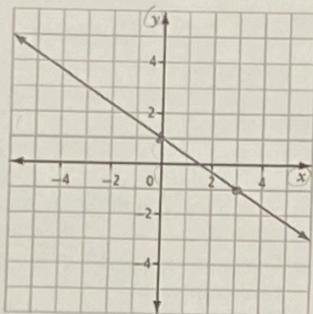


Example 1 Write the Equation of a Line in Slope-Intercept Form

- What are the slope and y-intercept of the line shown in the graph?
- Write the equation of the line in slope-intercept form, $y = mx + b$.
- Use graphing technology to check your equation.



a) $m = \frac{\Delta y}{\Delta x} = \frac{-2}{3}$

$b = +1$

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

Example 2 Convert an Equation to Slope-Intercept Form

A students' 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 $3x - 2y - 600 = 0$.

- Rewrite the equation in slope-intercept form.
- State the slope of the line. What does the slope represent?
- Identify the y-intercept. What does it represent?
- 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?

7.1 Slope-Intercept Form

Format

$$y = mx + b$$

where x & y are variables
 and m & b are specific parameters.

$m =$ slope

- change in y

change in x

- $\frac{\Delta y}{\Delta x}$

Δx

- rise

run

- charge per item

$b =$ y-intercept

- value of y when $x = 0$

- where the graph crosses the y-axis

- base fee

Ex 2. $y = mx + b$

a) $3x - 2y - 600 = 0$
 $+2y \quad +2y$

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

$$1.5x - 300 = y$$

$$y = 1.5x - 300$$

b) $m = 1.5$ \rightarrow It cost \$1.50/ball

c) $b = -300$ \rightarrow The cost of renting dunk tank

d) $y_{\text{MUST}} = 0$

$$y = 1.5x - 300$$

$$0 = 1.5x - 300$$

$$+300$$

$$+300$$

$$300 = 1.5x$$

$$\frac{300}{1.5} = \frac{1.5x}{1.5}$$

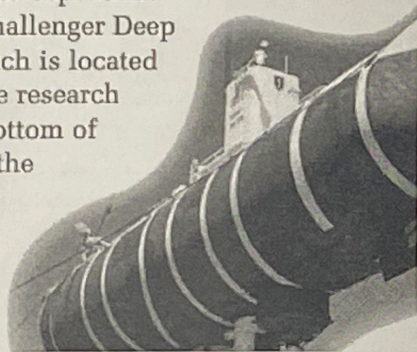
$x = 200$ balls to break even.

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.

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

- Sketch a graph of the data.
- What is the slope of the line? What does it represent?
- Determine the value of the **parameter** b . What does this value represent?
- 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.
- 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 Deep?



$$b) \frac{\Delta y}{\Delta x} \rightarrow \frac{\Delta P}{\Delta d} = \frac{350 - 100}{25 - 0}$$

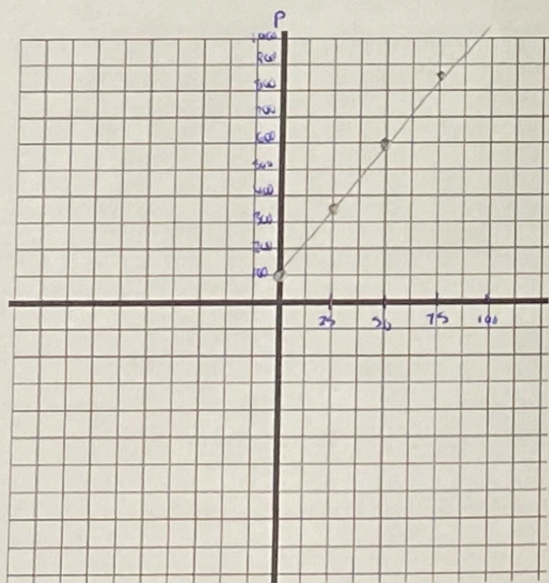
$$= \frac{250}{25}$$

$$= 10 \text{ kPa/m}$$

c) $b = +100$
Typical pressure asserted on humans

$$d) y = mx + b$$

$$P = 10d + 100$$



$$e) P = 10d + 100$$

$$109300 = 10d + 100$$

$$-100 \quad -100$$

$$\frac{109200}{10} = \frac{10d}{10}$$

$$10920 = d$$

Depth of Challenger Deep is 10 920 m.

Example 4 Determine an Unknown Parameter

An archaeologist simulates a First Nations method of boiling water by adding hot rocks to an earthen pit filled with water. As the rocks cool and lose their heat, the archaeologist replaces them with new rocks from the fire.



Cooking in a Fire Pit by Shayne Tolman
Painting on display at Head-Smashed-In Buffalo Jump Interpretive Centre likely represents 2500-year-old Besant culture.

Suppose the water temperature rises at a constant rate. The temperature of the water at the start of the experiment is 10°C .

The equation $W = mt + 10$ models how the temperature of the water, W , in degrees Celsius, increases at a constant rate of m degrees Celsius per minute for t minutes.

- After 5 min, the water temperature is 19°C . Determine the value of the parameter m . What does m represent?
- How long will it take for the water to boil?

$$a) m = \text{slope}$$

$$= \frac{\Delta y}{\Delta x}$$

$$= \frac{W}{t}$$

$$= \frac{19 - 10}{5 - 0}$$

$$= \frac{9}{5}$$

$9^\circ\text{C}/5 \text{ min.}$

$$b) W = mt + 10$$

$$100 = \frac{9}{5}t + 10$$

$$-10 \quad -10$$

$$\left(\frac{5}{9}\right)90 = \frac{9}{5}t \left(\frac{5}{9}\right)$$

$$50 = t$$

$$\frac{90 \cdot 5}{9} = \frac{450}{9}$$

$$= 50$$

It'll take 50 minutes for the water to boil.

