



Another way to determine the solution set of an inequality is to solve it algebraically. To **solve an inequality** means to determine the values of the variable that make the inequality true. The objective when solving an inequality is similar to the objective when solving an equation: You want to isolate the variable on one side of the inequality symbol.

**Let's Solve Algebraically**

In order to earn two \$55 gift cards, Alan's total sales,  $f(b)$ , needs to be at least \$1100. You can set up an inequality and solve it to determine the number of boxes Alan needs to sell.

$$f(b) \geq 1100$$

$$3.75b + 25 \geq 1100$$

Solve the inequality in the same way you would solve an equation.

$$3.75b + 25 \geq 1100$$

$$3.75b + 25 - 25 \geq 1100 - 25$$

$$3.75b \geq 1075$$

$$\frac{3.75b}{3.75} \geq \frac{1075}{3.75}$$

$$b \geq 286.66 \dots$$

Alan needs to sell at least 287 boxes of popcorn to earn two \$55 gift cards.

1. Why was the answer rounded to 287?

You have to sell a “whole number” of boxes, so you round up.



2. Write and solve an inequality for each. Show your work.

a. What is the greatest number of boxes Alan could sell and still not have enough to earn the Cyclone Sprayer? Using the table on page 102, sales of \$600 earns a Cyclone Sprayer.

$$3.75b + 25 < 600$$

$$3.75b < 575$$

$$b < 153.\bar{3}$$

Alan can sell at most 153 boxes of popcorn.



b. At least how many boxes would Alan have to sell to be able to choose his own prize? Using the table, sales of \$1500 let's you choose your own prize.

$$3.75b + 25 \geq 1500$$

$$3.75b \geq 1475$$

$$b \geq 393.\bar{3}$$

Alan needs to sell at least 394 boxes.

## PROBLEM 3 Reversing the Sign

Starting point



Alan's camping troop hikes down from their campsite at an elevation of 4800 feet to the bottom of the mountain. They hike down at a rate of 20 feet per minute.

Rate of change

1. Write a function,  $h(m)$ , to show the troop's elevation as a function of time in minutes.

$$h(m) = -20m + 4800$$

2. Analyze the function.

- a. Identify the independent and dependent quantities and their units.

**Independent Quantity (or  $m$ )** = time (in minutes)

**Dependent Quantity (or  $h(m)$ )** = height (in feet)

- b. Identify the rate of change and explain what it means in terms of this problem situation.

**Rate of Change** =  $-20$

The troop hikes down at a rate of 20 feet/minute.

- c. Identify the y-intercept and explain what it means in terms of this problem situation.

**Starting Point or y-intercept** = 4800

The troop starts their hike from a height of 4800 feet.

- d. What is the x-intercept and explain what it means in terms of this problem situation?

$$0 = -20m + 4800$$

$$-4800 = -20m$$

$$240 = m$$

The hikers will be at the base of the mountain in 240 minutes or 4 hours.

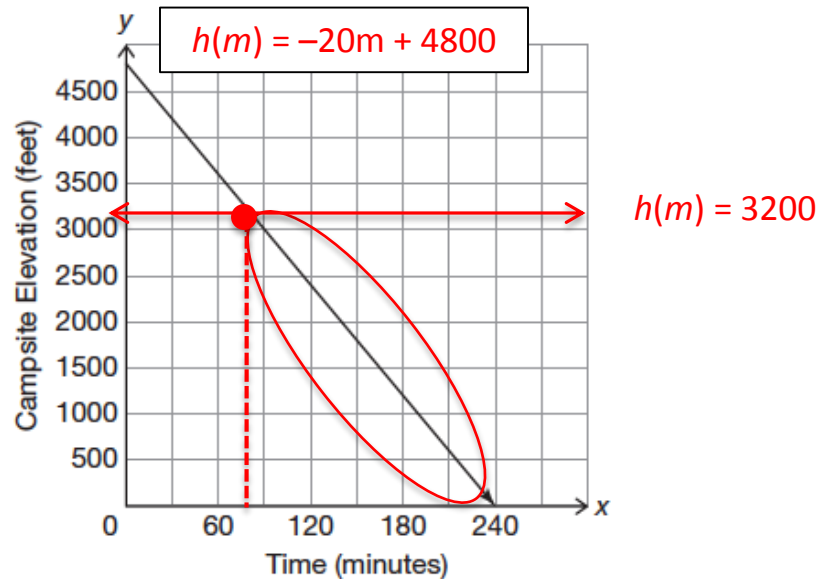
The y-intercept is where the graph crosses the y-axis.



The x-intercept is where the graph crosses the x-axis.



3. Label the function on the coordinate plane.



4. Use the graph to determine how many minutes passed if the troop is below 3200 feet. Draw an oval on the graph to represent this part of the function and write the corresponding inequality statement.

$$m > 80$$

5. Write and solve an inequality to verify the solution set you interpreted from the graph.

$$-20m + 4800 < 3200$$

$$-20m < -1600$$

$$m > 80$$

Flip the inequality sign!

6. Compare and contrast your solution sets using the graph and the function. What do you notice?

The solution sets are the same, but when we solve algebraically we have to flip the signs.



7. Complete the table by writing the corresponding inequality statement that represents the number of minutes for each height.

$h(m)$	$m$
$h(m) > 3200$	$m < 80$
$h(m) \geq 3200$	$m \leq 80$
$h(m) = 3200$	$m = 80$
$h(m) < 3200$	$m > 80$
$h(m) \leq 3200$	$m \geq 80$

Look at the graph on page 108.

- a. Compare each row in the table shown. What do you notice about the inequality signs?

The inequality signs are reversed!



- b. Explain your answer from part (a). Use what you know about solving inequalities when you have to multiply or divide by a negative number.

The negative slope reverses the inequality signs. When you multiply or divide by a negative number you must flip the inequality sign.