

Lesson 7.1 Slope -intercept form

. Relate linear relations expressed in:

- slope-intercept form ($y = mx + b$)
- general form ($Ax + By + C = 0$)
- slope-point form ($y - y_1 = m(x - x_1)$) to their graphs.

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Chapter
7
Label a Graph

Andrew makes long-distance calls every month. He is creating a graph to track his long-distance bills for the past few months. Drag and drop the labels to correctly label the graph. Use the green handle to rotate the label where necessary.

Andrew's Monthly Long-Distance Costs

Total Call Time (min)

Total Cost (\$)

Pull to here

Answer

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To write the equation of a straight-line graph, you can use the following two constants:

- the rate of change or slope, m
- the y -intercept. If $(0, b)$ is the point where the line crosses the y -axis, then b is the y -intercept.

The equation of a non-vertical straight-line graph can be written in slope-intercept form. The equation is $y = mx + b$, where m represents the slope and b represents the y -intercept.

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For each table of values below, determine the slope (m) and the y -intercept of the line containing the points. Then write the equation of the line in $y = mx + b$ form. Finally, graph the line using calculator technology

Table of Values	Graph	Slope, m	y -intercept, b	Equation, $y = mx + b$								
<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>0</td><td>1</td></tr> <tr><td>1</td><td>3</td></tr> <tr><td>2</td><td>5</td></tr> </table>	x	y	0	1	1	3	2	5		$m = \frac{\Delta y}{\Delta x}$ $m = \frac{2}{1}$ $m = 2$	1	$y = 2x + 1$
x	y											
0	1											
1	3											
2	5											
<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>0</td><td>1</td></tr> <tr><td>2</td><td>2</td></tr> <tr><td>4</td><td>3</td></tr> </table>	x	y	0	1	2	2	4	3		$m = \frac{\Delta y}{\Delta x}$ $m = \frac{1}{2}$	1	$y = \frac{1}{2}x + 1$
x	y											
0	1											
2	2											
4	3											
<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>0</td><td>-1</td></tr> <tr><td>2</td><td>0</td></tr> <tr><td>4</td><td>1</td></tr> </table>	x	y	0	-1	2	0	4	1		$m = \frac{\Delta y}{\Delta x}$ $m = \frac{1}{2}$	-1	$y = \frac{1}{2}x + (-1)$
x	y											
0	-1											
2	0											
4	1											
<table border="1"> <tr><th>x</th><th>y</th></tr> <tr><td>0</td><td>-1</td></tr> <tr><td>1</td><td>-3</td></tr> <tr><td>2</td><td>-5</td></tr> </table>	x	y	0	-1	1	-3	2	-5		$m = \frac{\Delta y}{\Delta x}$ $m = \frac{-2}{1}$ $m = -2$	-1	$y = -2x + (-1)$
x	y											
0	-1											
1	-3											
2	-5											

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Chapter
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Slope-Intercept Form

Using the information from the table, plot the individual data points on the graph. Then, draw a straight line through the points.

Total Call Time (min)	Total Cost (\$)
100	6
300	14
500	22

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Example 1 Write the Equation of a Line in Slope-Intercept Form

a) What are the slope and y-intercept of the line shown in the graph?

$y = mx + b$ \swarrow y -int

Solution

a) The y-intercept is 1. Therefore, $b = 1$.
Using the points (0, 1) and (3, -1), the slope is

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{-1 - 1}{3 - 0}$$

$$m = \frac{-2}{3}$$

What do you know about the slope if the line falls from left to right?

How else could you determine the slope?

$$y = -\frac{2}{3}x + 1$$

b) Write the equation of the line in slope-intercept form, $y = mx + b$.

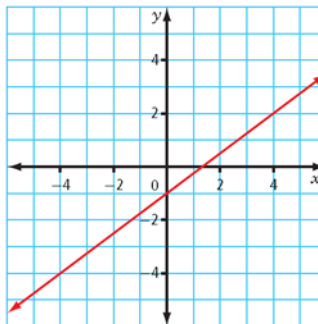
Substitute the values of m and b into the slope-intercept form of an equation, $y = mx + b$
The equation of the line in slope-intercept form is $y = -\frac{2}{3}x + 1$

c) Use graphing technology to check your equation.

How can you confirm that this is the equation of the line that passes through the points (0, 1) and (3, -1)?

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- a) What are the slope and y -intercept of the line shown in the graph?



- b) What is the equation of the line in slope-intercept form, $y = mx + b$?

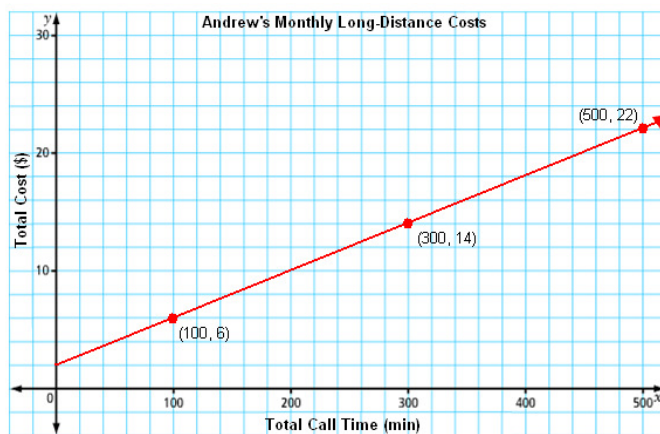
- c) Use graphing technology to check your equation.

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Chapter 7

Slope-Intercept Form

Using the rise and run of the graph to determine the y -intercept of the line.



[Click here for the answer](#)

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Chapter
7
Slope-Intercept Form

**Determine the slope of the line.
Write your solution in the box.**

[Click here to reveal the answer.](#)

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$3x - 2y - 600 = 0$
 $3x - 600 = 2y$
 $\frac{3x - 600}{2} = \frac{2y}{2}$
 $\frac{3}{2}x - 300 = y$

$y = \frac{3}{2}x - 300$

Example 2 Convert an Equation to Slope-Intercept Form
 A student's council rents a portable dunk tank as a fund-raising activity. Students pay for the chance to hit a target with a ball and dunk a teacher into a tank of water.

The relationship between the number of balls thrown, x , and the profit, y , in dollars, may be represented by the equation $3x - 2y - 600 = 0$.

a) Rewrite the equation in slope-intercept form.
Solution
 a) Rearrange the equation into the form $y = mx + b$. To do this, isolate the variable y .
 $3x - 2y - 600 = 0$
 $3x - 2y - 600 + 2y = 0 + 2y$
 $3x - 600 = 2y$
 $\frac{3}{2}x - 300 = y$

b) State the slope of the line. What does the slope represent?
Solution
 The slope of the line is $\frac{3}{2}$ or 1.5. It represents income of \$1.50 per ball. The slope is positive because the money is coming in.

c) Identify the y -intercept. What does it represent?
Solution
 The y -intercept is -300 . It represents a cost of \$300 to rent the portable dunk tank. It is negative because the money is paid out as an expense.

d) The break-even point is the point at which the money raised equals the money spent. How many balls must the students sell to reach the break-even point?
Solution
 At the break-even point, students do not make or lose money. So, the profit is zero.
 Substitute $y = 0$ into the equation and solve for x .
 $y = \frac{3}{2}x - 300$
 $0 = \frac{3}{2}x - 300$
 $300 = \frac{3}{2}x$
 $600 = 3x$
 $200 = x$

To reach the break-even point, they must sell 200 balls, at a rate of \$1.50 per ball. They will make money if they sell more than 200 balls.
 They lose money if they sell fewer than 200 balls.

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Example 3 Model and Solve a Problem Using an Equation in Slope-Intercept Form

Submarines must withstand tremendous pressure exerted on all sides by the water. The table shows the linear relationship between pressure and water depth.

a) Sketch a graph of the data

Depth (m)	Pressure (kPa)
0	100
25	350
50	600
75	850

b) What is the slope of the line? What does it represent?

$m = \frac{\Delta y}{\Delta x}$
 $m = \frac{250}{25}$
 $m = 10$

The slope of the line is 10. This means that for every metre you descend, the pressure increases by 10 kPa.

c) Determine the value of the parameter b . What does this value represent?

Solution
 The parameter, b , represents the y-intercept, which is equal to 100. The air pressure is 100 kPa at the surface of the water, where water depth is 0 m.

d) Write an equation that models the relationship between pressure, P , in kilopascals, and water depth, d , in metres. Express the equation in slope-intercept form.

Solution
 Substitute $m = 10$ and $b = 100$ into $y = mx + b$.
 $y = 10x + 100$
 If P represents pressure and d represents depth, then the equation of the line is $P = 10d + 100$.

e) The deepest point on Earth is Challenger Deep in the Mariana Trench. This trench is located in the Pacific Ocean. In 1960, the research submarine *Triton* reached the bottom of Challenger Deep. At this depth, the walls protecting the two crew members had to withstand a pressure of 109 300 kPa. What is the approximate depth of Challenger?

Solution
 Substitute 109 300 for P .
 $P = 10d + 100$
 $109\ 300 = 10d + 100$
 $109\ 200 = 10d$
 $10\ 920 = d$
 The approximate depth of Challenger Deep is 10 920 m.

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 Odd letters for #1,3,5, 6, 8, 9, 10, all letters for #13, ch 19

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