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## Positive and Negative Numbers in the Real World

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**Learning Goals:** By the end of this lesson, you will be able to:

- Represent and explain real world situations using integers.
- Apply the meaning of zero to a real world situation.

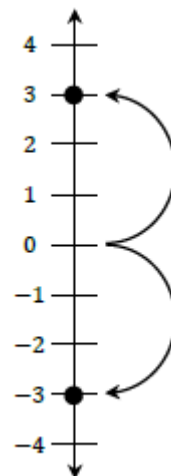
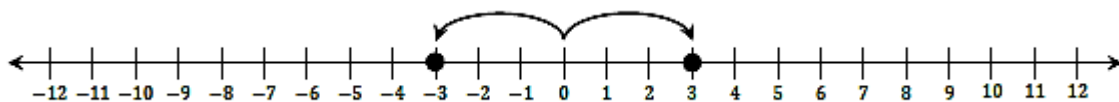
You have been working with adding and subtracting fractions, integers, rational numbers, etc. It is important to understand the real world applications of positive and negative numbers as you will be encountering them throughout the remainder of the Foundations and Algebra 1 Course.

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## Integers on a Number Line & the Meaning of Zero

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The set of whole numbers and their opposites, including zero, are called **integers**.



1. What is the relationship between -3 and 3? How far away are both -3 and 3 from zero?

2. On a horizontal number line, where are negative values located?

3. On a vertical number line, where are positive values located?

4. Circle the larger number:

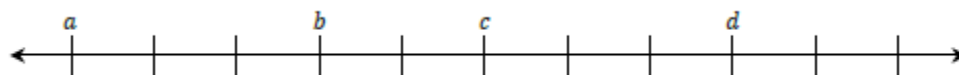
1. -5 or -9

2. -3 or -1

3. -45 or -48

4. -123 or -120

5. Use the number line below to answer the following questions:



a. If zero is located at  $c$ , what are the values of  $a$ ,  $b$ , &  $d$ ?  $a = \underline{\hspace{1cm}}$ ,  $b = \underline{\hspace{1cm}}$ ,  $d = \underline{\hspace{1cm}}$

b. If  $b$  is equal to -24, what are the values of  $a$ ,  $c$ , &  $d$ ?  $a = \underline{\hspace{1cm}}$ ,  $c = \underline{\hspace{1cm}}$ ,  $d = \underline{\hspace{1cm}}$

c. If zero is located between  $a$  and  $d$ , what are possible values for  $a$ ,  $b$ ,  $c$ , and  $d$ ?

$a = \underline{\hspace{1cm}}$ ,  $b = \underline{\hspace{1cm}}$ ,  $c = \underline{\hspace{1cm}}$ ,  $d = \underline{\hspace{1cm}}$

**Scenario #1:** Gretchen and Hilary started a company called Uptown Jewelry. They calculated the company's profit and loss each week. The table shown represents the first 10 weeks of operation. Losses are represented by amounts within parenthesis. Amounts that are not in parenthesis are profits.

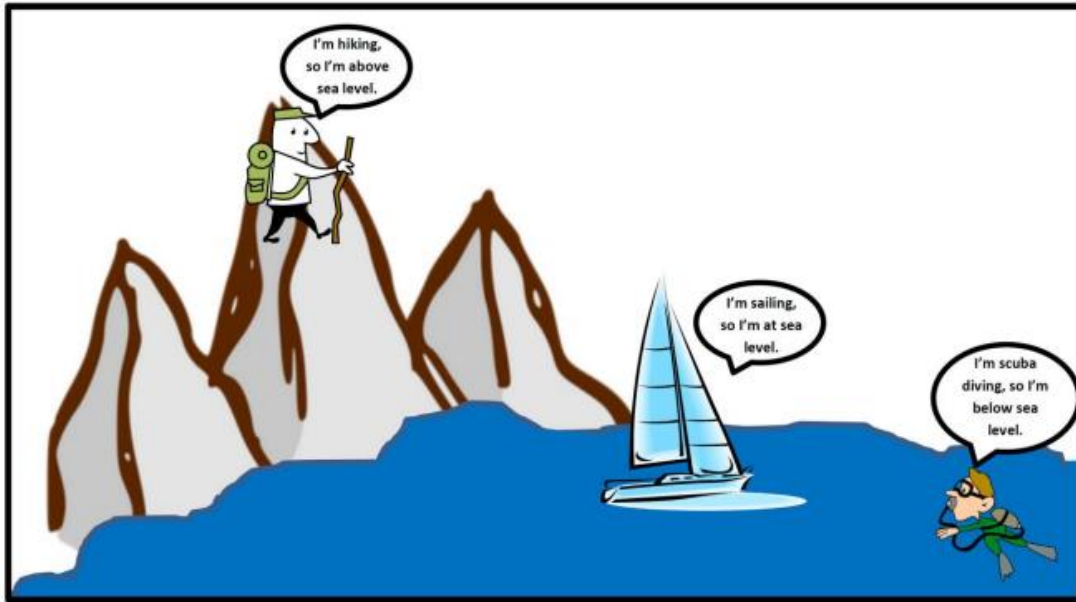
Week	1	2	3	4	5	6	7	8	9	10	Total Profit or Loss
Profit or Loss	\$159	(\$201)	\$231	(\$456)	(\$156)	(\$12)	\$281	\$175	\$192	\$213	

- In which week did Uptown Jewelry show:
  - the largest profit?
  - the largest loss?
  
- Between which two weeks did Uptown Jewelry have:
  - the largest gain in money? By how much?
  - the largest loss in money? By how much?
  
- Calculate the total profit or loss for Uptown Jewelry and record the answer in the table.

**Scenario #2:** For Tim's 15<sup>th</sup> birthday, he received \$150 in cash from his parents. His dad took him to the bank to open a savings account. Tim gave the cash to the banker to deposit into the account. The banker credited Tim's new account \$150 and gave Tim a receipt. One week later Tim deposited another \$25 that he had earned as allowance. The next month, Tim's dad gave him permission to withdraw \$35 to buy a new video game. Tim's dad explained that the bank would charge a \$5 fee for each withdrawal from the savings account and that each withdrawal and charge results in a debit to the account. Complete the table below by documenting each action Tim took with his bank account. How much money does Tim have remaining in his savings account?

Action	Integer	Balance
Opened Bank Account		

**Scenario #3:** The picture below shows three different people participating in activities at three different elevations. What do you think the word elevation means?



Represent each description with an integer:

- a. The scuba diver is 30 feet below sea level. \_\_\_\_\_
- b. The sailor is at sea level. \_\_\_\_\_
- c. The hiker is 10,560 feet above sea level. \_\_\_\_\_

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**Scenario #4:** An office building in downtown Atlanta has 20 floors above ground and 5 floors below ground for parking. Hunter parks on the third floor below ground and works on the 25<sup>th</sup> floor. Julia works on the top floor and parks on the lowest floor. Andrew works on the 15<sup>th</sup> floor but parks on whatever floor he can.

1. Let's look at a day of traveling for **Hunter**:

- a. Hunter decides to go to lunch with Andrew, but needs to go to his car first because he forgot his wallet. How many floors does Hunter go down to get to his car? Explain your reasoning.
  
- b. After Hunter gets his wallet, he goes up to Andrew's office. How many floors does he go up to get to Andrew's office? Explain your reasoning.
  
- c. If Hunter did not go to his car to get his wallet, how many floors would he have to go up or down to get to Andrew's office? Explain your reasoning.
  
- d. Andrew and Hunter go to lunch (which requires going to the 1<sup>st</sup> floor and across the street) and then Hunter returns to his office. How many floors in total did Hunter travel by the time he got back to his office? Explain your reasoning.

2. Let's look at a day of traveling for **Julia**.

a. On Tuesday, Julia eat her lunch at her desk and parks on the fifth level below ground. On Wednesday, she takes the bus to work and decided to go out to lunch. On which days does Julia go up and down the most floors? (A full work day begins when they enter the parking garage and ends when they leave the parking garage). Explain your reasoning.

3. On which level below ground should **Andrew** park if he only wants to go up 19 floors to get to his office?

4. On which level below ground should **Andrew** park if he only wants to travel up and down a total of 32 floors to get to his office and back to his car?

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### Practice

1. Write an integer to describe each situation:

- a. A company loses \$345,000 in 2016. \_\_\_\_\_
- b. You earned \$25 for dog sitting. \_\_\_\_\_
- c. Jacob owes his dad \$5. \_\_\_\_\_
- d. The temperature at the sun's surface is  $5,500^{\circ}\text{C}$ . \_\_\_\_\_
- e. The temperature outside is 4 degrees below zero. \_\_\_\_\_
- f. A football player lost 10 yards when tackled. \_\_\_\_\_
- g. Jose dove 25 feet into the water. \_\_\_\_\_
- h. 14,000 feet above sea level. \_\_\_\_\_
- i. A debit of \$40. \_\_\_\_\_

2. Describe a situation that can be modeled by the integer -15. Explain what zero represents in the situation.

3. Which statement is written correctly?
- a. The depth of the submarine is -800 feet below sea level.
  - b. The depth of the submarine is 800 feet below sea level.

4. Write each word under the appropriate column, "Positive Number" or "Negative Number."

Gain	Loss	Deposit	Credit
Debit	Charge	Withdraw	Owe
Below Zero	Above Ground	Receive	Below Sea Level

Positive Number	Negative Number

5. Can a temperature of -9 degrees be described as "Negative nine degrees below zero?" Why or why not?