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Unit 7, Lesson 1: Positive and Negative Numbers

Let's explore how we represent temperatures and elevations.

1.1: Notice and Wonder: Memphis and Bangor

Memphis, TN
Saturday 5:00 PM
Light Rain Showers



37°F

3°C

Bangor, ME
Saturday 6:00 PM
Partly Cloudy



1°F

-17°C

What do you notice? What do you wonder?

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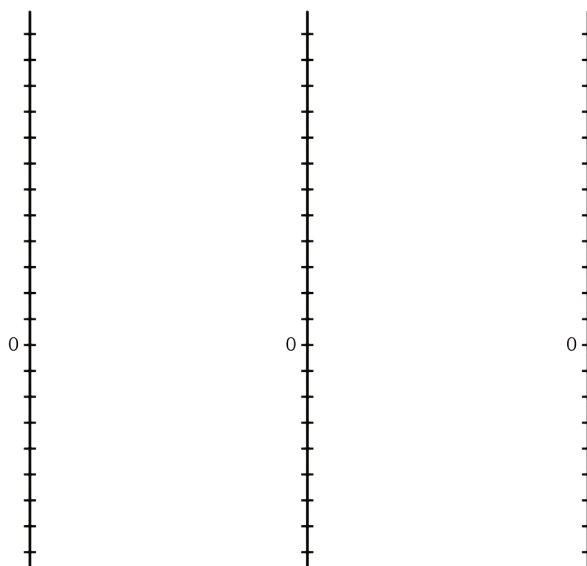
1.2: Above and Below Zero

m.openup.org/1/6-7-1-2



1. Here are three situations involving changes in temperature and three number lines. Represent each change on a number line. Then, answer the question.

- a. At noon, the temperature was 5 degrees Celsius. By late afternoon, it has risen 6 degrees Celsius. What was the temperature late in the afternoon?
- b. The temperature was 8 degrees Celsius at midnight. By dawn, it has dropped 12 degrees Celsius. What was the temperature at dawn?
- c. Water freezes at 0 degrees Celsius, but the freezing temperature can be lowered by adding salt to the water. A student discovered that adding half a cup of salt to a gallon of water lowers its freezing temperature by 7 degrees Celsius. What is the freezing temperature of the gallon of salt water?



2. Discuss with a partner:

- a. How did each of you name the resulting temperature in each situation?
- b. What does it mean when the temperature is above 0? Below 0?
- c. Do numbers less than 0 make sense in other contexts? Give some specific examples to show how they do or do not make sense.

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1.3: High Places, Low Places

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1. Here is a table that shows elevations of various cities.

city	elevation (feet)
Harrisburg, PA	320
Bethell, IN	1,211
Denver, CO	5,280
Coachella, CA	-22
Death Valley, CA	-282
New York City, NY	33
Miami, FL	0

- a. On the list of cities, which city has the second highest elevation?
- b. How would you describe the elevation of Coachella, CA in relation to sea level?
- c. How would you describe the elevation of Death Valley, CA in relation to sea level?
- d. If you are standing on a beach right next to the ocean, what is your elevation?
- e. How would you describe the elevation of Miami, FL?
- f. A city has a higher elevation than Coachella, CA. Select all numbers that could represent the city's elevation. Be prepared to explain your reasoning.

-11 feet -35 feet 4 feet -8 feet 0 feet

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2. Here are two tables that show the elevations of highest points on land and lowest points in the ocean. Distances are measured from sea level.

mountain	continent	elevation (meters)
Everest	Asia	8,848
Kilimanjaro	Africa	5,895
Denali	North America	6,168
Pikchu Pikchu	South America	5,664

trench	ocean	elevation (meters)
Mariana Trench	Pacific	-11,033
Puerto Rico Trench	Atlantic	-8,600
Tonga Trench	Pacific	-10,882
Sunda Trench	Indian	-7,725

- a. Which point in the ocean is the lowest in the world? What is its elevation?
- b. Which mountain is the highest in the world? What is its elevation?
- c. If you plot the elevations of the mountains and trenches on a vertical number line, what would 0 represent? What would points above 0 represent? What about points below 0?
- d. Which is farther from sea level: the deepest point in the ocean, or the top of the highest mountain in the world? Explain.

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Are you ready for more?

A spider spins a web in the following way:

- It starts at sea level.
- It moves up one inch in the first minute.
- It moves down two inches in the second minute.
- It moves up three inches in the third minute.
- It moves down four inches in the fourth minute.

Assuming that the pattern continues, what will the spider's elevation be after an hour has passed?

Lesson 1 Summary

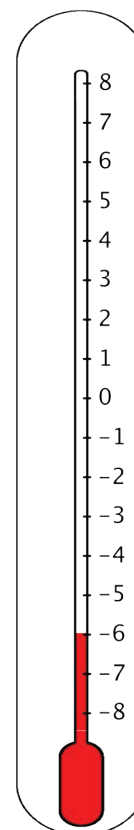
Positive numbers are numbers that are greater than 0.

Negative numbers are numbers that are less than zero. The meaning of a negative number in a context depends on the meaning of zero in that context.

For example, if we measure temperatures in degrees Celsius, then 0 degrees Celsius corresponds to the temperature at which water freezes.

In this context, positive temperatures are warmer than the freezing point and negative temperatures are colder than the freezing point. A temperature of -6 degrees Celsius means that it is 6 degrees away from 0 and it is less than 0. This thermometer shows a temperature of -6 degrees Celsius.

If the temperature rises a few degrees and gets very close to 0 degrees without reaching it, the temperature is still a negative number.

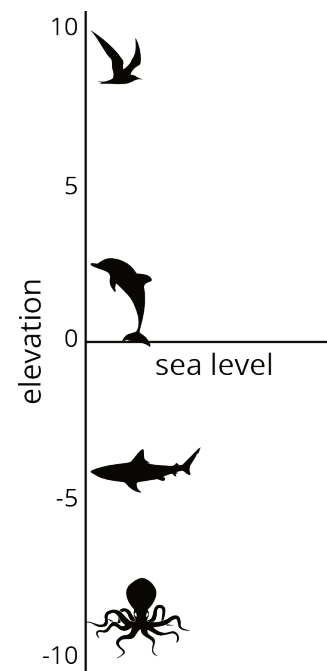


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Another example is elevation, which is a distance above or below sea level. An elevation of 0 refers to the sea level. Positive elevations are higher than sea level, and negative elevations are lower than sea level.



Lesson 1 Glossary Terms

- negative number
- positive number

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Unit 7, Lesson 1: Positive and Negative Numbers

1.
 - a. Is a temperature of -11 degrees warmer or colder than a temperature of -15 degrees?
 - b. Is an elevation of -10 feet closer or farther from the surface of the ocean than an elevation of -8 feet?
 - c. It was 8 degrees at nightfall. The temperature dropped 10 degrees by midnight. What was the temperature at midnight?
 - d. A diver is 25 feet below sea level. After he swims up 15 feet toward the surface, what is his elevation?
2.
 - a. A whale is at the surface of the ocean to breathe. What is the whale's elevation?
 - b. The whale swims down 300 feet to feed. What is the whale's elevation now?
 - c. The whale swims down 150 more feet more. What is the whale's elevation now?
 - d. Plot each of the three elevations as a point on a vertical number line. Label each point with its numeric value.
3. Explain how to calculate a number that is equal to $\frac{2.1}{1.5}$.
(from Unit 6, Lesson 5)
4. Write an equation to represent each situation and then solve the equation.
 - a. Andre drinks 15 ounces of water, which is $\frac{3}{5}$ of a bottle. How much does the bottle hold? Use x for the number of ounces of water the bottle holds.

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b. A bottle holds 15 ounces of water. Jada drank 8.5 ounces of water. How many ounces of water are left in the bottle? Use y for the number of ounces of water left in the bottle.

c. A bottle holds z ounces of water. A second bottle holds 16 ounces, which is $\frac{8}{5}$ times as much water. How much does the first bottle hold?

(from Unit 6, Lesson 4)

5. A rectangle has an area of 24 square units and a side length of $2\frac{3}{4}$ units. Find the other side length of the rectangle. Show your reasoning.

(from Unit 4, Lesson 13)