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 ($y - y1 = m(x - x1)$)) to their graphs.

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Label a Graph

Chapter 7

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, $y = mx + b$
x: 0, 1·, 2 / y: 1, 3, 5		$m = \dfrac{\Delta y}{\Delta x}$ $m = \dfrac{2}{1}$ $m = 2$	1	$y = 2x + 1$
x: 0, 2, 4 / y: 1, 2, 3		$m = \dfrac{\Delta y}{\Delta x}$ $m = \dfrac{1}{2}$	1	$y = \dfrac{1}{2}x + 1$
x: 0, 2, 4 / y: −1, 0, 1		$m = \dfrac{\Delta y}{\Delta x}$ $m = \dfrac{1}{2}$	−1	$y = \dfrac{1}{2}x + (-1)$
x: 0, 1, 2 / y: −1, −3, −5		$m = \dfrac{\Delta y}{\Delta x}$ $m = \dfrac{-2}{1}$ $m = -2$	−1	$y = -2x + (-1)$

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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

Andrew's Monthly Long-Distance Costs

Click here for the answer

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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?

$y = mx + b$ ← y-int

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

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

$0, 1$ — x_1, y_1
$3, -1$ — x_2, y_2

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

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

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

How else could you determine the slope?

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

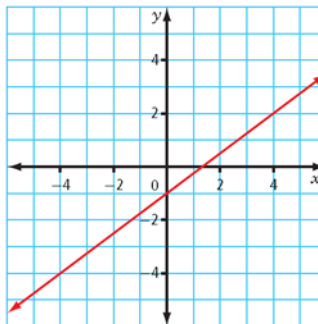**b)** Write the equation of the line in slope-intercept form, $y = mx + b$.

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?

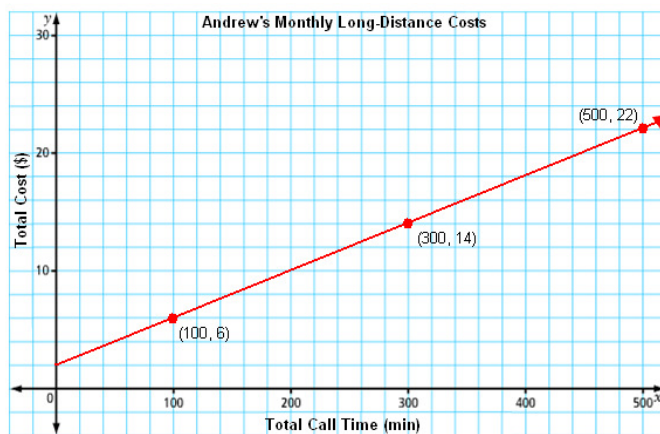**b)** What is the equation of the line in slope-intercept form, $y = mx + b$?

c) Use graphing technology to check your equation.

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Slope-Intercept Form

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

Andrew's Monthly Long-Distance Costs

(500, 22)

(300, 14)

(100, 6)

Total Cost ($)

Total Call Time (min)

Click here for the answer

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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

$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{(600 - 350)}{50 - 25}$$

$$\frac{250}{25} = 10$$

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

$$m = \frac{\Delta p}{\Delta x}$$

$$m = \frac{250}{25}$$

$$y = 10x + 100$$

$$m = 10$$

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 *Trieste* 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.
$P = 10d + 100$
$109\,300 = 10d + 100$ -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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