

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

Bangor, ME
Saturday 6:00 PM
Partly Cloudy

1°F



3°C



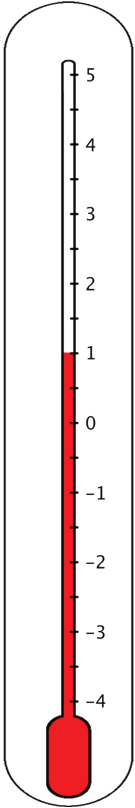
-17°C

What do you notice? What do you wonder?

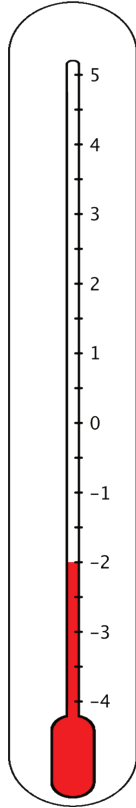
1.2: What's the Temperature?

1. Here are five thermometers. The first four thermometers show temperatures in Celsius. Write the temperatures in the blanks.

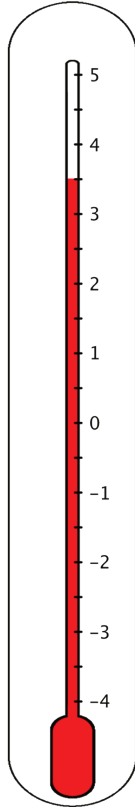
a. _____



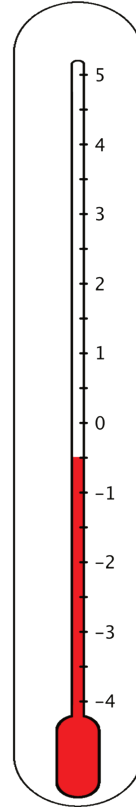
b. _____



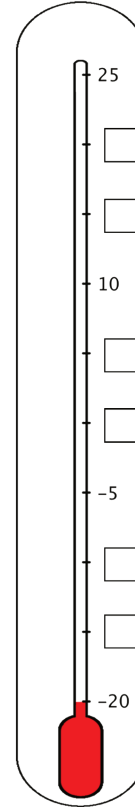
c. _____



d. _____

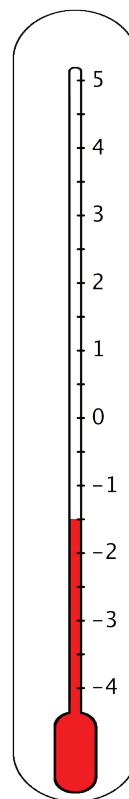


e.



The last thermometer is missing some numbers. Write them in the boxes.

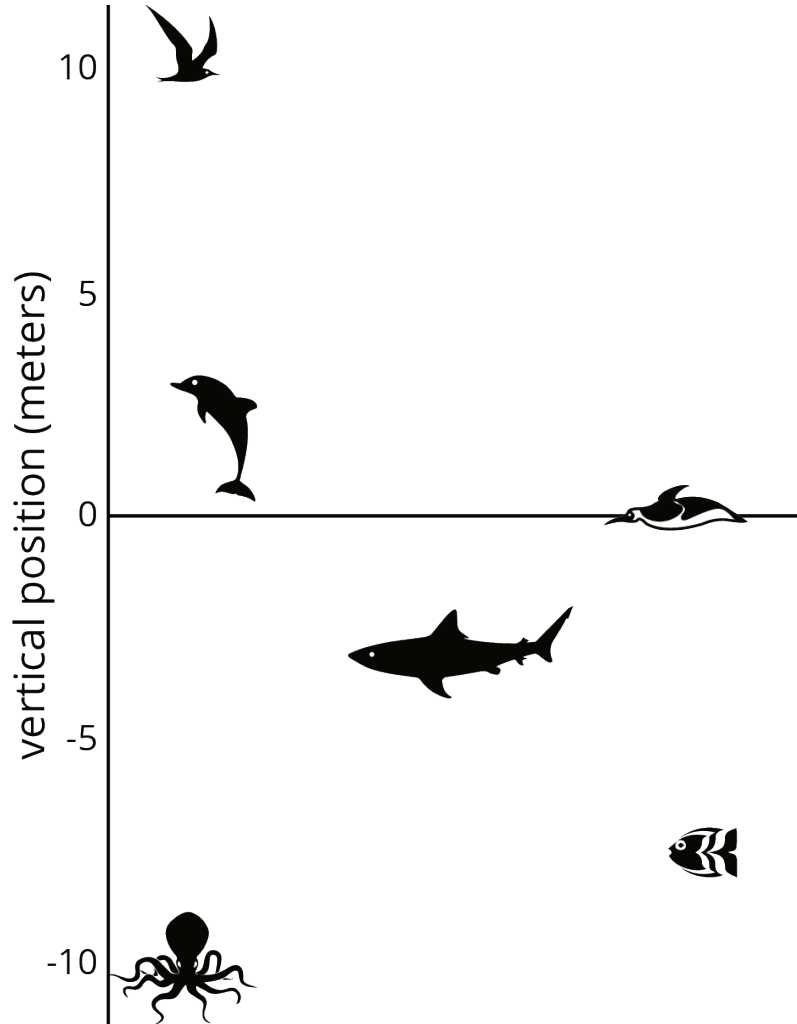
2. Elena says that the thermometer shown here reads -2.5°C because the line of the liquid is above -2°C . Jada says that it is -1.5°C . Do you agree with either one of them? Explain your reasoning.



3. One morning, the temperature in Phoenix, Arizona, was 8°C and the temperature in Portland, Maine, was 12°C cooler. What was the temperature in Portland?

1.3: Seagulls Soar, Sharks Swim

Here is a picture of some sea animals. The number line on the left shows the vertical position of each animal above or below sea level, in meters.



1. How far above or below sea level is each animal? Measure to their eye level.
2. A mobula ray is 3 meters above the surface of the ocean. How does its vertical position compare to the height or depth of:

The jumping dolphin?

The flying seagull?

The octopus?

3. An albatross is 5 meters above the surface of the ocean. How does its vertical position compare to the height or depth of:

The jumping dolphin?

The flying seagull?

The octopus?

4. A clownfish is 2 meters below the surface of the ocean. How does its vertical position compare to the height or depth of:

The jumping dolphin?

The flying seagull?

The octopus?

5. The vertical distance of a new dolphin from the dolphin in the picture is 3 meters. What is its distance from the surface of the ocean?

Are you ready for more?

The north pole is in the middle of the ocean. A person at sea level at the north pole would be 3,949 miles from the center of Earth. The sea floor below the north pole is at an elevation of approximately -2.7 miles. The elevation of the south pole is about 1.7 miles. How far is a person standing on the south pole from a submarine at the sea floor below the north pole?

1.4: High Places, Low Places

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 |

- On the list of cities, which city has the second highest elevation?
- How would you describe the elevation of Coachella, CA in relation to sea level?
- How would you describe the elevation of Death Valley, CA in relation to sea level?
- If you are standing on a beach right next to the ocean, what is your elevation?
- How would you describe the elevation of Miami, FL?
- 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

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 |

- Which point in the ocean is the lowest in the world? What is its elevation?
- Which mountain is the highest in the world? What is its elevation?
- 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?
- Which is farther from sea level: the deepest point in the ocean, or the top of the highest mountain in the world? Explain.

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?

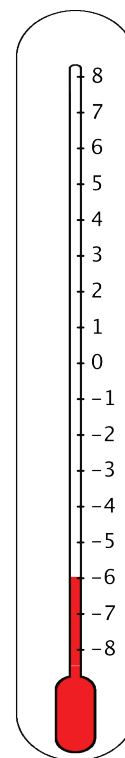
Lesson 1 Summary

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.



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.

