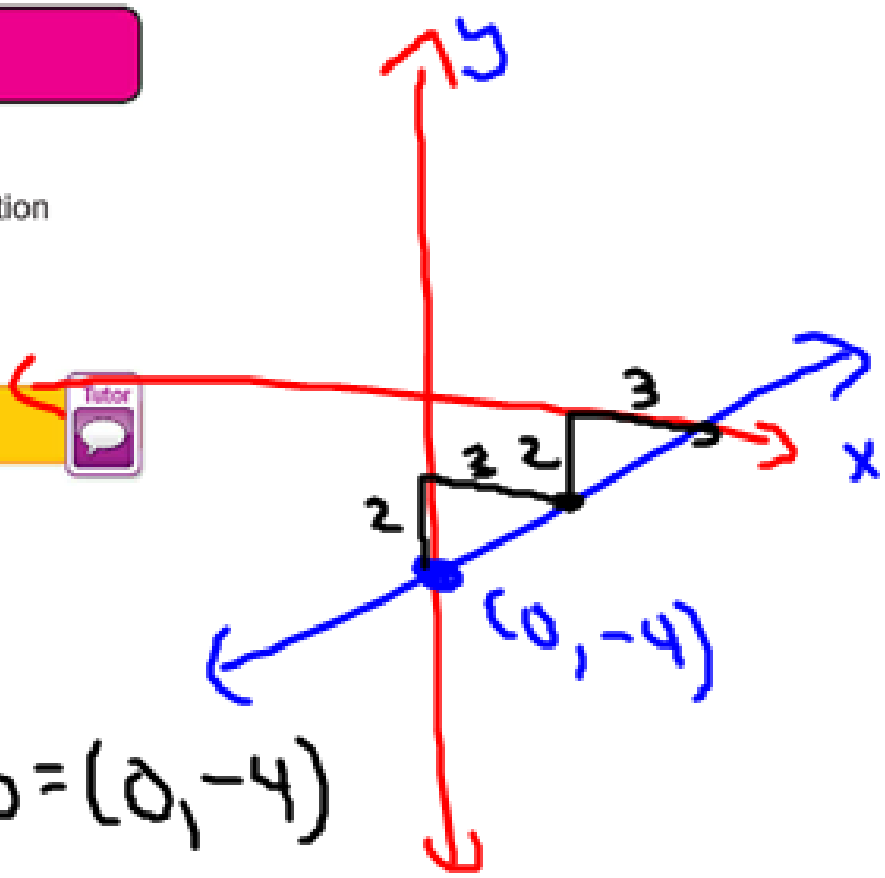
slope — y-intercept

$$y = mx + b$$

How can knowing about an interception in football help you remember the definition of y-intercept?

Slope-Intercept Form of a Line

Nonproportional linear relationships can be written in the form $y = mx + b$. This is called the **slope-intercept form**. When an equation is written in this form, m is the slope and b is the y-intercept.



Examples

1. **State the slope and the y-intercept of the graph of the equation $y = \frac{2}{3}x - 4$.**

$y = \frac{2}{3}x + (-4)$ Write the equation in the form $y = mx + b$.

$y = mx + b$ $m = \frac{2}{3}, b = -4$

$m = 2/3$

$b = (0, -4)$

The slope of the graph is $\frac{2}{3}$, and the y-intercept is -4.

Got it? **Do these problems to find out.**

$y = -1x + 5$

a. $y = -5x + 3$

$m = -5$

$b = (0, 3)$

b. $y = \frac{1}{4}x - 6$

$m = \frac{1}{4}$

$b = (0, -6)$

c. $y = -x + 5$

$m = -1$

$b = (0, 5)$

Examples

Tutor

$y = mx + b$

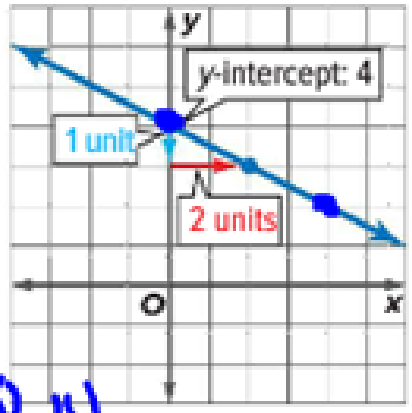
2. **Write an equation of a line in slope-intercept form with a slope of −3 and a *y*-intercept of −4.**

$m = -3$ $b = (0, -4)$

$y = mx + b$	Slope-intercept form
$y = -3x + (-4)$	Replace m with -3 and b with -4.
$y = -3x - 4$	Simplify.

$y = -3x - 4$

3. **Write an equation in slope-intercept form for the graph shown.**



The *y*-intercept is 4. From (0, 4), you move down 1 unit and right 2 units to another point on the line.

So, the slope is $-\frac{1}{2}$.

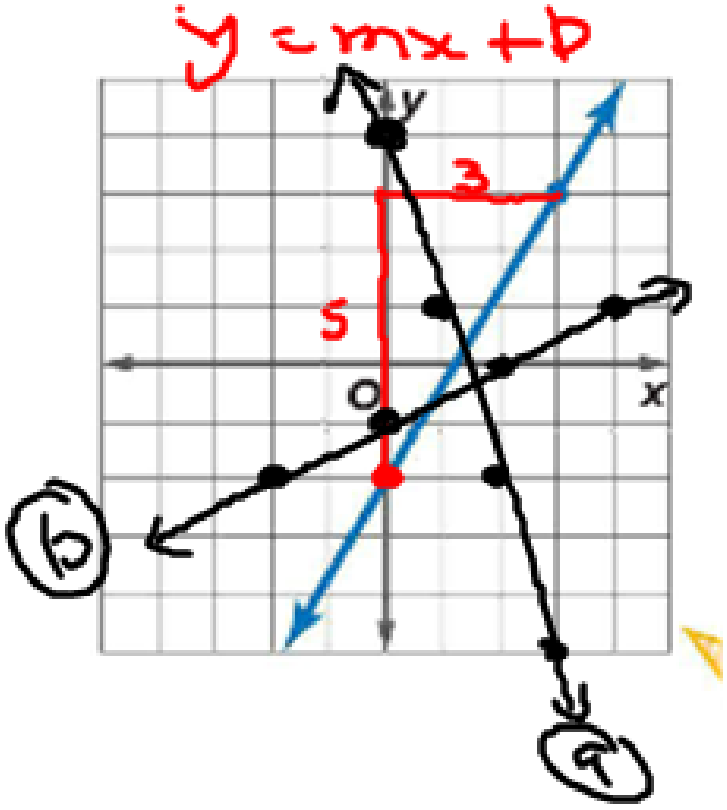
$m = -\frac{1}{2}$ $b = (0, 4)$

$y = mx + b$	Slope-intercept form
$y = -\frac{1}{2}x + 4$	Replace m with $-\frac{1}{2}$ and b with 4.

Got it? **Do these problems to find out.**

d. Write an equation in slope-intercept form for the graph shown.

e. Write an equation of a line in slope-intercept form with a slope of $\frac{3}{4}$ and a *y*-intercept of −3.



Extra Got It?

On the coordinate plane given, graph the equations:

a) y = -3x + 4

b = (0, 4)

m = -3 = $\frac{-3}{1}$

b) y = 1/2x - 1

b = (0, -1)

m = $\frac{1}{2}$

d) m = 5/3 b = (0, -2)

y = 5/3x - 2

e) y = 3/4x - 3

Interpret the *y*-Intercept

When an equation in slope-intercept form applies to a real-world situation, the slope represents the rate of change and the *y*-intercept represents the initial value.

Examples

Watch Tutor

$y = Cost$

$x = \#$ of shirts

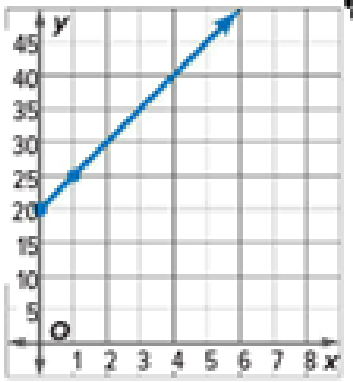
4. **Student Council is selling T-shirts during spirit week. It costs $20 for the design and $5 to print each shirt. The cost *y* to print *x* shirts is given by $y = 5x + 20$. Graph $y = 5x + 20$ using the slope and *y*-intercept.**

Step 1 Find the slope and *y*-intercept.

$y = 5x + 20$ slope $= 5$, *y*-intercept $= 20$

Step 2 Graph the *y*-intercept (0, 20).

Step 3 Write the slope 5 as $\frac{5}{1}$. Use it to locate a second point on the line. Go up 5 units and right 1 unit. Then draw a line through the points.



$b = (0, 20)$

$m = 5 = \frac{5}{1}$

5. **Interpret the slope and the *y*-intercept.**

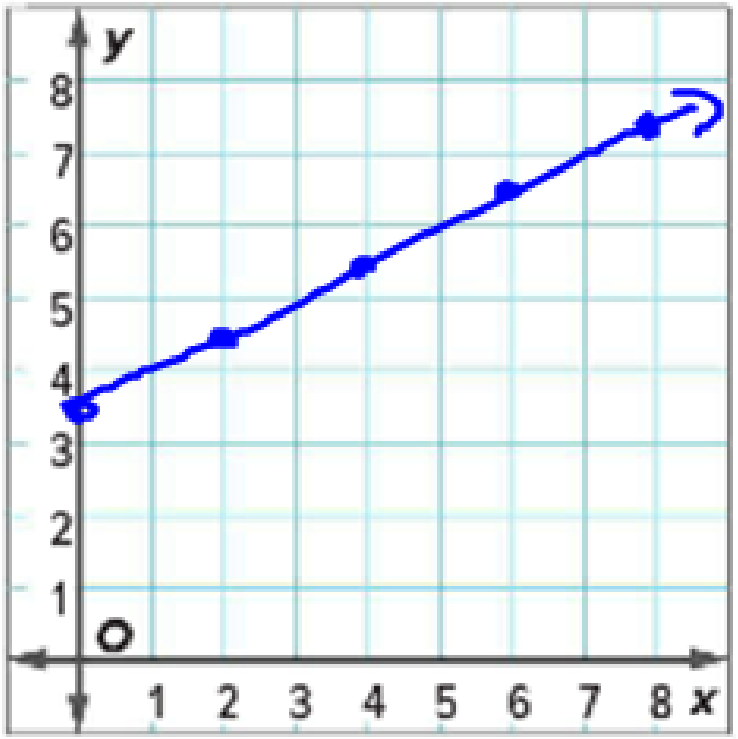
The slope 5 represents the cost in dollars per T-shirt. The *y*-intercept 20 is the one-time charge in dollars for the design.

Got it? Do these problems to find out.

A taxi fare y can be determined by the equation $y = 0.50x + 3.50$, where x is the number of miles traveled.

f. Graph the equation.

g. Interpret the slope and the y-intercept.



b = (0, 3.50)

m = 0.5 or $\frac{1}{2}$