Plan for Unit Grade 7 Unit 5: Rational Number Arithmetic

Relevant Unit(s) to review: Grade 6 Unit 7: Rational Numbers

Essential prior concepts to engage with this unit	• rational numbers • absolute value notation • understanding of the coordinate plane
Brief narrative of approach	Begin by reviewing positive and negative numbers (6.7.1, 6.7.2, 7.5.1), then refresh skills by comparing positive and negative numbers (6.7.2, 6.7.3) and ordering rational numbers (6.7.2, 6.7.5). This leads to a deeper understanding of addition and subtraction of rational numbers. Next, introduce multiplying and dividing rational numbers which will lead to working with expressions that use the four operations on rational numbers. Finally, students will work with linear equations in one variable that have rational number coefficients. The modified unit plan relies on lessons created for the IM 6–8 Math Accelerated course to provide combinations of lessons to provide background material as well as make room for the additional lessons.

Lessons to Add	Lessons to Remove or Modify
1. Combine Positive and Negative Numbers (6.7.1) / Points on the Number Line (6.7.2) / Interpreting Negative Numbers (7.5.1) 2. Comparing Positive and Negative Numbers (6.7.3) 3. Combine Ordering Rational Numbers (6.7.4) / Using Negative Numbers to Make Sense of Contexts (6.7.5) 4. 6.7.6 Absolute Value of Numbers 5. 6.7.7 Comparing Numbers and Distance from Zero	1. Combine Subtracting Rational Numbers (7.5.6) / Adding and Subtracting to Solve Problems (7.5.7) 2. Combine Position, Speed, Direction (7.5.8) / Multiplying Rational Numbers (7.5.9) 3. Combine Multiplying Rational Numbers (7.5.9) / Multiply! (7.5.10) 4. Combine Negative Rates (7.5.12) / Solving Problems with Rational Numbers (7.5.14)

6. Combine Points on the Coordinate Plane (6.7.11) / Constructing the Coordinate Plane (6.7.12) 7. Interpreting Points on a Coordinate Plane (6.7.13) 8. Distances on a Coordinate Plane (6.7.14) / Shapes on the Coordinate Plane (6.7.15)	5. Move 7.5.17 to outside of class. In this culminating lesson on percentages, students work at home to collect news clippings that mention percentages and sort them according to whether they are about percent increase or percent decrease, and formulate questions about them. A discussion could take place in class.
Lessons added: 8	Lessons removed: 5

Modified Plan for Grade 7 Unit 5

Day	IM lesson	Notes
	assessment	7.5 Check Your Readiness assessment Note that the Check Your Readiness assessment includes item-by-item guidance to inform just-in-time adjustments to instruction within the lessons in 7.5.
1	Acc6.7.1	A combination of 6.7.1, 6.7.2, and 7.5.1
2	6.7.3	
3	Acc6.7.3	A combination of 6.7.4 and 6.7.5
4	6.7.6	Focus on **absolute value** and the symbol to refer to a number's distance from zero on the number line.
5	6.7.7	Focus on inequalities to compare rational numbers and the **absolute values** of rational numbers.
6	7.5.2	
7	7.5.3	

8	7.5.4	
9	7.5.5	
10	Acc6.7.10	A combination of 7.5.6 and 7.5.7
11	Acc6.7.11	A combination of 6.7.11 and 6.7.12
12	6.7.13	Focus on identifying and interpreting points on a graph to answer questions about situations involving temperature or money.
13	Acc6.7.13	A combination of 6.7.14 and 6.7.15
14	Acc6.7.14	A combination of 7.5.8 and 7.5.9
15	Acc6.7.15	A combination of 7.5.9 and 7.5.10
16	7.5.11	
17	Acc6.7.17	A combination of 7.5.12 and 7.5.14
18	7.5.13	
19	7.5.15	
20	7.5.16	
21	7.5 End Assessment	

Priority and Category List for Lessons

High priority (+), Medium priority (0), Low priority (-)

E: Explore, Play, and Discuss, D: Deep Dive, A: Synthesize and Apply

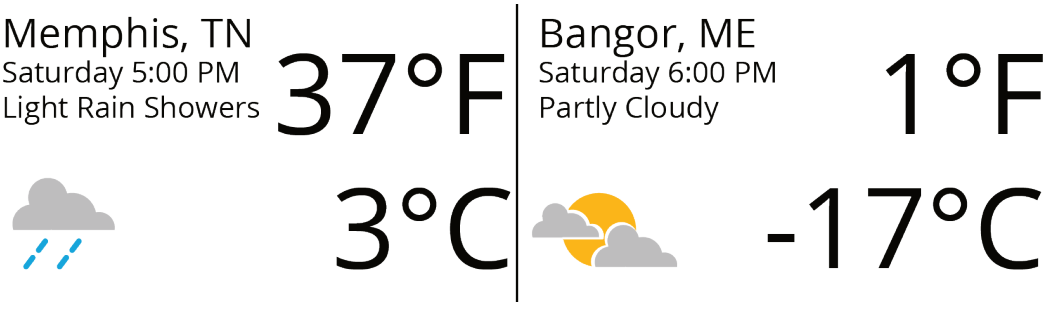
Lesson	Priority (+, 0, -)	Category (E, D, A)	Notes
7.5.1	0	E	In this lesson, students review what they learned about negative numbers in grade 6, including placing them on the number line, comparing and ordering them, and interpreting them in the contexts of temperature and elevation.
7.5.2	+	E	Students represent addition of signed numbers on a number line. Positive addends are represented by arrows that point to the right, and negative addends by arrows that point to the left.
7.5.3	+	E	In this lesson, students build towards fluency with adding signed numbers. They begin with the concrete context of elevations above and below sea level, but then move to more abstract work.
7.5.4	0	D	Students are introduced to using negative numbers in the context of money to represent debts or debits.
7.5.5	0	D	In this lesson, students represent subtraction of signed numbers on a number line by relating it to an addition equation with a missing addend.
7.5.6	+	A	In this lesson, students see that the difference between two numbers can be positive or negative, but the distance between two numbers is always positive. Using the geometry of the number line, they see that if you switch the order in which you subtract two numbers, the difference becomes its opposite.
7.5.7	0	A	The purpose of this lesson is to put students' knowledge about addition and subtraction of signed numbers to use in real-life contexts.

7.5.8	+	E	In this lesson, students are introduced to multiplying a negative number with a positive number, using the context of velocity, time, and position.
7.5.9	+	E	The purpose of this lesson is to develop the rules for multiplying two negative numbers. Students use the familiar fact that $distance = velocity \times time$ to make sense of this rule. They interpret negative time as the time before a chosen starting time and then figure out what the position is of an object moving with a negative velocity at a negative time.
7.5.10	-	D	The purpose of this optional lesson is to provide students with practice multiplying **rational numbers**.
7.5.11	+	D	In this lesson, students complete their work extending all four operations to signed numbers by studying division. They use the relationship between multiplication and division to develop rules for dividing signed numbers.
7.5.12	+	A	The purpose of this lesson is to introduce students to negative rates of change, which will become important when they start learning about linear functions in later lessons. Students apply their understanding of operating with signed numbers to solve problems in context.
7.5.13	0	D	As students start to gain fluency with rational number arithmetic, they encounter complicated numerical expressions and algebraic expressions with **variables** in this lesson.
7.5.14	+	A	In this lesson students put together what they have learned about rational number arithmetic and the interpretation of negative quantities, such as negative time or negative rates of change.
7.5.15	+	D	The purpose of this lesson is to get students thinking about how to solve equations involving rational numbers. In grade 6, students solved equations of the form $px = q$ and $x + p = q$ and saw that additive and multiplicative inverses (opposites and reciprocals) were useful for solving them. However, that work in grade 6 did not include equations with negative values of p or q or with negative **solutions**. This lesson builds on the ideas of the last lesson and brings together the work on equations in grade 6 with the work on operations on rational numbers from earlier in grade 7.

7.5.16	0	A	In the previous lesson, students looked at methods for solving equations with rational numbers. In this lesson, students choose equations that represent a context and write their own equations given a context. Students are also encouraged to look at the structure of an equation and decide if its solution is positive or negative, without solving it.
7.5.17	-	A	In the previous unit, students worked with percent increase and decrease. In this lesson, students see how signed numbers can be applied to representing changes in the stock market.

Lesson 1: Positive and Negative Numbers

1.1: Notice and Wonder: Memphis and Bangor



What do you notice? What do you wonder?

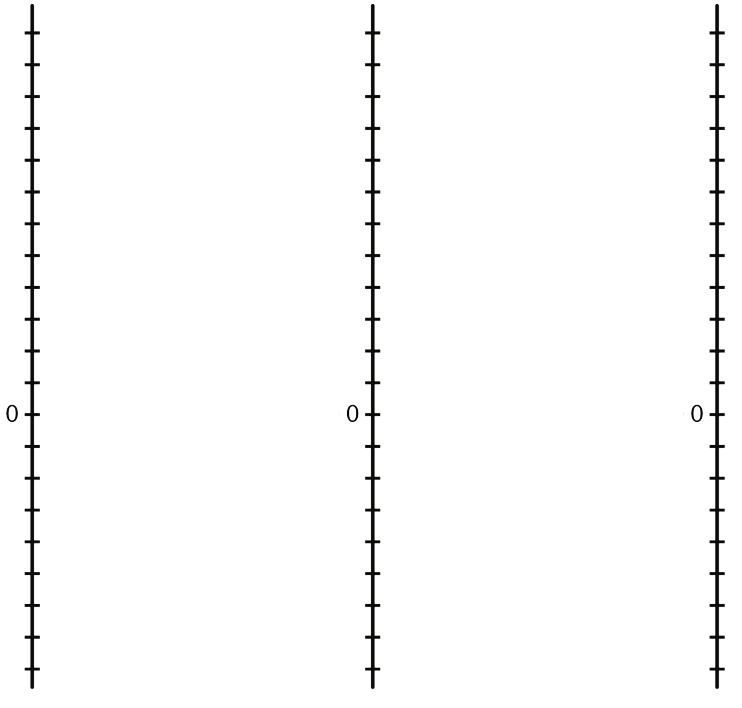
1.2: Above and Below Zero

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.

1.3: 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

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

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.

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?

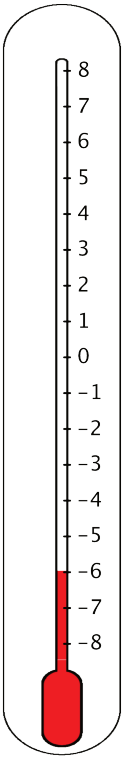
Lesson 1 Summary

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.

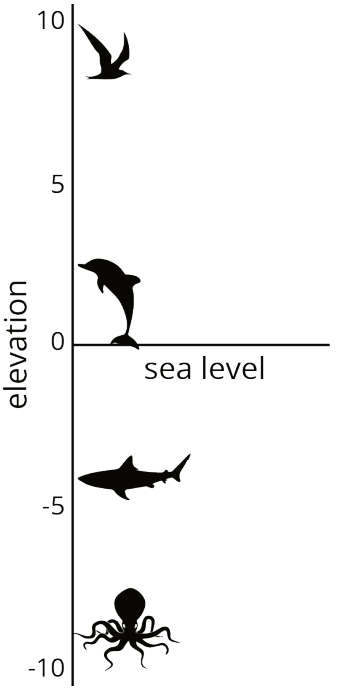
For example, if we measure temperatures in degrees Celsius, then 0 degrees Celsius corresponds to the temperature at which water freezes.

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.



Lesson 1: Positive and Negative Numbers

Cool Down: Agree or Disagree?

State whether you agree with each of the following statements. Explain your reasoning.

1. A temperature of 35 degrees Fahrenheit is as cold as a temperature of -35 degrees Fahrenheit.

2. A city that has an elevation of 15 meters is closer to sea level than a city that has an elevation of -10 meters.

3. A city that has an elevation of -17 meters is closer to sea level than a city that has an elevation of -40 meters.

Unit 7 Lesson 1 Cumulative Practice Problems

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.

   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.)

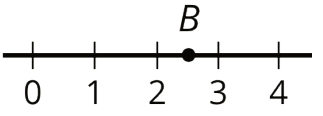
5. A rectangle has an area of 24 square units and a side length of $2\frac{3}{4}$ units. Find the other side length of the rectangle. Show your reasoning.

   (From Unit 4, Lesson 13.)

Lesson 2: Points on the Number Line

2.1: A Point on the Number Line

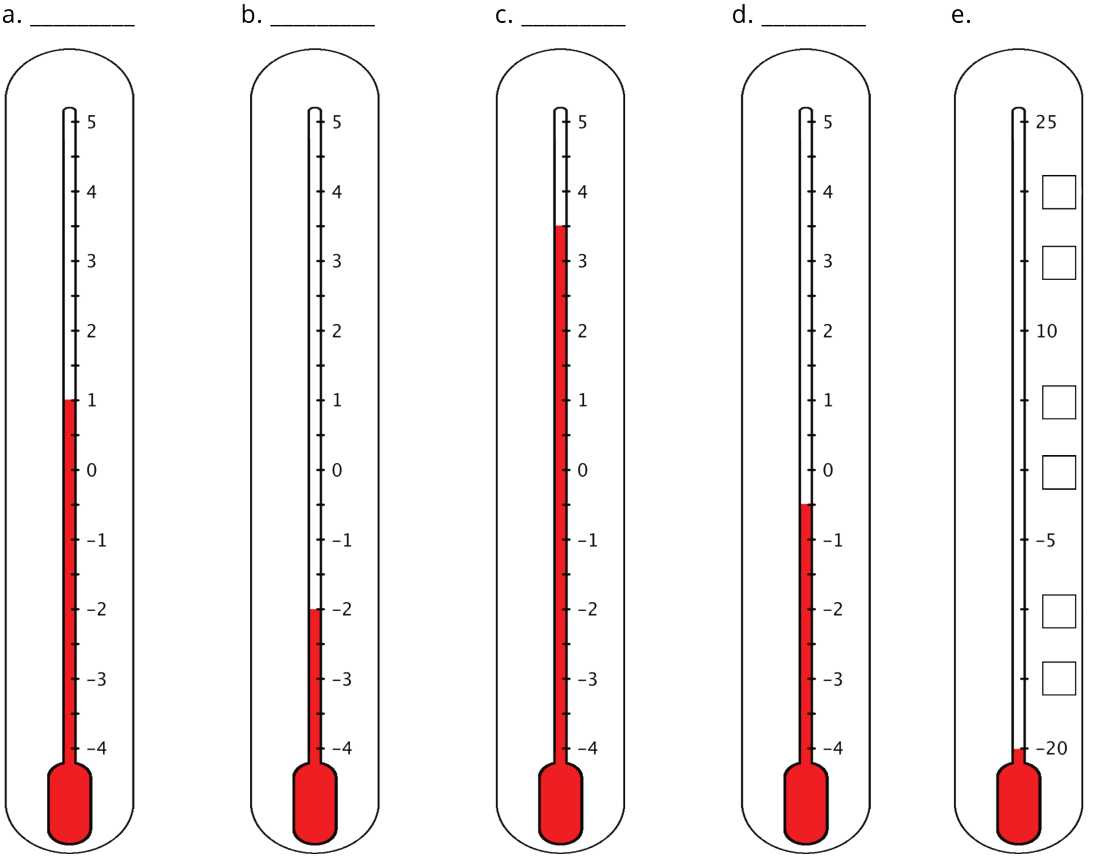
Which of the following numbers could be B?



2.5 $\frac{2}{5}$ $\frac{5}{2}$ $\frac{25}{10}$ 2.49

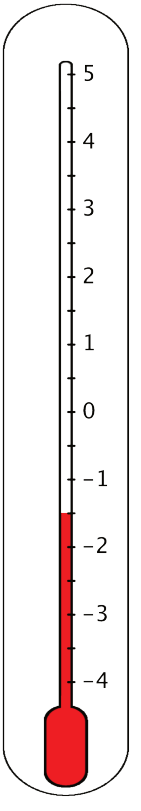
2.2: What's the Temperature?

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



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

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



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

2.3: Folded Number Lines

Your teacher will give you a sheet of tracing paper on which to draw a number line.

1. Follow the steps to make your own number line.
    - Use a straightedge or a ruler to draw a horizontal line. Mark the middle point of the line and label it 0.
    - To the right of 0, draw tick marks that are 1 centimeter apart. Label the tick marks 1, 2, 3. . . 10. This represents the positive side of your number line.
    - Fold your paper so that a vertical crease goes through 0 and the two sides of the number line match up perfectly.
    - Use the fold to help you trace the tick marks that you already drew onto the opposite side of the number line. Unfold and label the tick marks -1, -2, -3. . . -10. This represents the negative side of your number line.

2. Use your number line to answer these questions:

   a. Which number is the same distance away from zero as is the number 4?

   b. Which number is the same distance away from zero as is the number -7?

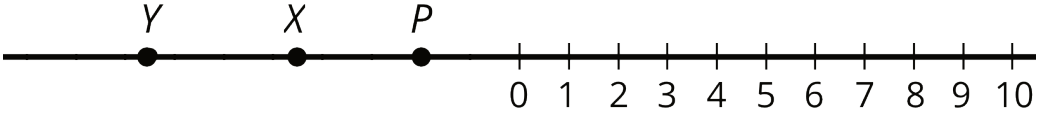
   c. Two numbers that are the same distance from zero on the number line are called **opposites**. Find another pair of opposites on the number line.

   d. Determine how far away the number 5 is from 0. Then, choose a positive number and a negative number that is each farther away from zero than is the number 5.

   e. Determine how far away the number -2 is from 0. Then, choose a positive number and a negative number that is each farther away from zero than is the number -2.

   Pause here so your teacher can review your work.

3. Here is a number line with some points labeled with letters. Determine the location of points P, X, and Y.



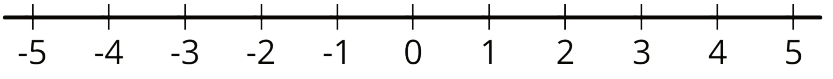
   If you get stuck, trace the number line and points onto a sheet of tracing paper, fold it so that a vertical crease goes through 0, and use the folded number line to help you find the unknown values.

Are you ready for more?

At noon, the temperatures in Portland, Maine, and Phoenix, Arizona, had opposite values. The temperature in Portland was 18°C lower than in Phoenix. What was the temperature in each city? Explain your reasoning.

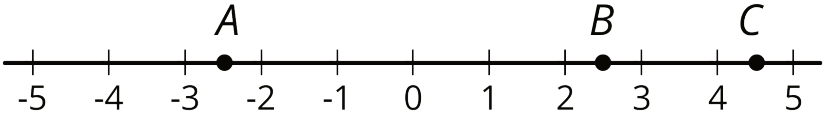
Lesson 2 Summary

Here is a number line labeled with positive and negative numbers. The number 4 is positive, so its location is 4 units to the right of 0 on the number line. The number -1.1 is negative, so its location is 1.1 units to the left of 0 on the number line.



We say that the *opposite* of 8.3 is -8.3, and that the *opposite* of $\frac{-3}{2}$ is $\frac{3}{2}$. Any pair of numbers that are equally far from 0 are called **opposites**.

Points A and B are opposites because they are both 2.5 units away from 0, even though A is to the left of 0 and B is to the right of 0.



A positive number has a negative number for its opposite. A negative number has a positive number for its opposite. The opposite of 0 is itself.

You have worked with positive numbers for many years. All of the positive numbers you have seen—whole and non-whole numbers—can be thought of as fractions and can be located on a the number line.

To locate a non-whole number on a number line, we can divide the distance between two whole numbers into fractional parts and then count the number of parts. For example, 2.7 can be written as $2\frac{7}{10}$. The segment between 2 and 3 can be partitioned into 10 equal parts or 10 tenths. From 2, we can count 7 of the tenths to locate 2.7 on the number line.

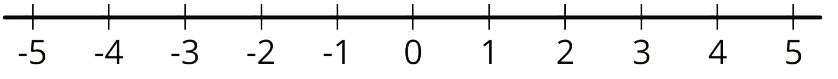
All of the fractions and their opposites are what we call **rational numbers**. For example, 4, -1.1, 8.3, -8.3, $\frac{-3}{2}$, and $\frac{3}{2}$ are all rational numbers.

Lesson 2: Points on the Number Line

Cool Down: Positive, Negative, and Opposite

1. Put these numbers in order, from least to greatest. If you get stuck, consider using the number line.

3.5 -1 4.8 -1.5 -0.5 -4.2 0.5 -2.1 -3.5



2. Write two numbers that are opposites and each more than 6 units away from 0.

Unit 7 Lesson 2 Cumulative Practice Problems

1. For each number, name its opposite.

   a. -5

   b. 28

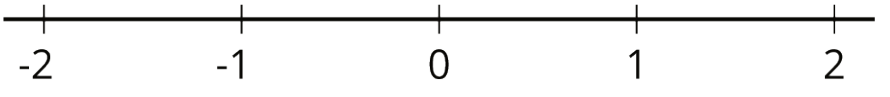
   c. -10.4

   a. 0.875

   b. 0

   c. -8,003

2. Plot the numbers -1.5, $\frac{3}{2}$, $-\frac{3}{2}$, and $-\frac{4}{3}$ on the number line. Label each point with its numeric value.



3. Plot these points on a number line.

   - -1.5
   - the opposite of -2
   - the opposite of 0.5
   - -2

4. a. Represent each of these temperatures in degrees Fahrenheit with a positive or negative number.

      - 5 degrees above zero
      - 3 degrees below zero
      - 6 degrees above zero
      - $2\frac{3}{4}$ degrees below zero

   b. Order the temperatures above from the coldest to the warmest.

(From Unit 7, Lesson 1.)

5. Solve each equation.

a. $8x = \frac{2}{3}$

b. $1\frac{1}{2} = 2x$

c. $5x = \frac{2}{7}$

d. $\frac{1}{4}x = 5$

e. $\frac{1}{5} = \frac{2}{3}x$

(From Unit 6, Lesson 5.)

6. Write the solution to each equation as a fraction and as a decimal.

a. $2x = 3$

b. $5y = 3$

c. $0.3z = 0.009$

(From Unit 6, Lesson 5.)

7. There are 15.24 centimeters in 6 inches.

a. How many centimeters are in 1 foot?

b. How many centimeters are in 1 yard?

(From Unit 3, Lesson 4.)

Lesson 3: Comparing Positive and Negative Numbers

3.1: Which One Doesn't Belong: Inequalities

Which inequality doesn't belong?

- $\frac{5}{4} < 2$
- $8.5 > 0.95$
- $8.5 < 7$
- $10.00 < 100$

3.2: Comparing Temperatures

Here are the low temperatures, in degrees Celsius, for a week in Anchorage, Alaska.

day	Mon	Tues	Weds	Thurs	Fri	Sat	Sun
temperature	5	-1	-5.5	-2	3	4	0

1. Plot the temperatures on a number line. Which day of the week had the lowest low temperature?

2. The lowest temperature ever recorded in the United States was -62 degrees Celsius, in Prospect Creek Camp, Alaska. The average temperature on Mars is about -55 degrees Celsius.

   a. Which is warmer, the coldest temperature recorded in the USA, or the average temperature on Mars? Explain how you know.

   b. Write an inequality to show your answer.

3. On a winter day the low temperature in Anchorage, Alaska, was -21 degrees Celsius and the low temperature in Minneapolis, Minnesota, was -14 degrees Celsius.

   Jada said, "I know that 14 is less than 21, so -14 is also less than -21. This means that it was colder in Minneapolis than in Anchorage."

   Do you agree? Explain your reasoning.

Are you ready for more?

Another temperature scale frequently used in science is the *Kelvin scale*. In this scale, 0 is the lowest possible temperature of anything in the universe, and it is -273.15 degrees in the Celsius scale. Each $1\ \text{K}$ is the same as 1°C, so $10\ \text{K}$ is the same as -263.15°C.

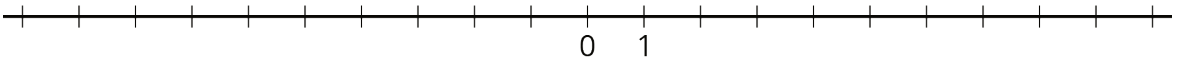
1. Water boils at 100°C. What is this temperature in K?

2. Ammonia boils at -35.5°C. What is the boiling point of ammonia in K?

3. Explain why only positive numbers (and 0) are needed to record temperature in K.

3.3: Rational Numbers on a Number Line

1. Plot the numbers -2, 4, -7, and 10 on the number line. Label each point with its numeric value.



2. Decide whether each inequality statement is true or false. Be prepared to explain your reasoning.

   a. $-2 < 4$

   b. $-2 < -7$

   c. $4 > -7$

   d. $-7 > 10$

3. Andre says that $\frac{1}{4}$ is less than $-\frac{3}{4}$ because, of the two numbers, $\frac{1}{4}$ is closer to 0. Do you agree? Explain your reasoning.

4. Answer each question. Be prepared to explain how you know.

   a. Which number is greater: $\frac{1}{4}$ or $\frac{5}{4}$?

   b. Which is farther from 0: $\frac{1}{4}$ or $\frac{5}{4}$?

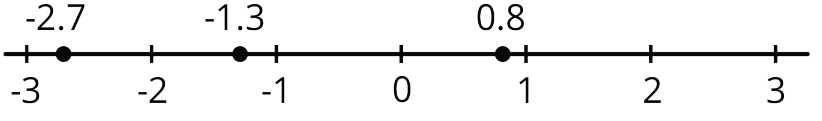
   c. Which number is greater: $-\frac{3}{4}$ or $\frac{5}{8}$?

   d. Which is farther from 0: $-\frac{3}{4}$ or $\frac{5}{8}$?

e. Is the number that is farther from 0 always the greater number? Explain your reasoning.

Lesson 3 Summary

We use the words *greater than* and *less than* to compare numbers on the number line. For example, the numbers -2.7, 0.8, and -1.3, are shown on the number line.



Because -2.7 is to the left of -1.3, we say that -2.7 is less than -1.3. We write:

$$-2.7 < -1.3$$

In general, any number that is to the left of a number n is less than n.

We can see that -1.3 is greater than -2.7 because -1.3 is to the right of -2.7. We write:

$$-1.3 > -2.7$$

In general, any number that is to the right of a number n is greater than n

We can also see that $0.8 > -1.3$ and $0.8 > -2.7$. In general, any positive number is greater than any negative number.

Lesson 3: Comparing Positive and Negative Numbers

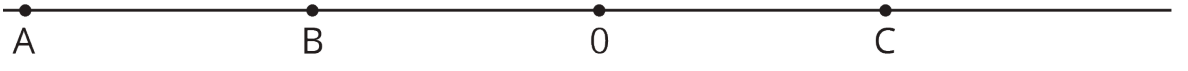
Cool Down: Making More Comparisons

1. The elevation of Death Valley, California, is -282 feet. The elevation of Tallahassee, Florida, is 203 feet. The elevation of Westmorland, California, is -157 feet.

   a. Compare the elevations of Death Valley and Tallahassee using $<$ or $>$.

   b. Compare the elevations of Death Valley and Westmorland.

2. Here are the points A, B, C, and 0 plotted on a number line.



   The points B and C are opposites. Decide whether each of the following statements is true.

   a. A is greater than B.

   b. A is farther from 0 than C.

   c. A is less than C.

   d. B and C are equally far away from 0.

   e. B and C are equal.

Unit 7 Lesson 3 Cumulative Practice Problems

1. Decide whether each inequality statement is true or false. Explain your reasoning.

   a. $-5 > 2$

   b. $3 > -8$

   c. $-12 > -15$

   d. $-12.5 > -12$

2. Here is a true statement: $-8.7 < -8.4$. Select **all** of the statements that are equivalent to $-8.7 < -8.4$.

   A. -8.7 is further to the right on the number line than -8.4.

   B. -8.7 is further to the left on the number line than -8.4.

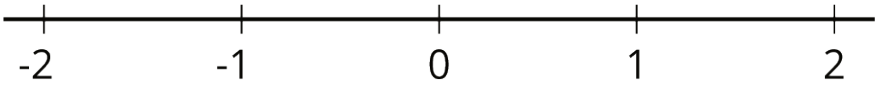
   C. -8.7 is less than -8.4.

   D. -8.7 is greater than -8.4.

   E. -8.4 is less than -8.7.

   F. -8.4 is greater than -8.7.

3. Plot each of the following numbers on the number line. Label each point with its numeric value. 0.4, -1.5, $-1\frac{7}{10}$, $-\frac{11}{10}$



(From Unit 7, Lesson 2.)

4. The table shows five states and the lowest point in each state.

   Put the states in order by their lowest elevation, from least to greatest.

state	lowest elevation (feet)
California	-282
Colorado	3350
Louisiana	-8
New Mexico	2842
Wyoming	3099

(From Unit 7, Lesson 4.)

5. Each lap around the track is 400 meters.

   a. How many meters does someone run if they run:

   2 laps? 5 laps? x laps?

   b. If Noah ran 14 laps, how many meters did he run?

   c. If Noah ran 7,600 meters, how many laps did he run?

(From Unit 6, Lesson 6.)

6. A stadium can seat 16,000 people at full capacity.

   a. If there are 13,920 people in the stadium, what percentage of the capacity is filled? Explain or show your reasoning.

   b. What percentage of the capacity is not filled?

(From Unit 3, Lesson 16.)

Lesson 4: Ordering Rational Numbers

4.1: How Do They Compare?

Use the symbols >, <, or = to compare each pair of numbers. Be prepared to explain your reasoning.

- 12 _____ 19
- 212 _____ 190
- 15 _____ 1.5
- 9.02 _____ 9.2
- 6.050 _____ 6.05
- 0.4 _____ $\frac{9}{40}$
- $\frac{19}{24}$ _____ $\frac{19}{21}$
- $\frac{16}{17}$ _____ $\frac{11}{12}$

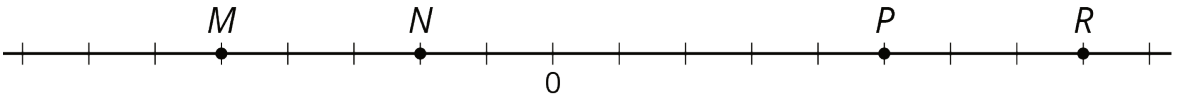
4.2: Ordering Rational Number Cards

Your teacher will give you a set of number cards. Order them from least to greatest.

Your teacher will give you a second set of number cards. Add these to the correct places in the ordered set.

4.3: Comparing Points on A Line

1.



Use each of the following terms at least once to describe or compare the values of points M, N, P, R.

- greater than
- less than
- opposite of (or opposites)
- negative number

2. Tell what the value of each point would be if:

a. P is $2\frac{1}{2}$

b. N is -0.4

c. R is 200

d. M is -15

Are you ready for more?

The list of fractions between 0 and 1 with denominators between 1 and 3 looks like this:

$$\frac{0}{1}, \frac{1}{1}, \frac{1}{2}, \frac{1}{3}, \frac{2}{3}$$

We can put them in order like this: $\frac{0}{1} < \frac{1}{3} < \frac{1}{2} < \frac{2}{3} < \frac{1}{1}$

Now let's expand the list to include fractions with denominators of 4. We won't include $\frac{2}{4}$, because $\frac{1}{2}$ is already on the list.

$$\frac{0}{1} < \frac{1}{4} < \frac{1}{3} < \frac{1}{2} < \frac{2}{3} < \frac{3}{4} < \frac{1}{1}$$

1. Expand the list again to include fractions that have denominators of 5.

2. Expand the list you made to include fractions have have denominators of 6.

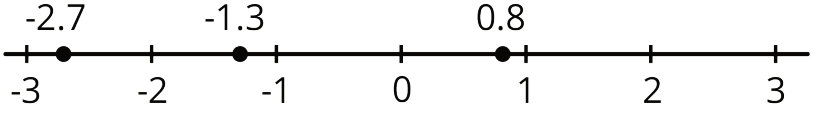
3. When you add a new fraction to the list, you put it in between two "neighbors." Go back and look at your work. Do you see a relationship between a new fraction and its two neighbors?

Lesson 4 Summary

To order rational numbers from least to greatest, we list them in the order they appear on the number line from left to right. For example, we can see that the numbers

-2.7, -1.3, 0.8

are listed from least to greatest because of the order they appear on the number line.



Ordering Rational Number Cards - Set 1 0	Ordering Rational Number Cards - Set 1 $\frac{1}{4}$	Ordering Rational Number Cards - Set 1 1	Ordering Rational Number Cards - Set 1 2
Ordering Rational Number Cards - Set 1 2.5	Ordering Rational Number Cards - Set 1 $\frac{8}{3}$	Ordering Rational Number Cards - Set 1 3	Ordering Rational Number Cards - Set 1 4
Ordering Rational Number Cards - Set 1 $\frac{9}{8}$	Ordering Rational Number Cards - Set 1 5	Ordering Rational Number Cards - Set 1 $5\frac{1}{2}$	Ordering Rational Number Cards - Set 1 6
Ordering Rational Number Cards - Set 1 7	Ordering Rational Number Cards - Set 1 7.5	Ordering Rational Number Cards - Set 1 8	Ordering Rational Number Cards - Set 1 9
Ordering Rational Number Cards - Set 1 10	Ordering Rational Number Cards - Set 1 11	Ordering Rational Number Cards - Set 1 14	Ordering Rational Number Cards - Set 1 15
Ordering Rational Number Cards - Set 1 16	Ordering Rational Number Cards - Set 1 17	Ordering Rational Number Cards - Set 1 $22\frac{1}{2}$	Ordering Rational Number Cards - Set 1 25
Ordering Rational Number Cards - Set 1 29	Ordering Rational Number Cards - Set 1 30	Ordering Rational Number Cards - Set 1 53	Ordering Rational Number Cards - Set 1 62

Ordering Rational Number Cards - Set 1 78	Ordering Rational Number Cards - Set 1 87	Ordering Rational Number Cards - Set 1 99	Ordering Rational Number Cards - Set 1 100

Ordering Rational Number Cards - Set 2 -23	Ordering Rational Number Cards - Set 2 $-22\frac{1}{2}$	Ordering Rational Number Cards - Set 2 -22	Ordering Rational Number Cards - Set 2 -10
Ordering Rational Number Cards - Set 2 -9	Ordering Rational Number Cards - Set 2 -8	Ordering Rational Number Cards - Set 2 -7.5	Ordering Rational Number Cards - Set 2 -7
Ordering Rational Number Cards - Set 2 $-5\frac{1}{2}$	Ordering Rational Number Cards - Set 2 -5	Ordering Rational Number Cards - Set 2 -3	Ordering Rational Number Cards - Set 2 -2.5
Ordering Rational Number Cards - Set 2 $-\frac{9}{8}$	Ordering Rational Number Cards - Set 2 -2	Ordering Rational Number Cards - Set 2 -1	Ordering Rational Number Cards - Set 2 $-\frac{1}{4}$

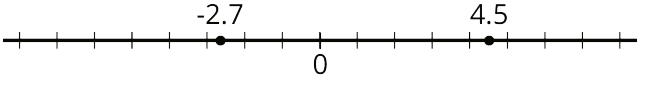
Lesson 4: Ordering Rational Numbers

Cool Down: Getting Them in Order

1. Place these numbers in order from least to greatest:

$\frac{16}{5}$ -3 6 3.1 -2.5 $\frac{1}{4}$ $-\frac{3}{4}$ $-\frac{3}{8}$

2. Write a sentence to compare the two points shown on the number line.



Unit 7 Lesson 4 Cumulative Practice Problems

1. Select **all** of the numbers that are *greater than* -5.

   A. 1.3

   B. -6

   C. -12

   D. $\frac{1}{7}$

   E. -1

   F. -4

2. Order these numbers from least to greatest: $\frac{1}{2}$, 0, 1, $-1\frac{1}{2}$, $-\frac{1}{2}$, -1

3. Here are the boiling points of certain elements in degrees Celsius:

   - Argon: -185.8
   - Chlorine: -34
   - Fluorine: -188.1
   - Hydrogen: -252.87
   - Krypton: -153.2

   List the elements from least to greatest boiling points.

4. Explain why zero is considered its own opposite.

   (From Unit 7, Lesson 2.)

5. Explain how to make these calculations mentally.

   a. $99 + 54$

   b. $244 - 99$

   c. $99 \cdot 6$

   d. $99 \cdot 15$

   (From Unit 6, Lesson 9.)

6. Find the quotients.

   a. $\frac{1}{2} \div 2$

   b. $2 \div 2$

   c. $\frac{1}{2} \div \frac{1}{2}$

   d. $\frac{38}{79} \div \frac{38}{79}$

   (From Unit 4, Lesson 11.)

7. Over several months, the weight of a baby measured in pounds doubles. Does its weight measured in kilograms also double? Explain.

   (From Unit 3, Lesson 4.)

Lesson 5: Using Negative Numbers to Make Sense of Contexts

5.1: Notice and Wonder: It Comes and Goes

activity	amount
do my chores	30.00
babysit my cousin	45.00
buy my lunch	-10.80
get my allowance	15.00
buy a shirt	-18.69
pet my dog	0.00

What do you notice? What do you wonder?

5.2: The Concession Stand

The manager of the concession stand keeps records of all of the supplies she buys and all of the items she sells. The table shows some of her records for Tuesday.

item	quantity	value in dollars
doughnuts	-58	37.70
straws	3,000	-10.35
hot dogs	-39	48.75
pizza	13	-116.87
apples	-40	14.00
french fries	-88	132.00

1. Which items did she sell? Explain your reasoning.

2. How can we interpret -58 in this situation?

3. How can we interpret -10.35 in this situation?

4. On which item did she spend the most amount of money? Explain your reasoning.

5.3: Drinks for Sale

A vending machine in an office building sells bottled beverages. The machine keeps track of all changes in the number of bottles from sales and from machine refills and maintenance. This record shows the changes for every 5-minute period over one hour.

1. What might a positive number mean in this context? What about a negative number?

2. What would a "0" in the second column mean in this context?

3. Which numbers—positive or negative—result in fewer bottles in the machine?

4. At what time was there the greatest change to the number of bottles in the machine? How did that change affect the number of remaining bottles in the machine?

5. At which time period, 8:05–8:09 or 8:25–8:29, was there a greater change to the number of bottles in the machine? Explain your reasoning.

6. The machine must be emptied to be serviced. If there are 40 bottles in the machine when it is to be serviced, what number will go in the second column in the table?

time	number of bottles
8:00–8:04	-1
8:05–8:09	+12
8:10–8:14	-4
8:15–8:19	-1
8:20–8:24	-5
8:25–8:29	-12
8:30–8:34	-2
8:35–8:39	0
8:40–8:40	0
8:45–8:49	-6
8:50–8:54	+24
8:55–8:59	0
service	

Are you ready for more?

Priya, Mai, and Lin went to a cafe on a weekend. Their shared bill came to $25. Each student gave the server a $10 bill. The server took this $30 and brought back five $1 bills in change. Each student took $1 back, leaving the rest, $2, as a tip for the server.

As she walked away from the cafe, Lin thought, "Wait—this doesn't make sense. Since I put in $10 and got $1 back, I wound up paying $9. So did Mai and Priya. Together, we paid $27. Then we left a $2 tip. That makes $29 total. And yet we originally gave the waiter $30. Where did the extra dollar go?"

Think about the situation and about Lin's question. Do you agree that the numbers didn't add up properly? Explain your reasoning.

Lesson 5 Summary

Sometimes we represent changes in a quantity with positive and negative numbers. If the quantity increases, the change is positive. If it decreases, the change is negative.

- Suppose 5 gallons of water is put in a washing machine. We can represent the change in the number of gallons as +5. If 3 gallons is emptied from the machine, we can represent the change as -3.

It is especially common to represent money we receive with positive numbers and money we spend with negative numbers.

- Suppose Clare gets $30.00 for her birthday and spends $18.00 buying lunch for herself and a friend. To her, the value of the gift can be represented as +30.00 and the value of the lunch as -18.00.

Whether a number is considered positive or negative depends on a person's perspective. If Clare's grandmother gives her $20 for her birthday, Clare might see this as +20, because to her, the amount of money she has increased. But her grandmother might see it as -20, because to her, the amount of money she has decreased.

In general, when using positive and negative numbers to represent changes, we have to be very clear about what it means when the change is positive and what it means when the change is negative.

Lesson 5: Using Negative Numbers to Make Sense of Contexts

Cool Down: Bakery Owner

The table shows records of money-related activities of a bakery owner over a period of a week.

date	items	amount in dollars
May 1	rent	-850.00
May 2	order (birthday cake and cookies)	106.75
May 3	utilities (electricity, gas, phone)	-294.50
May 5	order (wedding cake and desserts)	240.55
May 5	baking supplies	-147.95
May 6	order (anniversary cake)	158.20
May 7	order (breads and desserts for a conference)	482.30
May 7	bakery sales	415.65

1. For which items did she receive money?

2. What does the number -147.95 mean in this context?

3. Did the bakery owner receive more or spend more money on May 5? Explain how you know.

Unit 7 Lesson 5 Cumulative Practice Problems

1. Write a positive or negative number to represent each change in the high temperature.

   a. Tuesday's high temperature was 4 degrees less than Monday's high temperature.

   b. Wednesday's high temperature was 3.5 degrees less than Tuesday's high temperature.

   c. Thursday's high temperature was 6.5 degrees more than Wednesday's high temperature.

   d. Friday's high temperature was 2 degrees less than Thursday's high temperature.

2. Decide which of the following quantities can be represented by a positive number and which can be represented by a negative number. Give an example of a quantity with the opposite sign in the same situation.

   a. Tyler's puppy gained 5 pounds.

   b. The aquarium leaked 2 gallons of water.

   c. Andre received a gift of $10.

   d. Kiran gave a gift of $10.

   e. A climber descended 550 feet.

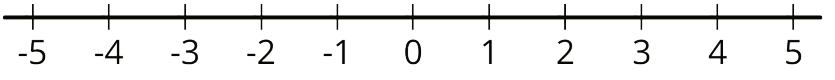
3. Make up a situation where a quantity is changing.

   a. Explain what it means to have a negative change.

   b. Explain what it means to have a positive change.

   c. Give an example of each.

4. a. On the number line, label the points that are 4 units away from 0.



   b. If you fold the number line so that a vertical crease goes through 0, the points you label would match up. Explain why this happens.

   c. On the number line, label the points that are $\frac{5}{2}$ units from 0. What is the distance between these points?

(From Unit 7, Lesson 2.)

5. Evaluate each expression.

   a. $2^3 \cdot 3$

   b. $\frac{4^2}{2}$

   c. 3^1

   a. $6^2 \div 4$

   b. $2^3 - 2$

   c. $10^2 + 5^2$

(From Unit 6, Lesson 12.)

Lesson 6: Absolute Value of Numbers

6.1: Number Talk: Closer to Zero

For each pair of expressions, decide mentally which one has a value that is closer to 0.

$\frac{9}{11}$ or $\frac{15}{11}$

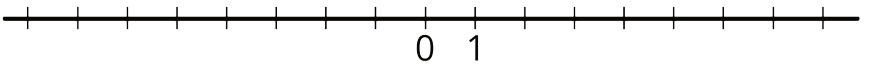
$\frac{1}{5}$ or $\frac{1}{9}$

1.25 or $\frac{5}{4}$

0.01 or 0.001

6.2: Jumping Flea

1. A flea is jumping around on a number line.



   a. If the flea starts at 1 and jumps 4 units to the right, where does it end up? How far away from 0 is this?

   b. If the flea starts at 1 and jumps 4 units to the left, where does it end up? How far away from 0 is this?

   c. If the flea starts at 0 and jumps 3 units away, where might it land?

   d. If the flea jumps 7 units and lands at 0, where could it have started?

   e. The **absolute value** of a number is the distance it is from 0. The flea is currently to the left of 0 and the absolute value of its location is 4. Where on the number line is it?

   f. If the flea is to the left of 0 and the absolute value of its location is 5, where on the number line is it?

   g. If the flea is to the right of 0 and the absolute value of its location is 2.5, where on the number line is it?

2. We use the notation $|-2|$ to say "the absolute value of -2," which means "the distance of -2 from 0 on the number line."

   a. What does $|-7|$ mean and what is its value?

   b. What does $|1.8|$ mean and what is its value?

6.3: Absolute Elevation and Temperature

1. A part of the city of New Orleans is 6 feet below sea level. We can use "-6 feet" to describe its elevation, and "$|-6|$ feet" to describe its vertical distance from sea level. In the context of elevation, what would each of the following numbers describe?

   a. 25 feet

   b. $|25|$ feet

   c. -8 feet

   d. $|-8|$ feet

2. The elevation of a city is different from sea level by 10 feet. Name the two elevations that the city could have.

3. We write "$-5^\circ C$" to describe a temperature that is 5 degrees Celsius below freezing point and "$5^\circ C$" for a temperature that is 5 degrees above freezing. In this context, what do each of the following numbers describe?

   a. $1^\circ C$

   b. $-4^\circ C$

   c. $|12|^\circ C$

   d. $|-7|^\circ C$

4. a. Which temperature is colder: $-6^\circ C$ or $3^\circ C$?

   b. Which temperature is closer to freezing temperature: $-6^\circ C$ or $3^\circ C$?

   c. Which temperature has a smaller absolute value? Explain how you know.

Are you ready for more?

At a certain time, the difference between the temperature in New York City and in Boston was 7 degrees Celsius. The difference between the temperature in Boston and in Chicago was also 7 degrees Celsius. Was the temperature in New York City the same as the temperature in Chicago? Explain your answer.

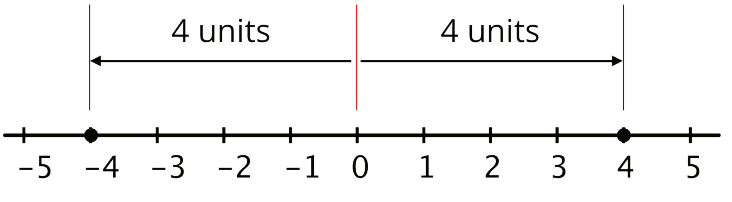
Lesson 6 Summary

We compare numbers by comparing their positions on the number line: the one farther to the right is greater; the one farther to the left is less.

Sometimes we wish to compare which one is closer to or farther from 0. For example, we may want to know how far away the temperature is from the freezing point of 0°C, regardless of whether it is above or below freezing.

The **absolute value** of a number tells us its distance from 0.

The absolute value of -4 is 4, because -4 is 4 units to the left of 0. The absolute value of 4 is also 4, because 4 is 4 units to the right of 0. Opposites always have the same absolute value because they both have the same distance from 0.



The distance from 0 to itself is 0, so the absolute value of 0 is 0. Zero is the *only* number whose distance to 0 is 0. For all other absolute values, there are always two numbers—one positive and one negative—that have that distance from 0.

To say "the absolute value of 4," we write:

$$|4|$$

To say that "the absolute value of -8 is 8," we write:

$$|\text{-}8| = 8$$

Lesson 6: Absolute Value of Numbers

Cool Down: Greater, Less, the Same

1. Write a number that has the same value as each expression:

   a. $|5|$

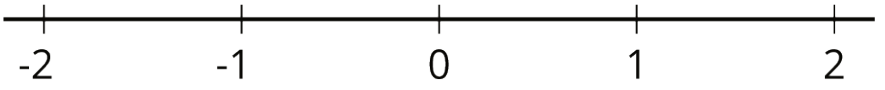
   b. $|-12.9|$

2. Write a number that has a value less than $|4.7|$

3. Write a number that has a value greater than $|-2.6|$

Unit 7 Lesson 6 Cumulative Practice Problems

1. On the number line, plot and label all numbers with an absolute value of $\frac{3}{2}$.



2. The temperature at dawn is $6^\circ C$ away from 0. Select **all** the temperatures that are possible.

   A. $-12^\circ C$

   B. $-6^\circ C$

   C. $0^\circ C$

   D. $6^\circ C$

   E. $12^\circ C$

3. Put these numbers in order, from least to greatest.

   $|-2.7|$ 0 1.3 $|-1|$ 2

4. Lin's family needs to travel 325 miles to reach her grandmother's house.

   a. At 26 miles, what percentage of the trip's distance have they completed?

   b. How far have they traveled when they have completed 72% of the trip's distance?

   c. At 377 miles, what percentage of the trip's distance have they completed?

(From Unit 5, Lesson 11.)

5. Elena donates some money to charity whenever she earns money as a babysitter. The table shows how much money, d, she donates for different amounts of money, m, that she earns.

d	4.44	1.80	3.12	3.60	2.16
m	37	15	26	30	18

   a. What percent of her income does Elena donate to charity? Explain or show your work.

   b. Which quantity, m or d, would be the better choice for the dependent variable in an equation describing the relationship between m and d? Explain your reasoning.

   c. Use your choice from the second question to write an equation that relates m and d.

(From Unit 6, Lesson 16.)

6. How many times larger is the first number in the pair than the second?

   a. 3^4 is _____ times larger than 3^3.

   b. 5^3 is _____ times larger than 5^2.

   c. 7^{10} is _____ times larger than 7^8.

   d. 17^6 is _____ times larger than 17^4.

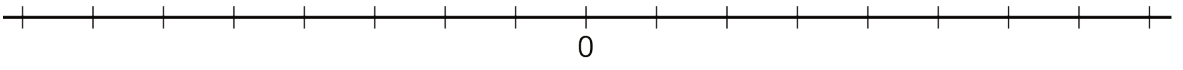
   e. 5^{10} is _____ times larger than 5^4.

(From Unit 6, Lesson 12.)

Lesson 7: Comparing Numbers and Distance from Zero

7.1: Opposites

1. a is a rational number. Choose a value for a and plot it on the number line.



2. a. Based on where you plotted a, plot $-a$ on the same number line.

   b. What is the value of $-a$ that you plotted?

3. Noah said, "If a is a rational number, $-a$ will always be a negative number." Do you agree with Noah? Explain your reasoning.

7.2: Submarine

A submarine is at an elevation of -100 feet (100 feet below sea level). Let's compare the elevations of these four people to that of the submarine:

- Clare's elevation is greater than the elevation of the submarine. Clare is farther from sea level than the submarine.
- Andre's elevation is less than the elevation of the submarine. Andre is farther away from sea level than the submarine.
- Han's elevation is greater than the elevation of the submarine. Han is closer to sea level than is the submarine.
- Lin's elevation is the same distance away from sea level as the submarine's.

1. Complete the table as follows.

   a. Write a possible elevation for each person.

   b. Use $<$, $>$, or $=$ to compare the elevation of that person to that of the submarine.

   c. Use absolute value to tell how far away the person is from sea level (elevation 0).

   As an example, the first row has been filled with a possible elevation for Clare.

	possible elevation	compare to submarine	distance from sea level
Clare	150 feet	$150 > -100$	$\lvert 150 \rvert$ or 150 feet
Andre			
Han			
Lin			

2. Priya says her elevation is less than the submarine's and she is closer to sea level. Is this possible? Explain your reasoning.

7.3: Info Gap: Points on the Number Line

Your teacher will give you either a *problem card* or a *data card*. Do not show or read your card to your partner.

If your teacher gives you the *problem card*:

1. Silently read your card and think about what information you need to be able to answer the question.
2. Ask your partner for the specific information that you need.
3. Explain how you are using the information to solve the problem.

   Continue to ask questions until you have enough information to solve the problem.
4. Share the *problem card* and solve the problem independently.
5. Read the *data card* and discuss your reasoning.

If your teacher gives you the *data card*:

1. Silently read your card.
2. Ask your partner *"What specific information do you need?"* and wait for them to *ask* for information.

   If your partner asks for information that is not on the card, do not do the calculations for them. Tell them you don't have that information.
3. Before sharing the information, ask "*Why do you need that information?*" Listen to your partner's reasoning and ask clarifying questions.
4. Read the *problem card* and solve the problem independently.
5. Share the *data card* and discuss your reasoning.

7.4: Inequality Mix and Match

Here are some numbers and inequality symbols. Work with your partner to write true comparison statements.

-0.7	$-\frac{3}{5}$	1	4	$\lvert -8 \rvert$	$<$
$-\frac{6}{3}$	-2.5	2.5	8	$\lvert 0.7 \rvert$	$=$
-4	0	$\frac{7}{2}$	$\lvert 3 \rvert$	$\lvert -\frac{5}{2} \rvert$	$>$

One partner should select two numbers and one comparison symbol and use them to write a true statement using symbols. The other partner should write a sentence in words with the same meaning, using the following phrases:

- is equal to
- is the absolute value of
- is greater than
- is less than

For example, one partner could write $4 < 8$ and the other would write, "4 is less than 8." Switch roles until each partner has three true mathematical statements and three sentences written down.

Are you ready for more?

For each question, choose a value for each variable to make the whole statement true. (When the word *and* is used in math, both parts have to be true for the whole statement to be true.) Can you do it if one variable is negative and one is positive? Can you do it if both values are negative?

1. $x < y$ and $|x| < y$.

2. $a < b$ and $|a| < |b|$.

3. $c < d$ and $|c| > d$.

4. $t < u$ and $|t| > |u|$.

Lesson 7 Summary

We can use elevation to help us compare two rational numbers or two absolute values.

- Suppose an anchor has an elevation of -10 meters and a house has an elevation of 12 meters. To describe the anchor having a lower elevation than the house, we can write $-10 < 12$ and say "-10 is less than 12."
- The anchor is closer to sea level than the house is to sea level (or elevation of 0). To describe this, we can write $|-10| < |12|$ and say "the distance between -10 and 0 is less than the distance between 12 and 0."

We can use similar descriptions to compare rational numbers and their absolute values outside of the context of elevation.

- To compare the distance of -47.5 and 5.2 from 0, we can say: $|-47.5|$ is 47.5 units away from 0, and $|5.2|$ is 5.2 units away from 0, so $|-47.5| > |5.2|$.
- $|-18| > 4$ means that the absolute value of -18 is greater than 4. This is true because 18 is greater than 4.

Info Gap: Points on the Number Line

Problem Card 1

The points A, B, C, and D are located on the number line. What is the location of point A?

Info Gap: Points on the Number Line

Data Card 1

- Point A has the same absolute value as B, but a different sign.
- B is less than D.
- Point C is located at -2.
- D is the opposite of C.
- The distance between B and D is $1\frac{1}{2}$.

Info Gap: Points on the Number Line

Problem Card 2

The points X, Y, and Z are located on the number line. What is the location of point Z?

Info Gap: Points on the Number Line

Data Card 2

- The absolute value of X is 2.
- Y is greater than X.
- Point Y is closer to zero than point X is.
- Z is positive.
- The distance between X and Y is 1.
- The distance between Y and Z is 4.

Info Gap: Points on the Number Line

Problem Card 1

The points A, B, C, and D are located on the number line. What is the location of point A?

Info Gap: Points on the Number Line

Data Card 1

- Point A has the same absolute value as B, but a different sign.
- B is less than D.
- Point C is located at -2.
- D is the opposite of C.
- The distance between B and D is $1\frac{1}{2}$.

Info Gap: Points on the Number Line

Problem Card 2

The points X, Y, and Z are located on the number line. What is the location of point Z?

Info Gap: Points on the Number Line

Data Card 2

- The absolute value of X is 2.
- Y is greater than X.
- Point Y is closer to zero than point X is.
- Z is positive.
- The distance between X and Y is 1.
- The distance between Y and Z is 4.

Lesson 7: Comparing Numbers and Distance from Zero

Cool Down: True or False?

Mark each of the following as true or false and explain how you know.

1. $-5 < 3$

2. $-5 > 3$

3. $|-5| < 3$

4. $|-5| > 3$

Unit 7 Lesson 7 Cumulative Practice Problems

1. In the context of elevation, what would |-7| feet mean?

2. Match the the statements written in English with the mathematical statements.

A. The number -4 is a distance of 4 units away from 0 on the number line.	1. $\lvert -63 \rvert > 4$
B. The number -63 is more than 4 units away from 0 on the number line.	2. $-63 < 4$
C. The number 4 is greater than the number -4.	3. $\lvert -63 \rvert > \lvert 4 \rvert$
D. The numbers 4 and -4 are the same distance away from 0 on the number line.	4. $\lvert -4 \rvert = 4$
E. The number -63 is less than the number 4.	5. $4 > -4$
F. The number -63 is further away from 0 than the number 4 on the number line.	6. $\lvert 4 \rvert = \lvert -4 \rvert$

3. Compare each pair of expressions using >, <, or =.

a. -32 ____ 15	a. 2 ____ -17
b. |-32| ____ |15|	b. 2 ____ |-17|
c. 5 ____ -5	c. |-27| ____ |-45|
d. |5| ____ |-5|	d. |-27| ____ -45

4. Mai received and spent money in the following ways last month. For each example, write a signed number to represent the change in money from her perspective.

   a. Her grandmother gave her $25 in a birthday card.

   b. She earned $14 dollars babysitting.

   c. She spent $10 on a ticket to the concert.

   d. She donated $3 to a local charity

   e. She got $2 interest on money that was in her savings account.

(From Unit 7, Lesson 5.)

5. Here are the lowest temperatures recorded in the last 2 centuries for some US cities.

   - Death Valley, CA was -45°F in January of 1937.
   - Danbury, CT was -37°F in February of 1943.
   - Monticello, FL was -2°F in February of 1899.
   - East Saint Louis, IL was -36°F in January of 1999.
   - Greenville, GA was -17°F in January of 1940.

   a. Which of these states has the lowest record temperature?

   b. Which state has a lower record temperature, FL or GA?

   c. Which state has a lower record temperature, CT or IL?

   d. How many more degrees colder is the record temperature for GA than for FL?

(From Unit 7, Lesson 1.)

6. Find the quotients.

   a. $0.024 \div 0.015$

   b. $0.24 \div 0.015$

   c. $0.024 \div 0.15$

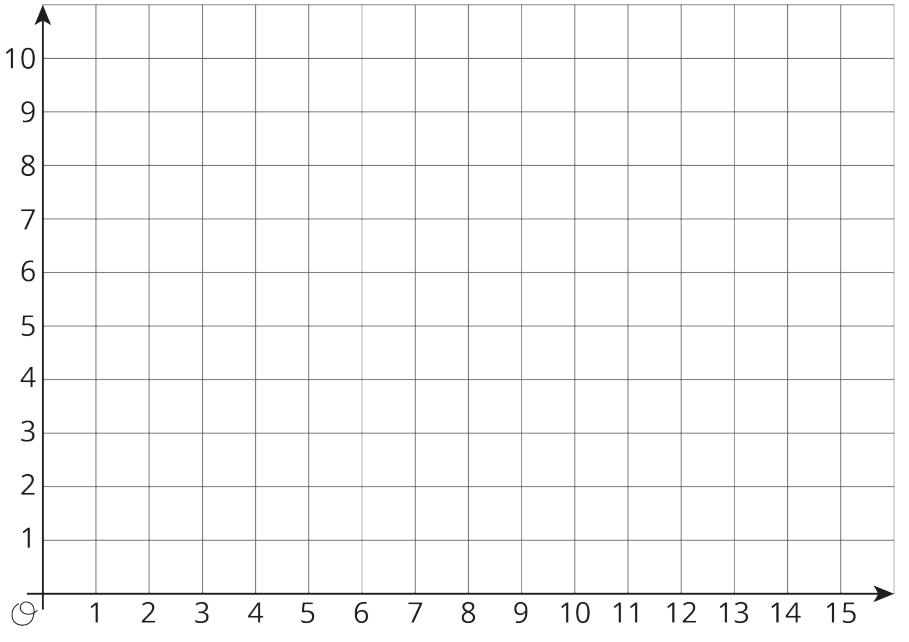
   d. $24 \div 15$

(From Unit 5, Lesson 13.)

Lesson 11: Points on the Coordinate Plane

11.1: Guess My Line

1. Choose a horizontal or a vertical line on the grid. Draw 4 points on the line and label each point with its coordinates.



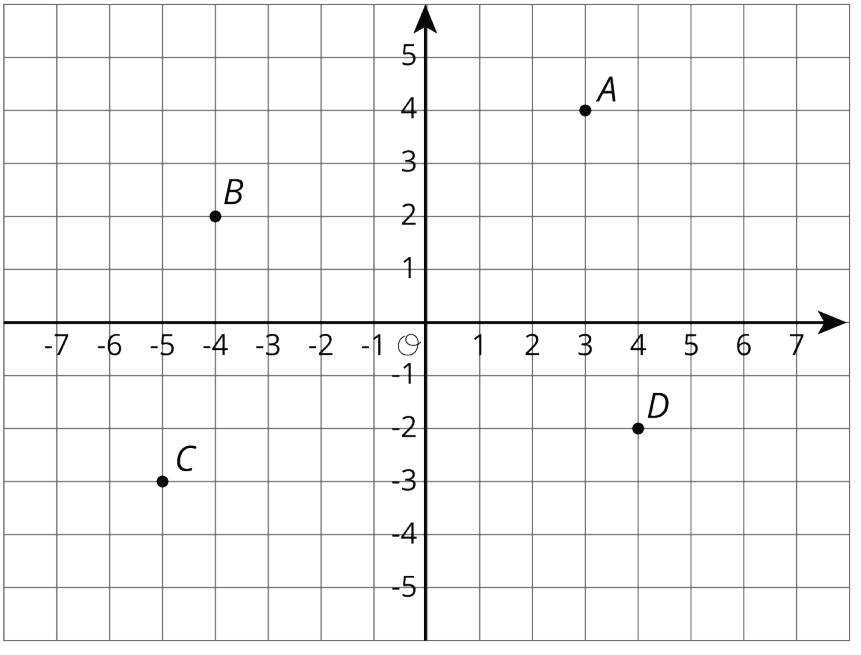
2. Tell your partner whether your line is horizontal or vertical, and have your partner guess the locations of your points by naming coordinates.

   If a guess is correct, put an X through the point. If your partner guessed a point that is on your line but not the point that you plotted, say, "That point is on my line, but is not one of my points."

   Take turns guessing each other's points, 3 guesses per turn.

11.2: The Coordinate Plane

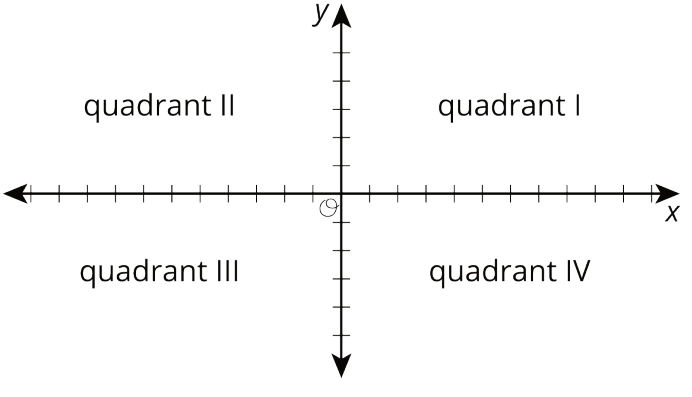
1. Label each point on the coordinate plane with an ordered pair.



2. What do you notice about the locations and ordered pairs of B, C, and D? How are they different from those for point A?

3. Plot a point at $(-2, 5)$. Label it E. Plot another point at $(3, -4.5)$. Label it F.

4. The coordinate plane is divided into four **quadrants**, I, II, III, and IV, as shown here.



$G = (5, 2)$

$H = (-1, -5)$

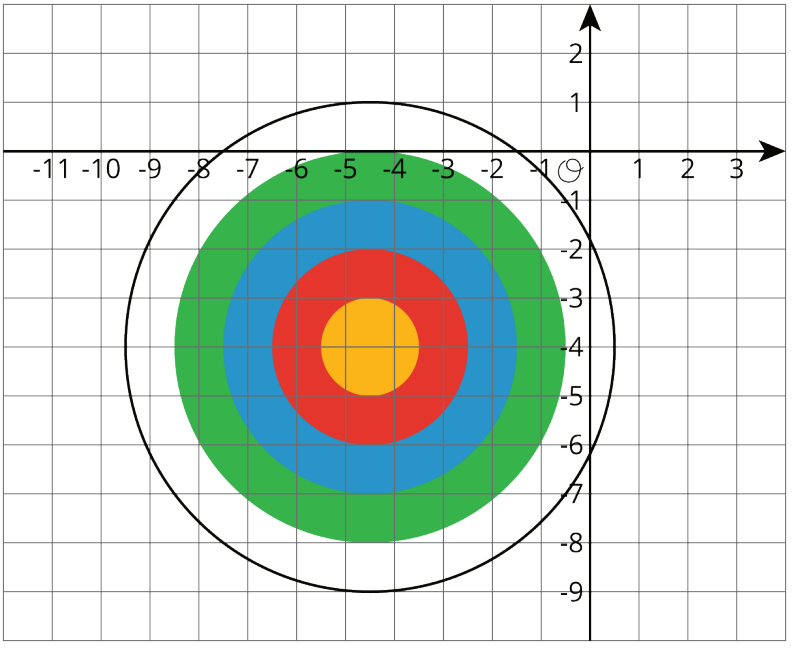
$I = (7, -4)$

5. In which quadrant is point G located? Point H? Point I?

6. A point has a positive y-coordinate. In which quadrant could it be?

11.3: Coordinated Archery

Here is an image of an archery target on a coordinate plane. The scores for landing an arrow in the colored regions are shown.



- Yellow: 10 points
- Red: 8 points
- Blue: 6 points
- Green: 4 points
- White: 2 points

Name the coordinates for a possible landing point to score:

1. 6 points

2. 10 points

3. 2 points

4. No points

5. 4 points

6. 8 points

Are you ready for more?

Pretend you are stuck in a coordinate plane. You can only take vertical and horizontal steps that are one unit long.

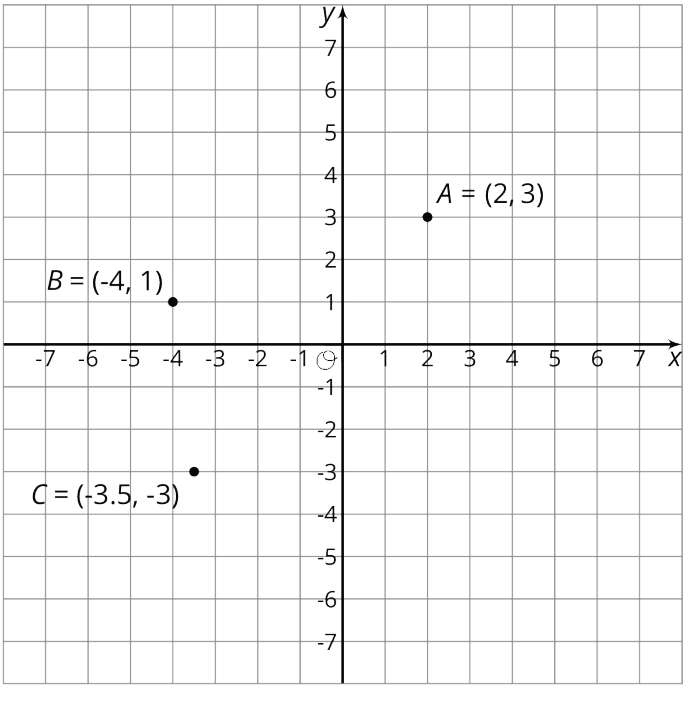
1. How many ways are there to get from the point $(-3, 2)$ to $(-1, -1)$ if you will only step down and to the right?

2. How many ways are there to get from the point $(-1, -2)$ to $(4, 0)$ if you can only step up and to the right?

3. Make up some more problems like this and see what patterns you notice.

Lesson 11 Summary

Just as the number line can be extended to the left to include negative numbers, the x- and y-axis of a coordinate plane can also be extended to include negative values.



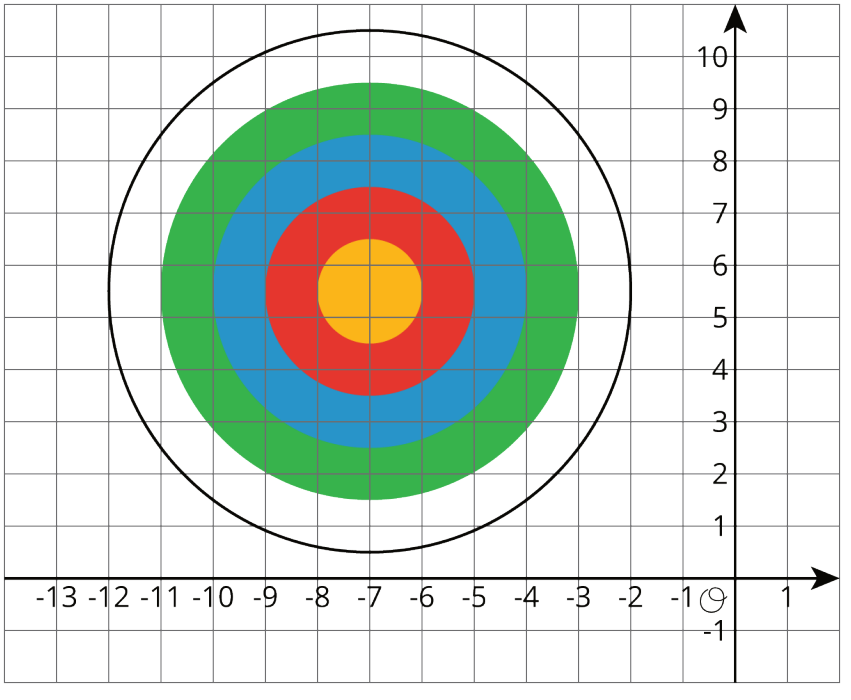
The ordered pair (x, y) can have negative x- and y-values. For $B = (-4, 1)$, the x-value of -4 tells us that the point is 4 units to the left of the y-axis. The y-value of 1 tells us that the point is one unit above the x-axis.

The same reasoning applies to the points A and C. The x- and y-coordinates for point A are positive, so A is to the right of the y-axis and above the x-axis. The x- and y-coordinates for point C are negative, so C is to the left of the y-axis and below the x-axis.

Lesson 11: Points on the Coordinate Plane

Cool Down: Target Practice

Here are the scores for landing an arrow in the colored regions of the archery target.



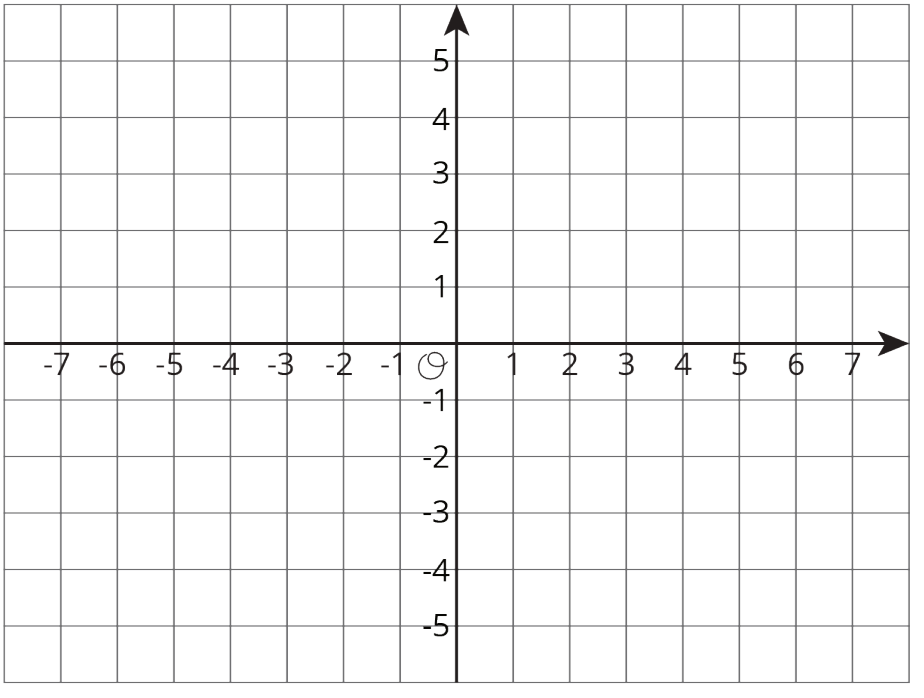
- Yellow: 10 points
- Red: 8 points
- Blue: 6 points
- Green: 4 points
- White: 2 points

1. Andre shot three arrows and they landed at $(-5, 4)$, $(-8, 7)$ and $(1, 6)$. What is his total score? Show your reasoning.

2. Jada shot an arrow and scored 10 points. She shot a second arrow that landed directly below the first one but scored only 2 points. Name two coordinates that could be the landing points of her two arrows.

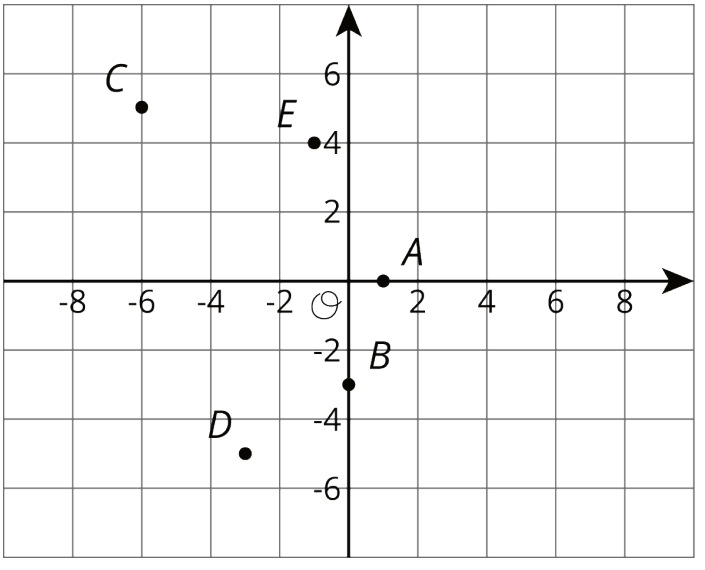
Unit 7 Lesson 11 Cumulative Practice Problems

1. a. Graph these points in the coordinate plane: $(-2, 3)$, $(2, 3)$, $(-2, -3)$, $(2, -3)$.



b. Connect all of the points. Describe the figure.

2. Write the coordinates of each point.



3. These three points form a horizontal line: $(-3.5, 4)$, $(0, 4)$, and $(6.2, 4)$. Name two additional points that fall on this line.

4. One night, it is $24^\circ C$ warmer in Tucson than it was in Minneapolis. If the temperatures in Tucson and Minneapolis are opposites, what is the temperature in Tucson?

   A. $-24^\circ C$

   B. $-12^\circ C$

   C. $12^\circ C$

   D. $24^\circ C$

(From Unit 7, Lesson 2.)

5. Lin ran 29 meters in 10 seconds. She ran at a constant speed.

   a. How far did Lin run every second?

   b. At this rate, how far can she run in 1 minute?

(From Unit 2, Lesson 9.)

6. Noah is helping his band sell boxes of chocolate to fund a field trip. Each box contains 20 bars and each bar sells for $1.50.

   a. Complete the table for values of m.

boxes sold (b)	money collected (m)
1	
2	
3	
4	
5	
6	
7	
8	

   b. Write an equation for the amount of money, m, that will be collected if b boxes of chocolate bars are sold. Which is the independent variable and which is the dependent variable in your equation?

   c. Write an equation for the number of boxes, b, that were sold if m dollars were collected. Which is the independent variable and which is the dependent variable in your equation?

(From Unit 6, Lesson 16.)

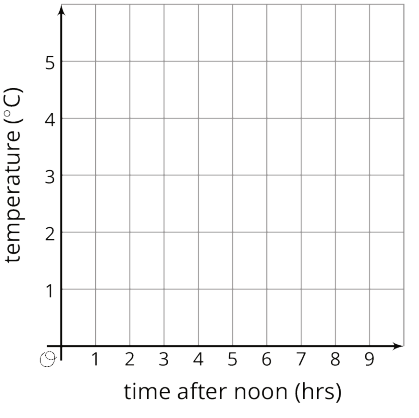
Lesson 12: Constructing the Coordinate Plane

12.1: English Winter

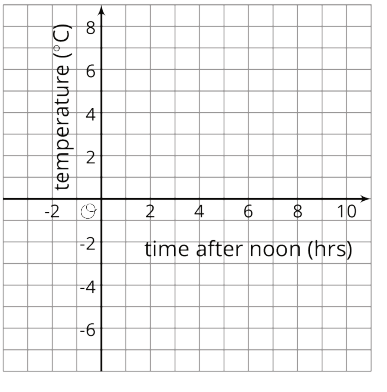
The following data were collected over one December afternoon in England.

time after noon (hours)	temperature (°C)
0	5
1	3
2	4
3	2
4	1
5	-2
6	-3
7	-4
8	-4

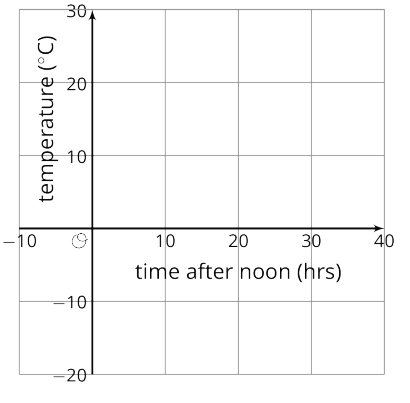
A



B



C



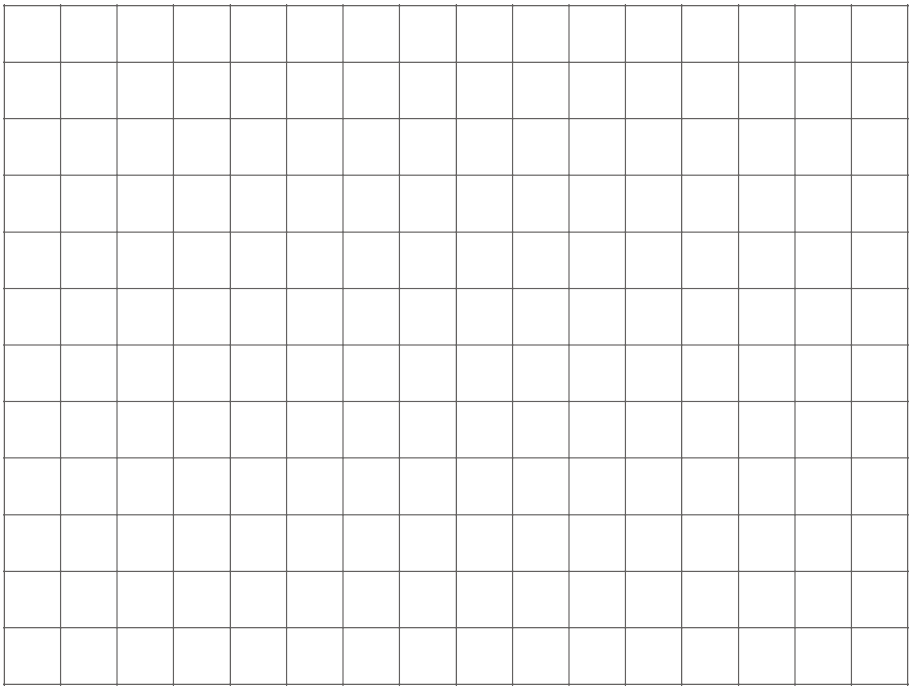
1. Which set of axes would you choose to represent these data? Explain your reasoning.

2. Explain why the other two sets of axes did not seem as appropriate as the one you chose.

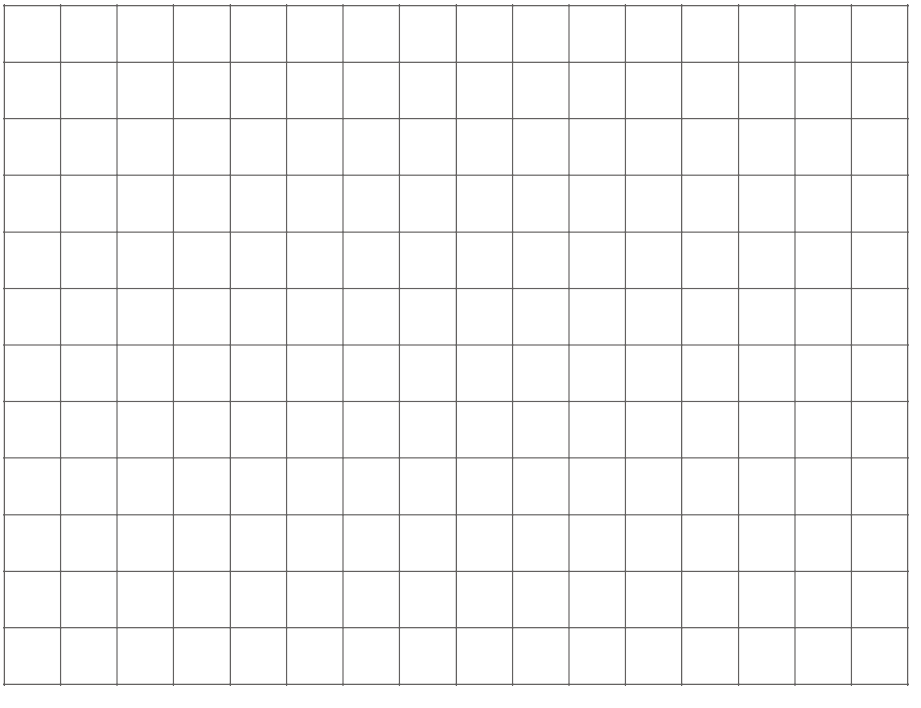
12.2: Axes Drawing Decisions

1. Here are three sets of coordinates. For each set, draw and label an appropriate pair of axes and plot the points.

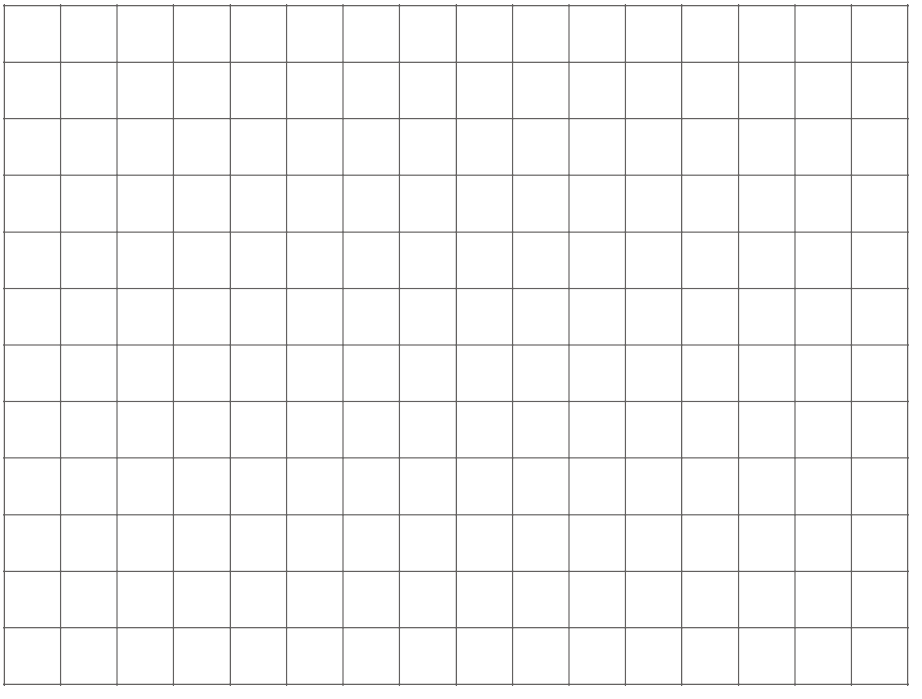
   a. $(1, 2), (3, -4), (-5, -2), (0, 2.5)$



   b. $(50, 50), (0, 0), (-10, -30), (-35, 40)$



c. $\left(\frac{1}{4}, \frac{3}{4}\right), \left(\frac{-5}{4}, \frac{1}{2}\right), \left(-1\frac{1}{4}, \frac{-3}{4}\right), \left(\frac{1}{4}, \frac{-1}{2}\right)$

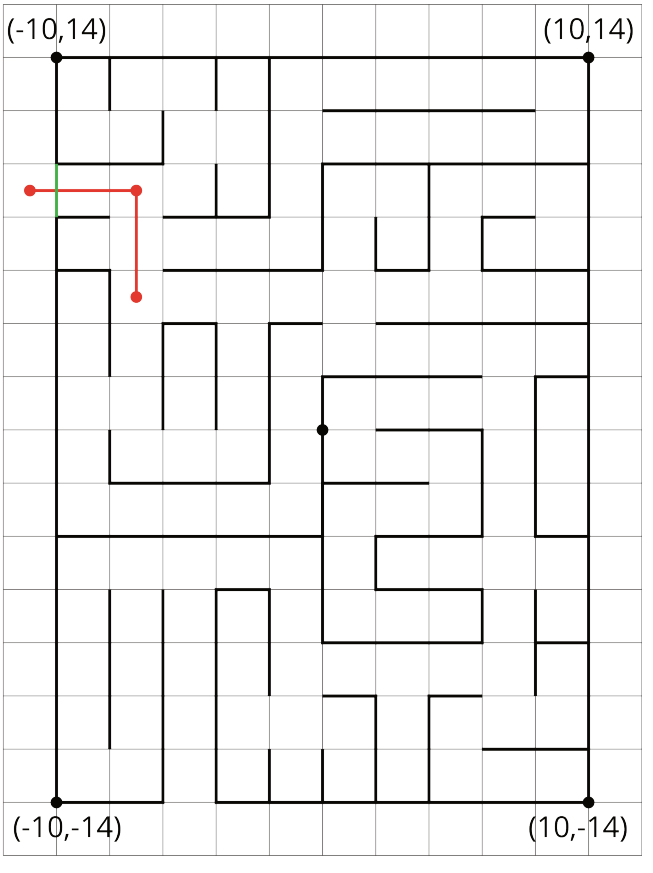


2. Discuss with a partner:

   - How are the axes and labels of your three drawings different?
   - How did the coordinates affect the way you drew the axes and label the numbers?

12.3: Positively A-maze-ing

Here is a maze on a coordinate plane. The black point in the center is (0, 0). The side of each grid square is 2 units long.

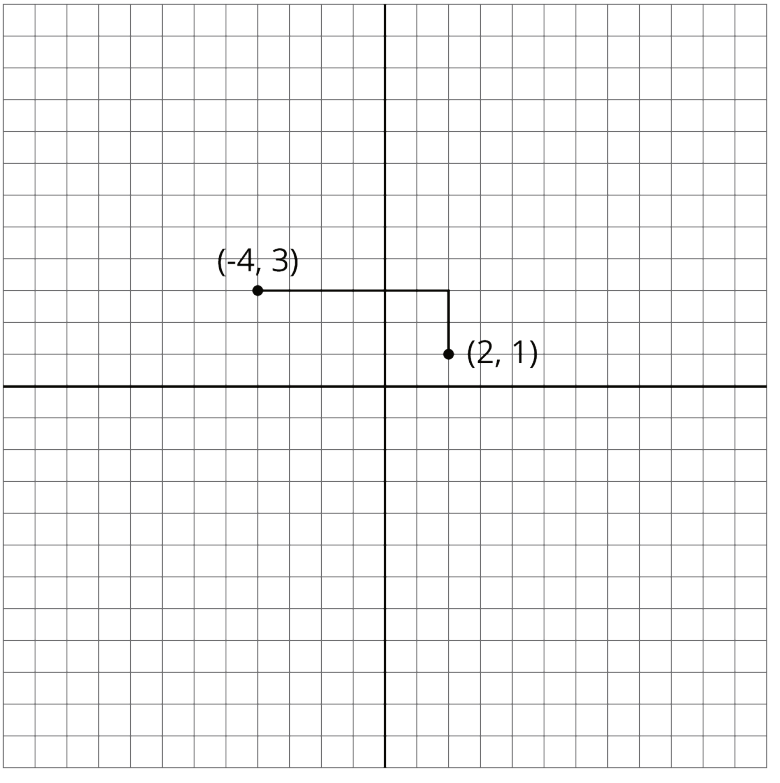


1. Enter the above maze at the location marked with a green segment. Draw line segments to show your way through and out of the maze. Label each turning point with a letter. Then, list all the letters and write their coordinates.

2. Choose any 2 turning points that share the same line segment. What is the same about their coordinates? Explain why they share that feature.

Are you ready for more?

To get from the point $(2, 1)$ to $(-4, 3)$ you can go two units up and six units to the left, for a total distance of eight units. This is called the "taxicab distance," because a taxi driver would have to drive eight blocks to get between those two points on a map.



Find as many points as you can that have a taxicab distance of eight units away from $(2, 1)$. What shape do these points make?

Lesson 12 Summary

The coordinate plane can be used to show information involving pairs of numbers.

When using the coordinate plane, we should pay close attention to what each axis represents and what scale each uses.

Suppose we want to plot the following data about the temperatures in Minneapolis one evening.

time (hours from midnight)	temperature (degrees C)
-4	3
-1	-2
0	-4
3	-8

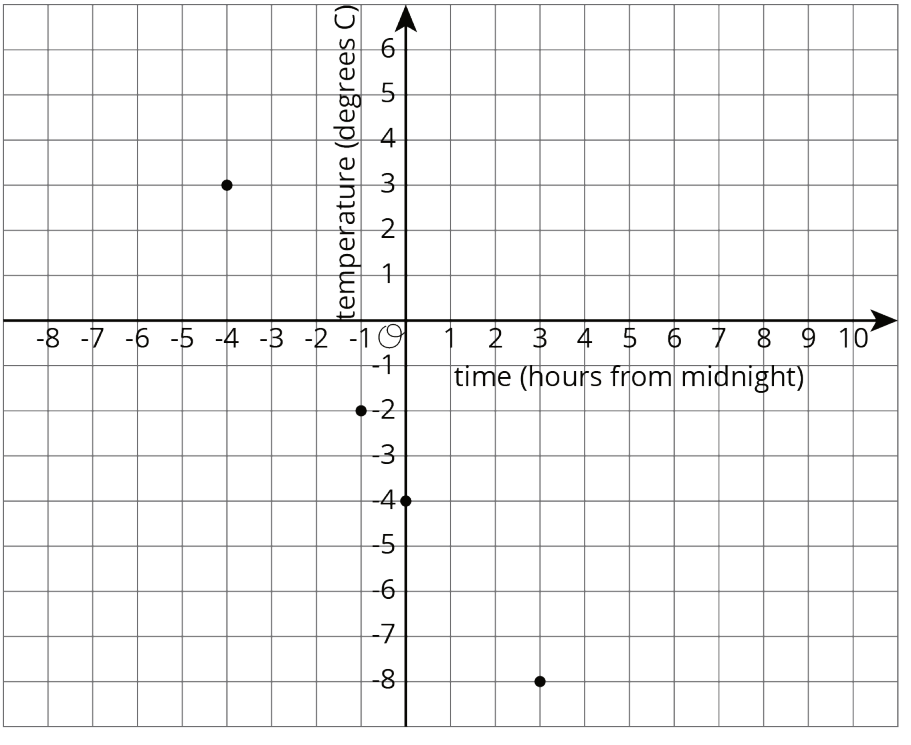
We can decide that the x-axis represents number of hours in relation to midnight and the y-axis represents temperatures in degrees Celsius.

- In this case, x-values less than 0 represent hours before midnight, and and x-values greater than 0 represent hours after midnight.
- On the y-axis, the values represents temperatures above and below the the freezing point of 0 degrees Celsius.

The data involve whole numbers, so it is appropriate that the each square on the grid represents a whole number.

- On the left of the origin, the x-axis needs to go as far as -4 or less (farther to the left). On the right, it needs to go to 3 or greater.
- Below the origin, the y-axis has to go as far as -8 or lower. Above the origin, it needs to go to 3 or higher.

Here is a graph of the data with the axes labeled appropriately.

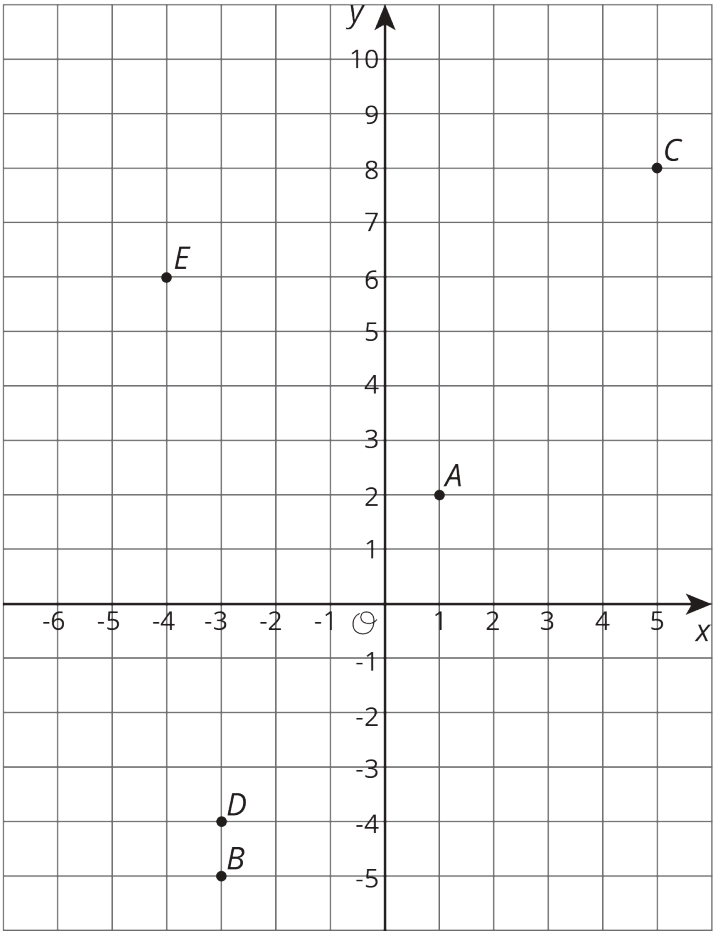


On this coordinate plane, a point at $(0, 0)$ would mean a temperature of 0 degrees Celsius at midnight. The point at $(-4, 3)$ means a temperature of 3 degrees Celsius at 4 hours before midnight (or 8 p.m.).

Lesson 12: Constructing the Coordinate Plane

Cool Down: What Went Wrong: Graphing Edition

Lin drew this set of axes and plotted the points $A = (1, 2)$, $B = (-3, -5)$, $C = (5, 7)$, $D = (-4, -3)$, and $E = (-4, 6)$ on them.



Identify as many mistakes as you notice in Lin's graph.

Unit 7 Lesson 12 Cumulative Practice Problems

1. Draw and label an appropriate pair of axes and plot the points.

   $(\frac{1}{5}, \frac{4}{5})$

   $(-\frac{3}{5}, \frac{2}{5})$

   $(-1\frac{1}{5}, -\frac{4}{5})$

   $(\frac{1}{5}, -\frac{3}{5})$

2. Diego was asked to plot these points: $(-50, 0)$, $(150, 100)$, $(200, -100)$, $(350, 50)$, $(-250, 0)$. What interval could he use for each axis? Explain your reasoning.

3. a. Name 4 points that would form a square with the origin at its center.

   b. Graph these points to check if they form a square.

4. Which of the following changes would you represent using a negative number? Explain what a positive number would represent in that situation.

   a. A loss of 4 points

   b. A gain of 50 yards

   c. A loss of $10

   d. An elevation above sea level

(From Unit 7, Lesson 5.)

5. Jada is buying notebooks for school. The cost of each notebook is $1.75.

   a. Write an equation that shows the cost of Jada's notebooks, c, in terms of the number of notebooks, n, that she buys.

   b. Which of the following could be points on the graph of your equation?

   $(1.75, 1)$ $(2, 3.50)$ $(5, 8.75)$ $(17.50, 10)$ $(9, 15.35)$

(From Unit 6, Lesson 16.)

6. A corn field has an area of 28.6 acres. It requires about 15,000,000 gallons of water. About how many gallons of water per acre is that?

   A. 5,000

   B. 50,000

   C. 500,000

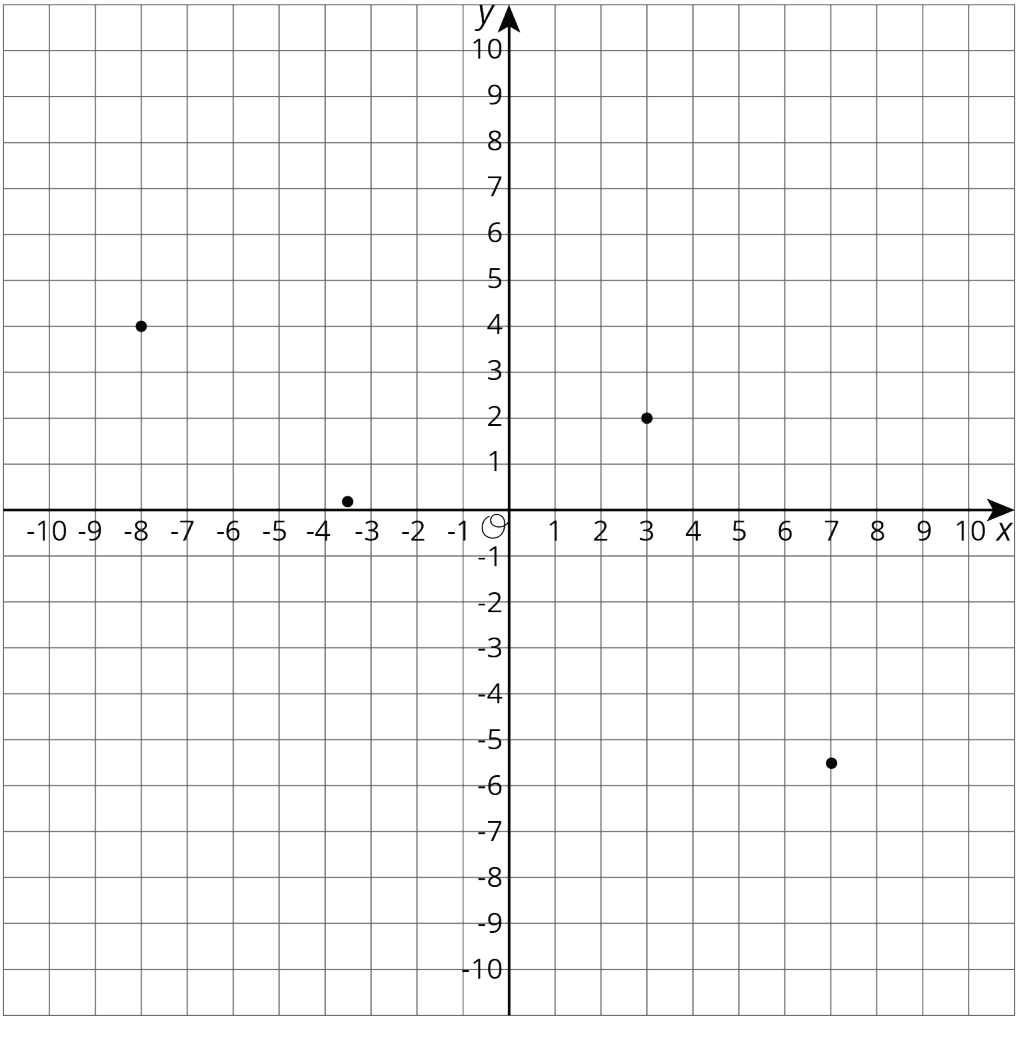
   D. 5,000,000

(From Unit 5, Lesson 13.)

Lesson 13: Interpreting Points on a Coordinate Plane

13.1: Unlabeled Points

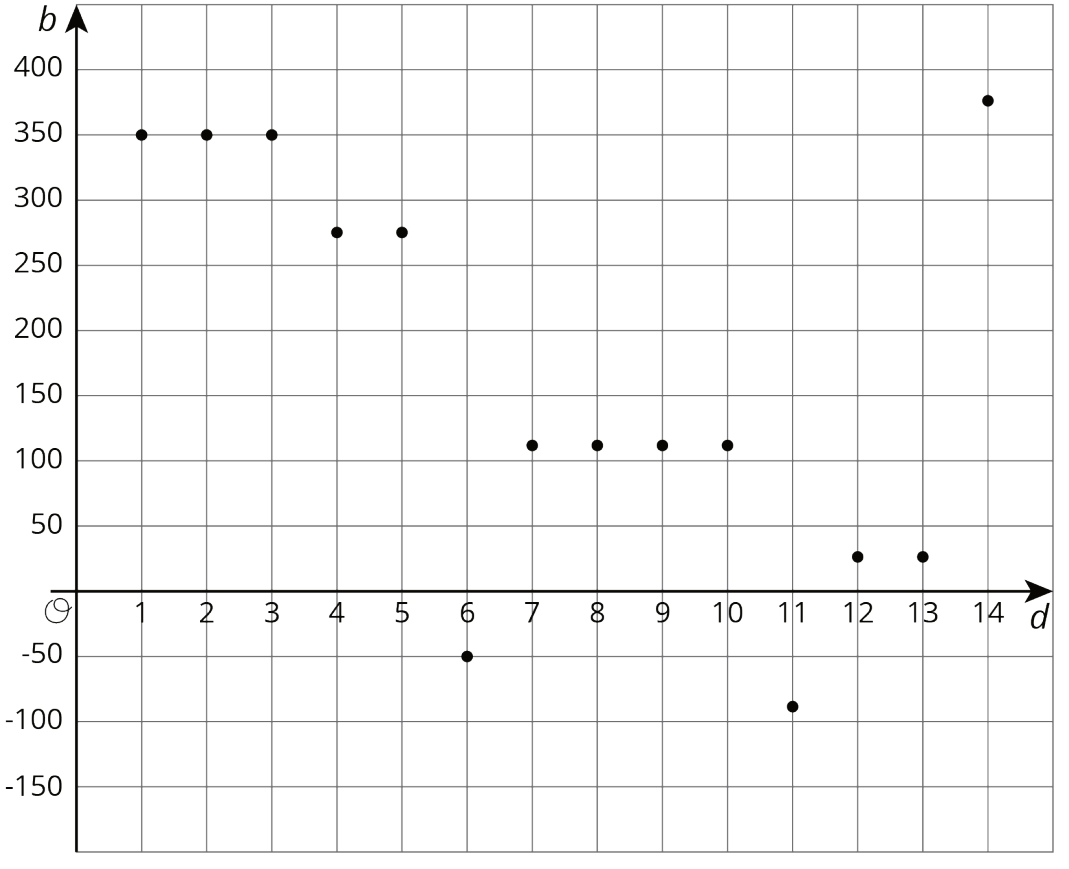
Label each point on the coordinate plane with the appropriate letter and ordered pair.



$A = (7, -5.5)$ $B = (-8, 4)$ $C = (3, 2)$ $D = (-3.5, 0.2)$

13.2: Account Balance

The graph shows the balance in a bank account over a period of 14 days. The axis labeled b represents account balance in dollars. The axis labeled d represents the day.



1. Estimate the greatest account balance. On which day did it occur?

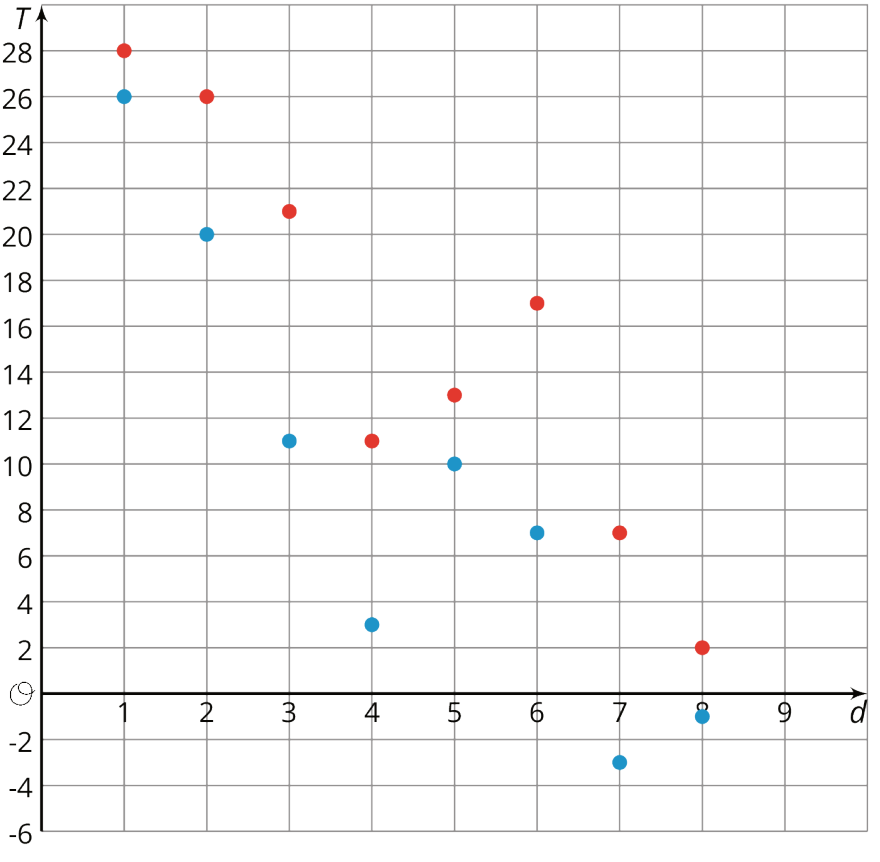
2. Estimate the least account balance. On which day did it occur?

3. What does the point $(6, -50)$ tell you about the account balance?

4. How can we interpret $|-50|$ in the context?

13.3: High and Low Temperatures

The coordinate plane shows the high and low temperatures in Nome, Alaska over a period of 8 days. The axis labeled T represents temperatures in degrees Fahrenheit. The axis labeled d represents the day.



1. a. What was the warmest high temperature?

   b. Write an inequality to describe the high temperatures, H, over the 8-day period.

2. a. What was the coldest low temperature?

   b. Write an inequality to describe the low temperatures, L, over the 8-day period.

3. a. On which day(s) did the *largest* difference between the high and low temperatures occur? Write down this difference.

   b. On which day(s) did the *smallest* difference between the high and low temperatures occur? Write down this difference.

Are you ready for more?

Before doing this problem, do the problem about taxicab distance in an earlier lesson.

The point $(0, 4)$ is 4 taxicab units away from $(-4, 3)$ and 4 taxicab units away from $(2, 1)$.

1. Find as many other points as you can that are 4 taxicab units away from *both* $(-4, 3)$ and $(2, 1)$.

2. Are there any points that are 3 taxicab units away from both points?

Lesson 13 Summary

Points on the coordinate plane can give us information about a context or a situation. One of those contexts is about money.

To open a bank account, we have to put money into the account. The account balance is the amount of money in the account at any given time. If we put in $350 when opening the account, then the account balance will be 350.

Sometimes we may have no money in the account and need to borrow money from the bank. In that situation, the account balance would have a negative value. If we borrow $200, then the account balance is -200.

A coordinate grid can be used to display both the balance and the day or time for any balance. This allows to see how the balance changes over time or to compare the balances of different days.

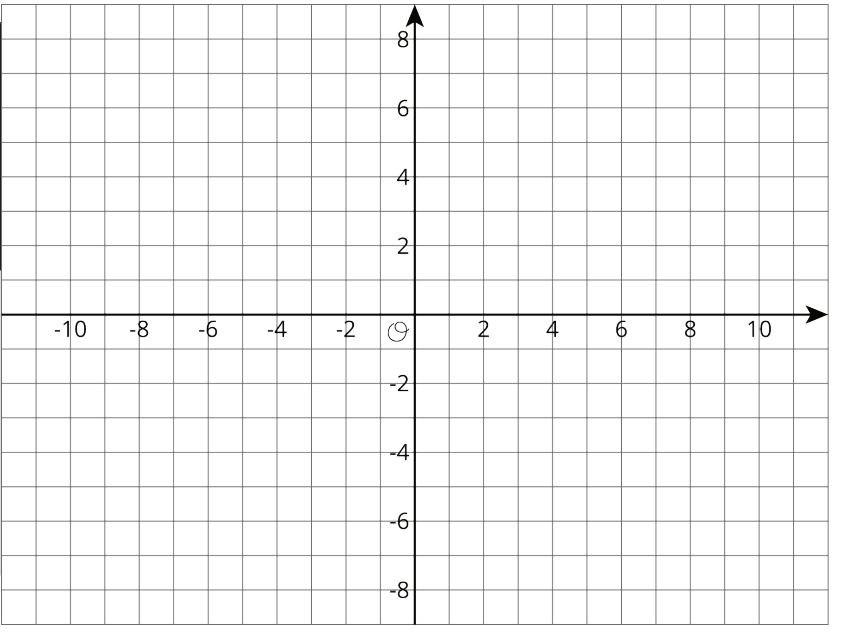
Similarly, if we plot on the coordinate plane data such as temperature over time, we can see how temperature changes over time or compare temperatures of different times.

Lesson 13: Interpreting Points on a Coordinate Plane

Cool Down: Time and Temperature

The temperature in Princeton was recorded at various times during the day. The times and temperatures are shown in the table.

time (hours before or after midnight)	temperature (degrees C)
-5	1.2
-2	-1.6
0	-3.5
8	-6.7



1. Plot points that represent the data. Be sure to label the axes.

2. In the town of New Haven, the temperature at midnight was $1.2^\circ C$. Plot and label this point. Which town was warmer at midnight, Princeton or New Haven? How many degrees warmer was it?

3. If the point $(3, -2.5)$ were also plotted on the diagram, what would it mean?

Unit 7 Lesson 13 Cumulative Practice Problems

1. The elevation of a submarine is shown in the table. Draw and label coordinate axes with an appropriate scale and plot the points.

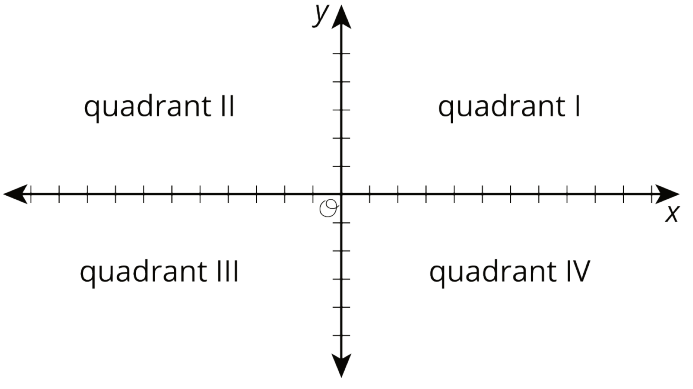
time after noon (hours)	elevation (meters)
0	-567
1	-892
2	-1,606
3	-1,289
4	-990
5	-702
6	-365

2. The inequalities $h > 42$ and $h < 60$ represent the height requirements for an amusement park ride, where h represents a person's height in inches.

   Write a sentence or draw a sign that describes these rules as clearly as possible.

   (From Unit 7, Lesson 8.)

3. The x-axis represents the number of hours before or after noon, and the y-axis represents the temperature in degrees Celsius.



a. At 9 a.m., it was below freezing. In what quadrant would this point be plotted?

b. At 11 a.m., it was 10°C. In what quadrant would this point be plotted?

c. Choose another time and temperature. Then tell the quadrant where the point should be plotted.

d. What does the point $(0, 0)$ represent in this context?

4. Solve each equation.

$3a = 12$ $\quad$ $b + 3.3 = 8.9$ $\quad$ $1 = \frac{1}{4}c$

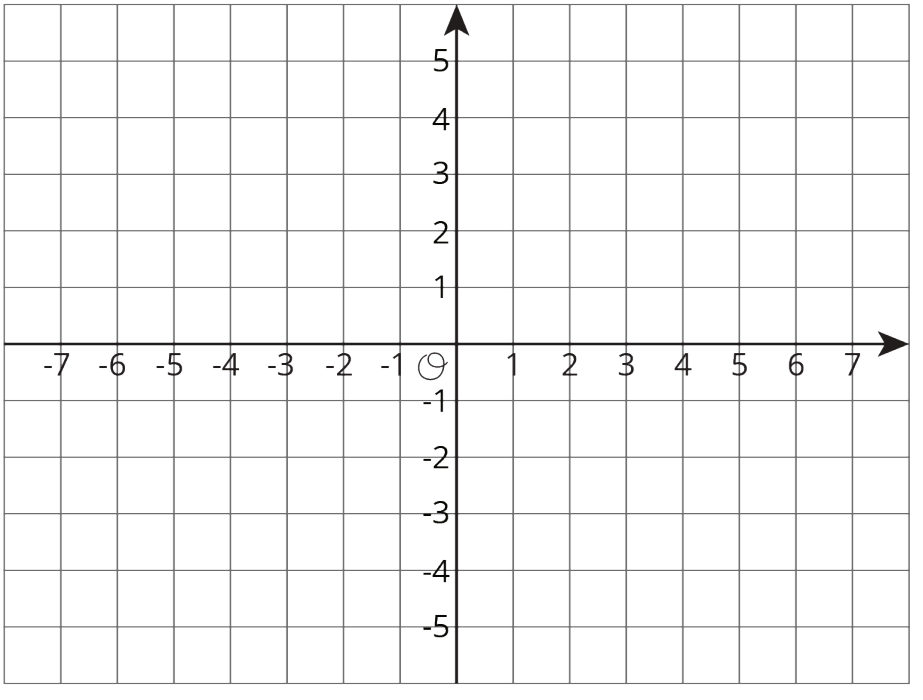
$5\frac{1}{2} = d + \frac{1}{4}$ $\quad$ $2e = 6.4$

(From Unit 6, Lesson 4.)

Lesson 14: Distances on a Coordinate Plane

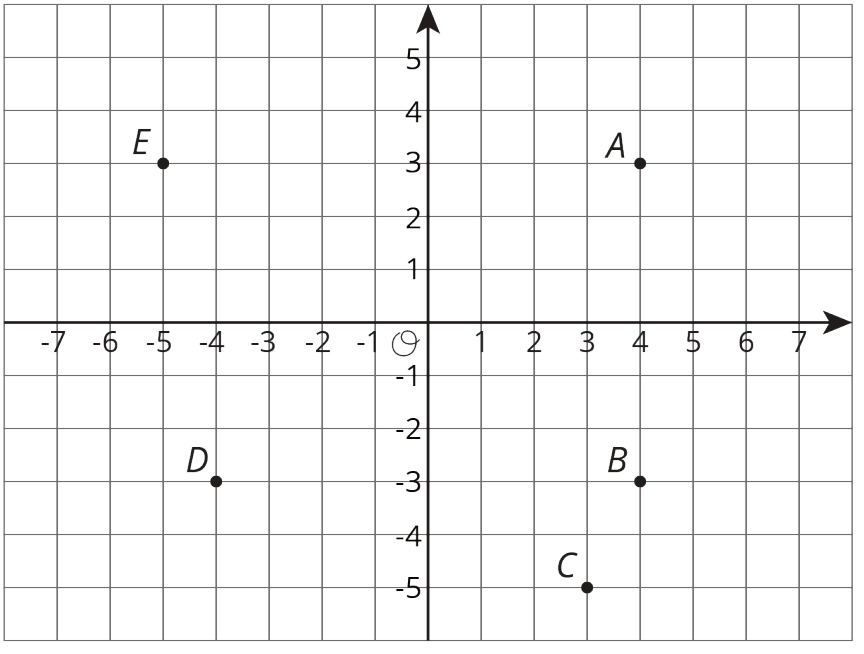
14.1: Coordinate Patterns

Plot points in your assigned quadrant and label them with their coordinates.



14.2: Signs of Numbers in Coordinates

1. Write the coordinates of each point.



$A =$

$B =$

$C =$

$D =$

$E =$

2. Answer these questions for each pair of points.

   - How are the coordinates the same? How are they different?
   - How far away are they from the y-axis? To the left or to the right of it?
   - How far away are they from the x-axis? Above or below it?

   a. A and B

   b. B and D

   c. A and D

Pause here for a class discussion.

3. Point F has the same coordinates as point C, except its y-coordinate has the opposite sign.

   a. Plot point F on the coordinate plane and label it with its coordinates.

   b. How far away are F and C from the x-axis?

   c. What is the distance between F and C?

4. Point G has the same coordinates as point E, except its x-coordinate has the opposite sign.

   a. Plot point G on the coordinate plane and label it with its coordinates.

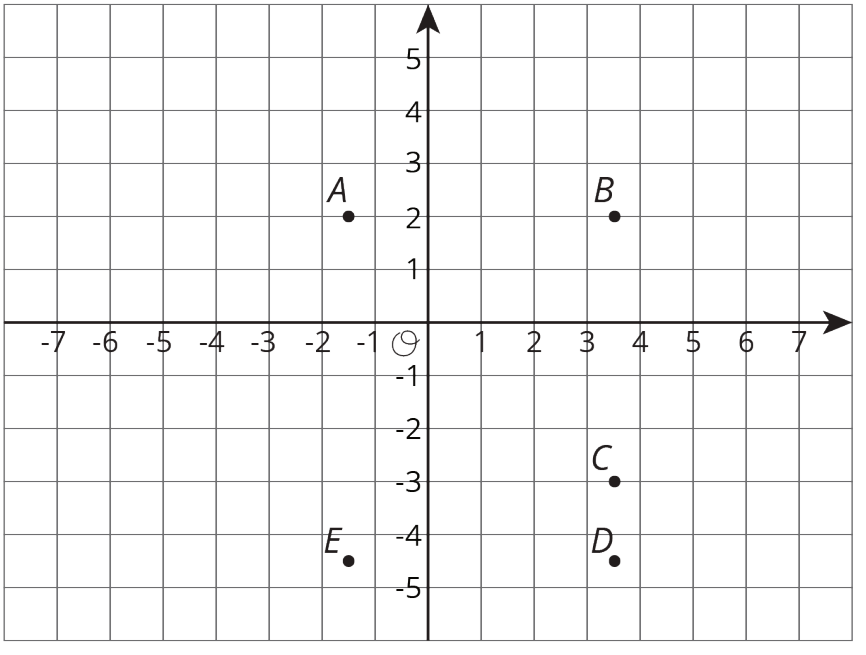
   b. How far away are G and E from the y-axis?

   c. What is the distance between G and E?

5. Point H has the same coordinates as point B, except its *both* coordinates have the opposite sign. In which quadrant is point H?

14.3: Finding Distances on a Coordinate Plane

1. Label each point with its coordinates.



2. Find the distance between each of the following pairs of points.

   a. Point B and C

   b. Point D and B

   c. Point D and E

3. Which of the points are 5 units from $(-1.5, -3)$?

4. Which of the points are 2 units from $(0.5, -4.5)$?

5. Plot a point that is both 2.5 units from A and 9 units from E. Label that point M and write down its coordinates.

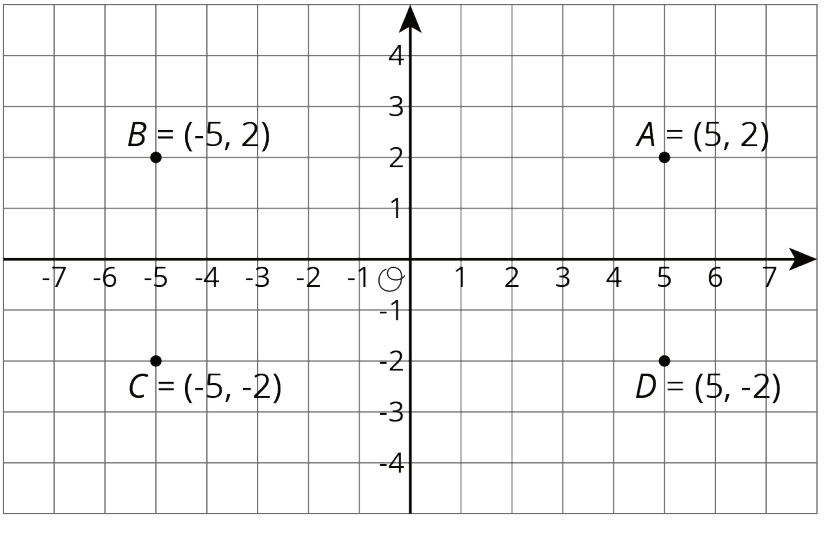
Are you ready for more?

Priya says, "There are exactly four points that are 3 units away from $(-5, 0)$." Lin says, "I think there are a whole bunch of points that are 3 units away from $(-5, 0)$."

Do you agree with either of them? Explain your reasoning.

Lesson 14 Summary

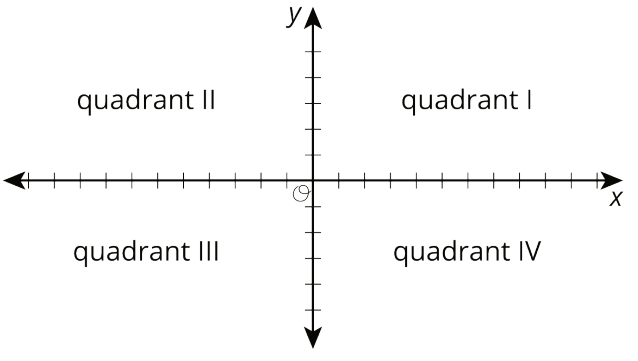
The points $A = (5, 2)$, $B = (-5, 2)$, $C = (-5, -2)$, and $D = (5, -2)$ are shown in the plane. Notice that they all have almost the same coordinates, except the signs are different. They are all the same distance from each axis but are in different quadrants.



Notice that the vertical distance between points A and D is 4 units, because point A is 2 units above the horizontal axis and point D is 2 units below the horizontal axis. The horizontal distance between points A and B is 10 units, because point B is 5 units to the left of the vertical axis and point A is 5 units to the right of the vertical axis.

We can always tell which quadrant a point is located in by the signs of its coordinates.

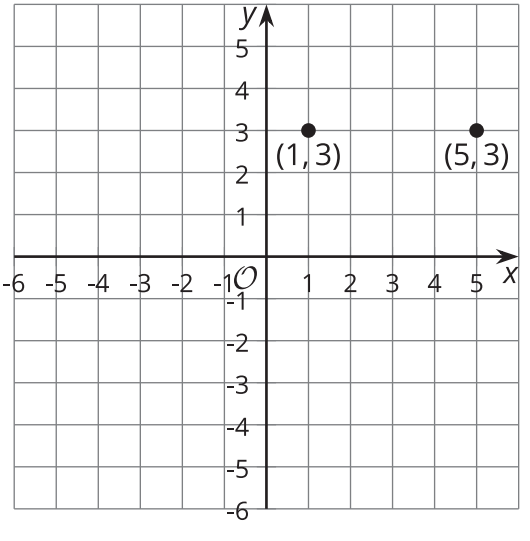
x	y	quadrant
positive	positive	I
negative	positive	II
negative	negative	III
positive	negative	IV



In general:

- If two points have x-coordinates that are opposites (like 5 and -5), they are the same distance away from the vertical axis, but one is to the left and the other to the right.
- If two points have y-coordinates that are opposites (like 2 and -2), they are the same distance away from the horizontal axis, but one is above and the other below.

When two points have the same value for the first or second coordinate, we can find the distance between them by subtracting the coordinates that are different. For example, consider $(1, 3)$ and $(5, 3)$:

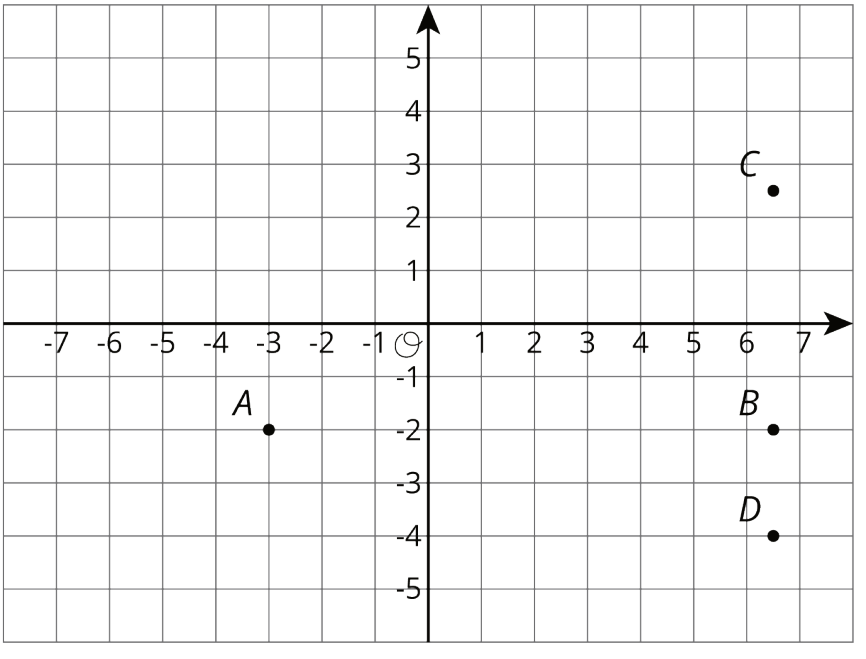


They have the same y-coordinate. If we subtract the x-coordinates, we get $5 - 1 = 4$. These points are 4 units apart.

Lesson 14: Distances on a Coordinate Plane

Cool Down: Points and Distances

Here are four points on a coordinate plane.



1. What is the distance between points A and B?

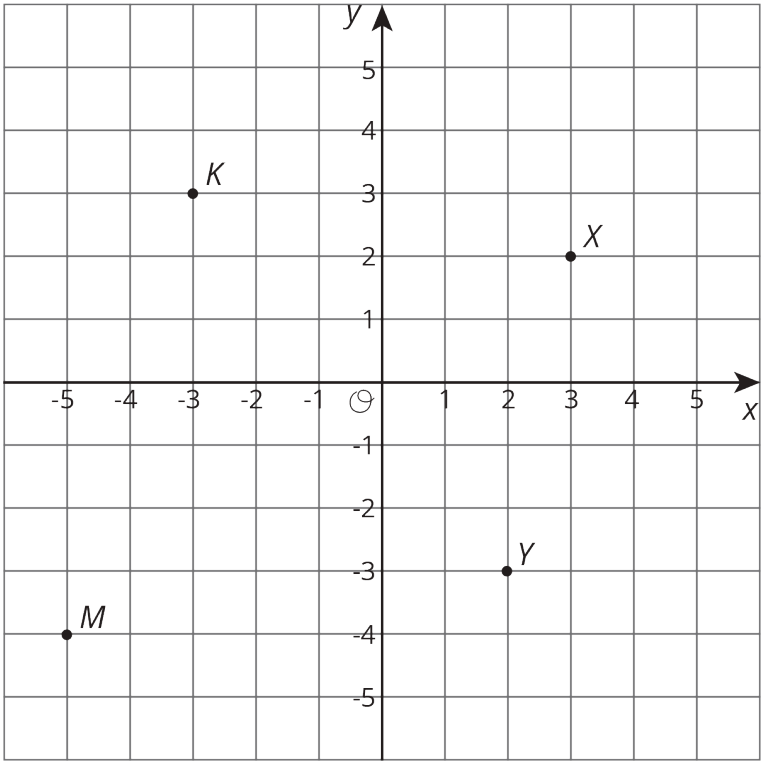
2. What is the distance between points C and D?

3. Plot the point $(-3, 2)$. Label it E.

4. Plot the point $(-4.5, -4.5)$. Label it F.

Unit 7 Lesson 14 Cumulative Practice Problems

1. Here are 4 points on a coordinate plane.



   a. Label each point with its coordinates.

   b. Plot a point that is 3 units from point K. Label it P.

   c. Plot a point that is 2 units from point M. Label it W.

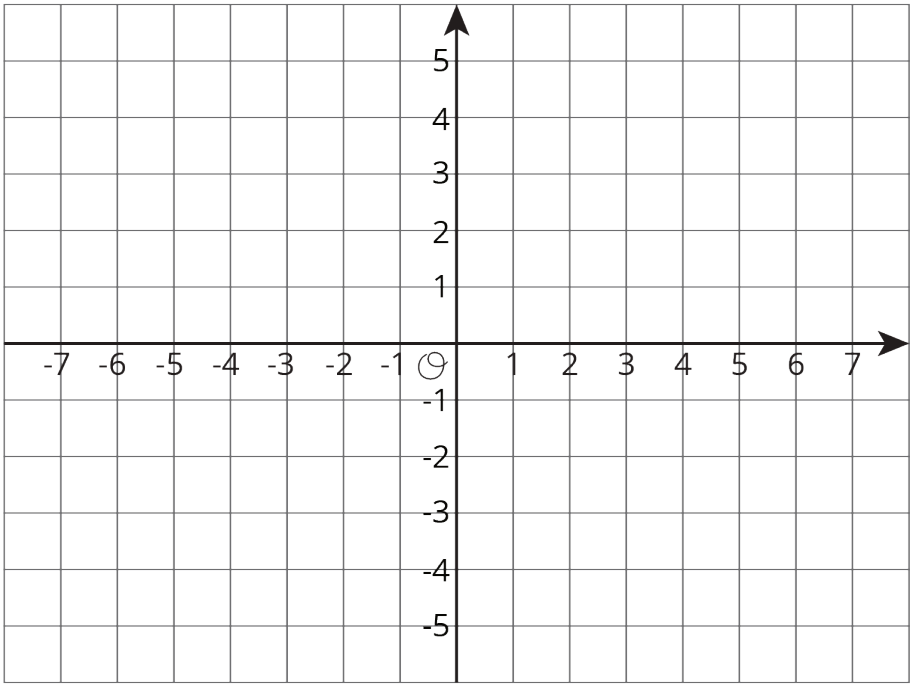
2. Each set of points are connected to form a line segment. What is the length of each?

   a. A = $(3, 5)$ and B = $(3, 6)$

   b. C = $(-2, -3)$ and D = $(-2, -6)$

   c. E = $(-3, 1)$ and F = $(-3, -1)$

3. On the coordinate plane, plot four points that are each 3 units away from point $P = (-2, -1)$. Write the coordinates of each point.



4. Noah's recipe for sparkling orange juice uses 4 liters of orange juice and 5 liters of soda water.

   a. Noah prepares large batches of sparkling orange juice for school parties. He usually knows the total number of liters, t, that he needs to prepare. Write an equation that shows how Noah can find s, the number of liters of soda water, if he knows t.

   b. Sometimes the school purchases a certain number, j, of liters of orange juice and Noah needs to figure out how much sparkling orange juice he can make. Write an equation that Noah can use to find t if he knows j.

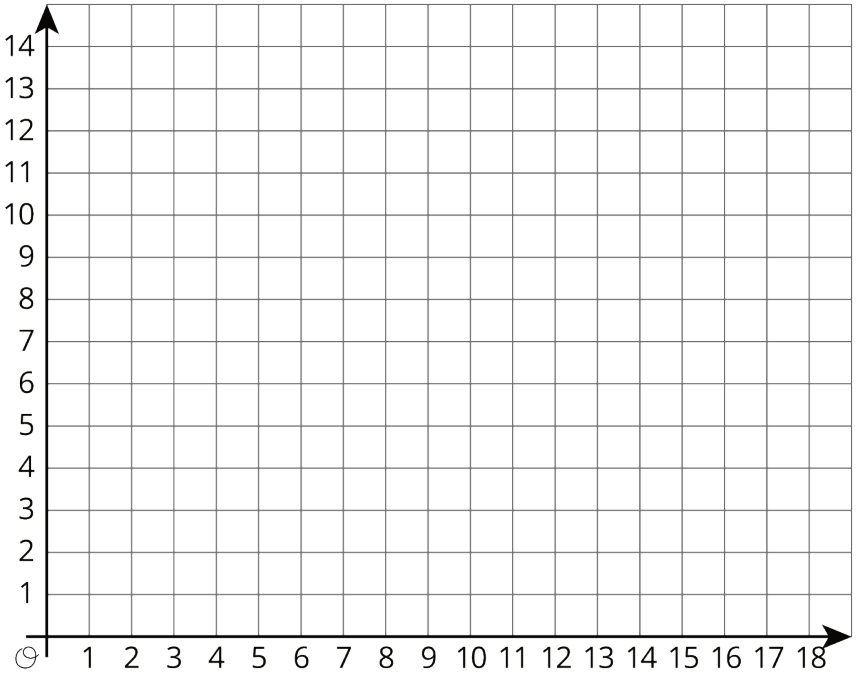
(From Unit 6, Lesson 16.)

5. For a suitcase to be checked on a flight (instead of carried by hand), it can weigh at most 50 pounds. Andre's suitcase weighs 23 kilograms. Can Andre check his suitcase? Explain or show your reasoning. (Note: 10 kilograms $\approx$ 22 pounds)

(From Unit 3, Lesson 4.)

Lesson 15: Shapes on the Coordinate Plane

15.1: Figuring Out The Coordinate Plane

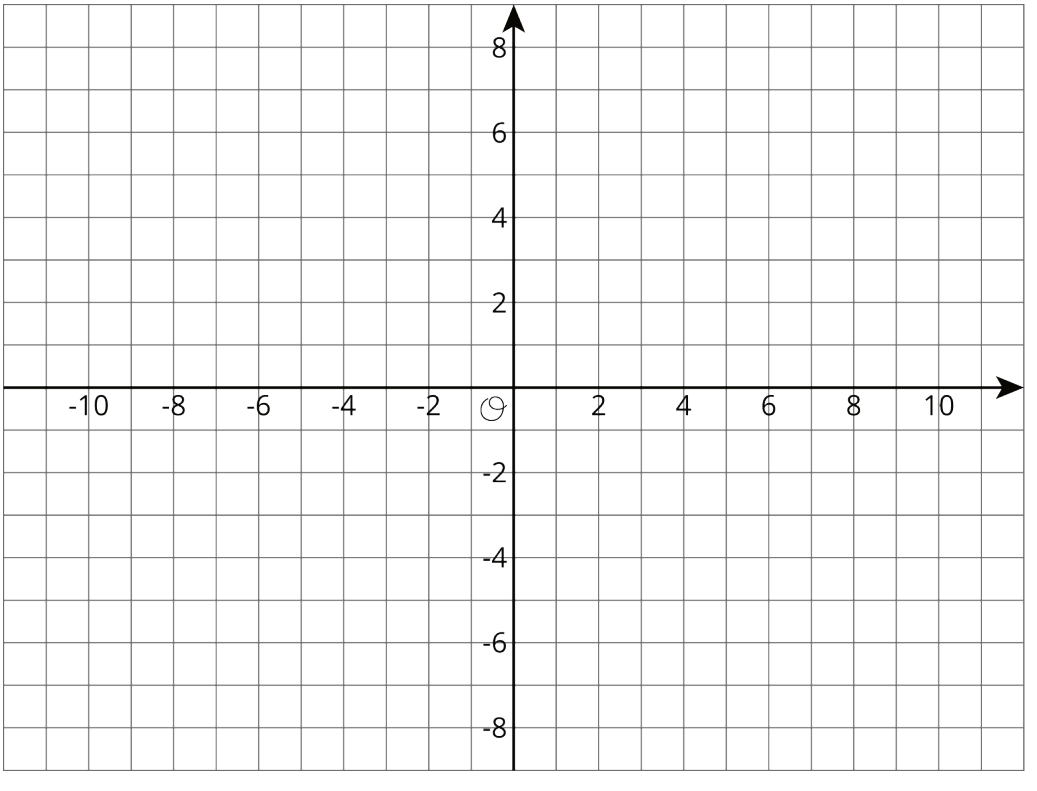


1. Draw a figure in the coordinate plane with at least three of following properties:
    - 6 vertices
    - Exactly 1 pair of parallel sides
    - At least 1 right angle
    - 2 sides with the same length
2. Is your figure a polygon? Explain how you know.

15.2: Plotting Polygons

Here are the coordinates for four polygons. Plot them on the coordinate plane, connect the points in the order that they are listed, and label each polygon with its letter name.

1. Polygon A: (-7, 4), (-8, 5), (-8, 6), (-7, 7), (-5, 7), (-5, 5), (-7, 4)
2. Polygon B: (4, 3), (3, 3), (2, 2), (2, 1), (3, 0), (4, 0), (5, 1), (5, 2), (4, 3)
3. Polygon C: (-8, -5), (-8, -8), (-5, -8), (-5, -5), (-8, -5)
4. Polygon D: (-5, 1), (-3, -3), (-1, -2), (0, 3), (-3, 3), (-5, 1)

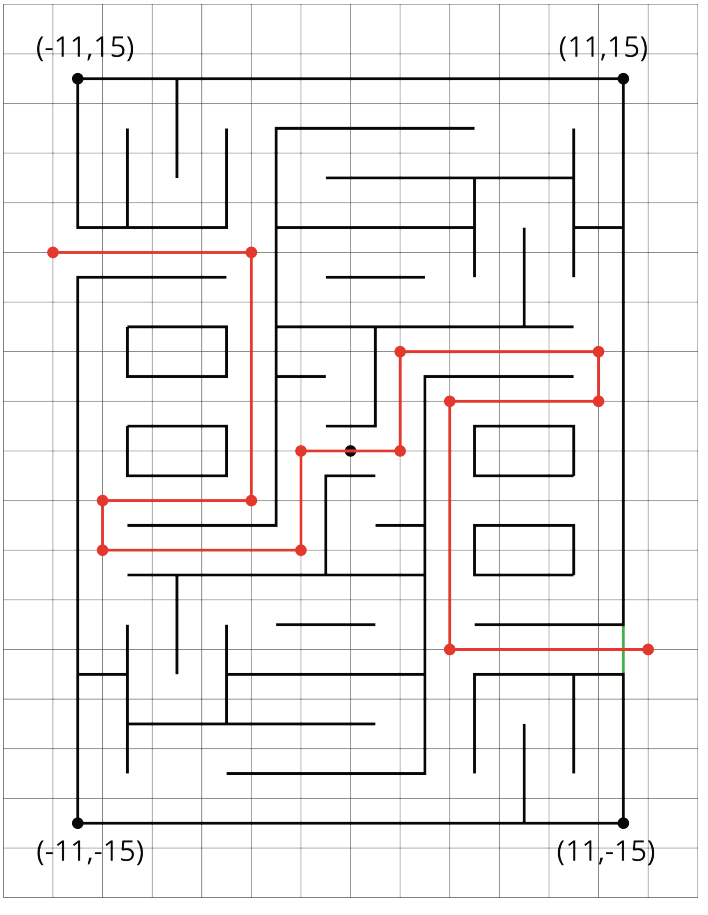


Are you ready for more?

Find the area of Polygon D in this activity.

15.3: Four Quadrants of A-Maze-ing

1. The following diagram shows Andre's route through a maze. He started from the lower right entrance.



a. What are the coordinates of the first two and the last two points of his route?

b. How far did he walk from his starting point to his ending point? Show how you know.

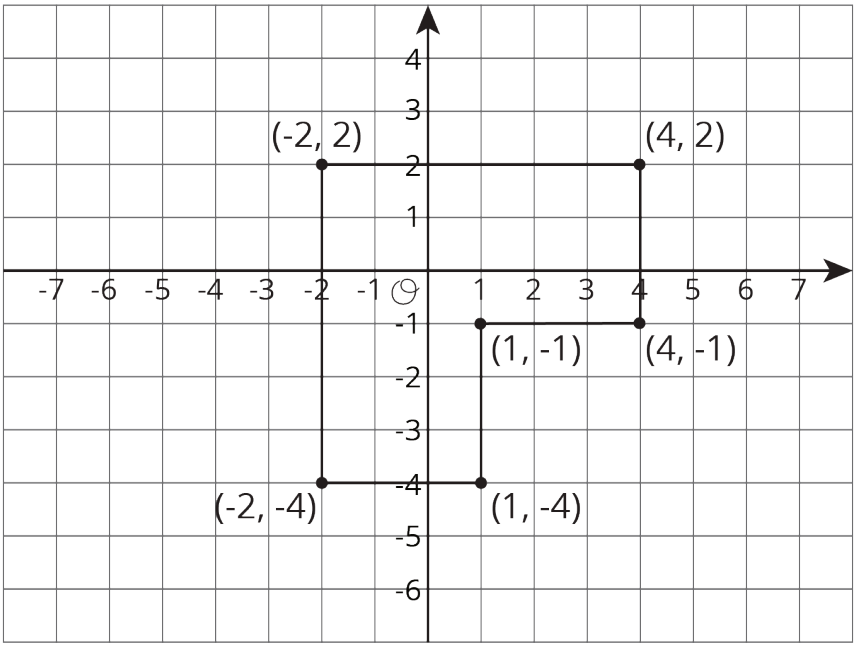
2. Jada went into the maze and stopped at $(-7, 2)$.

   a. Plot that point and other points that would lead her out of the maze (through the exit on the upper left side).

   b. How far from $(-7, 2)$ must she walk to exit the maze? Show how you know.

Lesson 15 Summary

We can use coordinates to find lengths of segments in the coordinate plane.



For example, we can find the perimeter of this polygon by finding the sum of its side lengths. Starting from $(-2, 2)$ and moving clockwise, we can see that the lengths of the segments are 6, 3, 3, 3, 3, and 6 units. The perimeter is therefore 24 units.

In general:

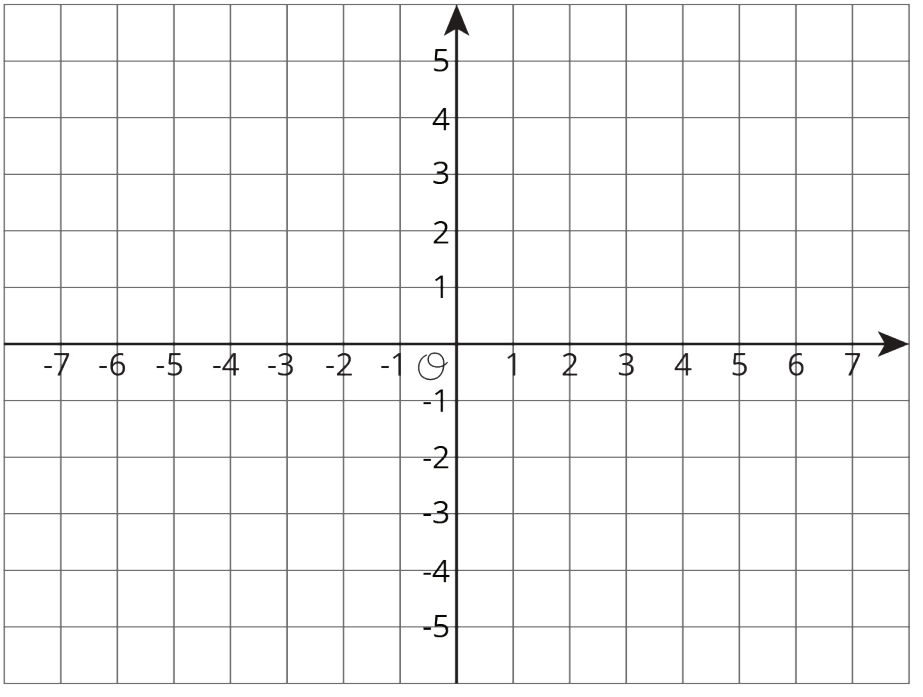
- If two points have the same x-coordinate, they will be on the same vertical line, and we can find the distance between them.
- If two points have the same y-coordinate, they will be on the same horizontal line, and we can find the distance between them.

Lesson 15: Shapes on the Coordinate Plane

Cool Down: Perimeter of A Polygon

1. Plot the following points on the coordinate plane and connect them to create a polygon.

$A = (1, 3)$
$B = (3, 3)$
$C = (3, -2)$
$D = (-2, -2)$
$E = (-2, 0)$
$F = (0, 0)$
$G = (0, 2)$
$H = (1, 2)$
$I = (1, 3)$



2. Find the perimeter of the polygon.

Unit 7 Lesson 15 Cumulative Practice Problems

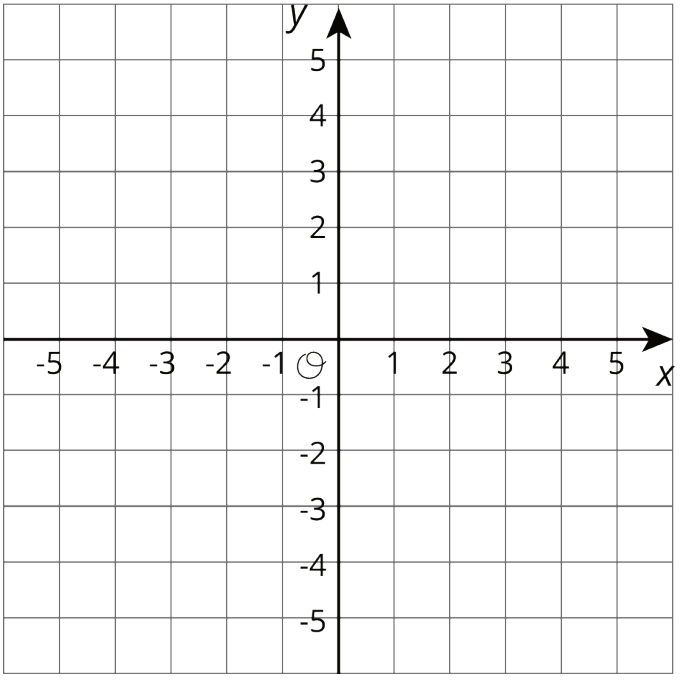
1. The coordinates of a rectangle are $(3, 0)$, $(3, -5)$, $(-4, 0)$ and $(-4, -5)$

   a. What is the length and width of this rectangle?

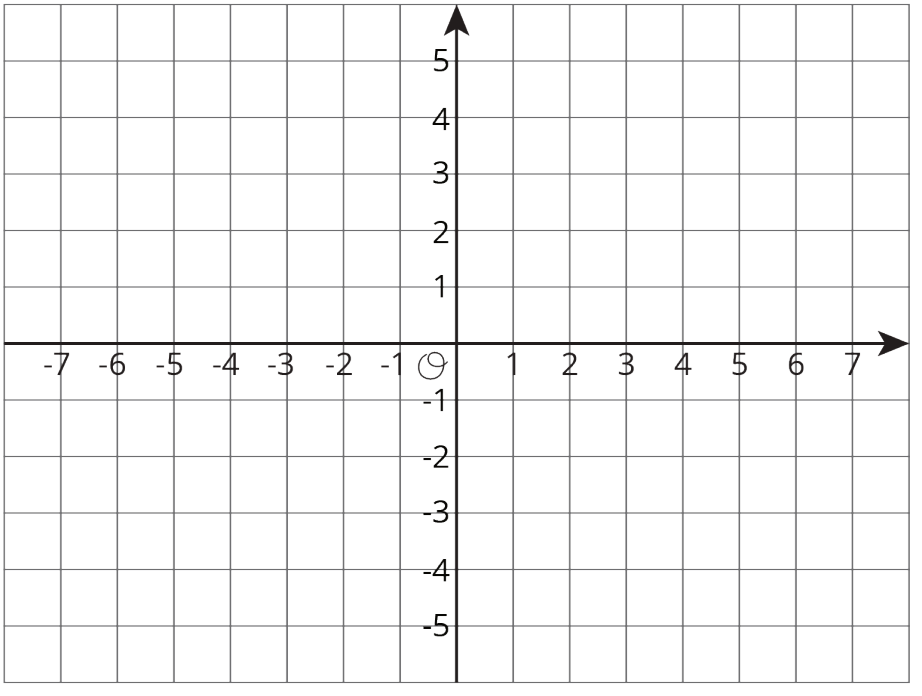
   b. What is the perimeter of the rectangle?

   c. What is the area of the rectangle?

2. Draw a square with one vertex on the point $(-3, 5)$ and a perimeter of 20 units. Write the coordinates of each other vertex.



3. a. Plot and connect the following points to form a polygon.
$(-3, 2), (2, 2), (2, -4), (-1, -4), (-1, -2), (-3, -2), (-3, 2)$



b. Find the perimeter of the polygon.

4. For each situation, select **all** the equations that represent it. Choose one equation and solve it.

a. Jada's cat weighs 3.45 kg. Andre's cat weighs 1.2 kg more than Jada's cat. How much does Andre's cat weigh?

$x = 3.45 + 1.2$ $x = 3.45 - 1.2$ $x + 1.2 = 3.45$ $x - 1.2 = 3.45$

b. Apples cost $1.60 per pound at the farmer's market. They cost 1.5 times as much at the grocery store. How much do the apples cost per pound at the grocery store?

$y = (1.5) \cdot (1.60)$ $y = 1.60 \div 1.5$ $(1.5)y = 1.60$ $\frac{y}{1.5} = 1.60$

(From Unit 6, Lesson 4.)