

Interpreting Points on a Coordinate Plane

Goals

- Compare points on a graph, including statements about relative position and the vertical distance between points.
- Describe (using words and inequality symbols) and interpret the range of coordinates on a graph, including the meaning of y -values that are negative.
- Identify and interpret points on a graph to answer questions about situations involving temperature or money.

Learning Targets

- I can explain how rational numbers represent balances in a money context.
- I can explain what points in a four-quadrant coordinate plane represent in a situation.
- I can plot points in a four-quadrant coordinate plane to represent situations and solve problems.

Access for Students with Diverse Abilities

- Engagement (Activity 2)

Access for Multilingual Learners

- MLR5: Co-Craft Questions (Activity 1)

Instructional Routines

- MLR5: Co-Craft Questions

Lesson Narrative

In this lesson, students pay attention to choices for what the axes represent and the scale used on each axis. Graphs need to present information clearly and legibly to be useful for visualizing relationships between quantities. Students begin by matching points plotted in the coordinate plane with their coordinates. They interpret the meaning of certain points in relation to a given situation and use inequalities to express relationships. They also reason abstractly and quantitatively as they interpret vertical distance in a coordinate plane in context.

Student Learning Goal

Let's examine what points on the coordinate plane can tell us.

Lesson Timeline

5 min

Warm-up

20 min

Activity 1

10 min

Activity 2

10 min

Lesson Synthesis

Assessment

5 min

Cool-down

Student Workbook

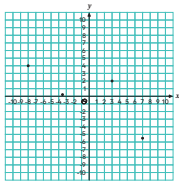
LESSON 13

Interpreting Points on a Coordinate Plane

Let's examine what points on the coordinate plane can tell us.

Warm-up: Unlabeled Points

Label each point in the coordinate plane with the letter that represents its coordinates.



A (7, -5.5)

B (-8, 4)

C (3, 2)

D (-3.5, 0.2)

155

GRADE 6 • UNIT 7 • SECTION C | LESSON 13

Warm-up

Unlabeled Points

5 min

Activity Narrative

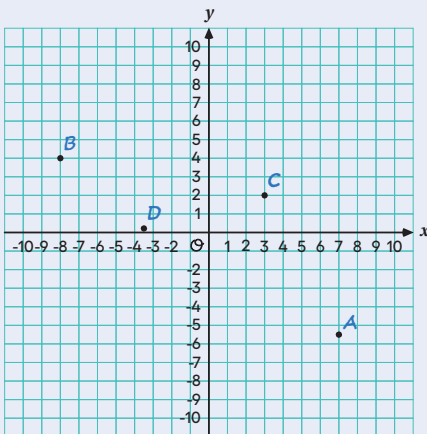
In this *Warm-up*, students practice skills that they have developed for plotting points in all four quadrants of the coordinate plane. This *Warm-up* also gives students the opportunity to describe points that do not fall nicely on the intersection of grid lines. This will be useful in following activities, when students apply these skills to answer questions in context.

Launch

Give students 3 minutes of quiet work time, and follow with a whole-class discussion.

Student Task Statement

Label each point in the coordinate plane with the letter that represents its coordinates.



A (7, -5.5)

B (-8, 4)

C (3, 2)

D (-3.5, 0.2)

Activity Synthesis

The main goal of this discussion is to make sense of points that don't fall on the intersection of grid lines. Invite students to explain how they knew which points matched with which coordinates. Ask students how they would make sense of point D , since it doesn't fall nicely where grid lines cross.

Activity 1

Account Balance

20
min

Activity Narrative

In this activity, students reason abstractly and quantitatively as they interpret points in the coordinate plane that correspond to the balance in a bank account. Since bank accounts may not be familiar to students in grade 6, they may need to be oriented to the context.

Launch



Arrange students in groups of 2. Introduce the context graph. Use *Co-Craft Questions* to orient students to the context and elicit possible mathematical questions.

Display only the problem stem and related image, without revealing the questions.

Give students 1–2 minutes to write a list of mathematical questions that could be asked about the situation before comparing questions with a partner.

Invite several partners to share one question with the class and record responses. Ask the class to make comparisons among the shared questions and their own. Ask,

💬 *“What do these questions have in common? How are they different?”*

Reveal the questions, and give students 1–2 minutes to compare it to their own question and those of their classmates.

Invite students to identify similarities and differences by asking:

💬 *“Which of your questions is most similar to or different from the ones provided? Why?”*

Instructional Routines

MLR5: Co-Craft Questions

ilclass.com/r/10695544

Please log in to the site before using the QR code or URL.



Access for Multilingual Learners (Activity 1)

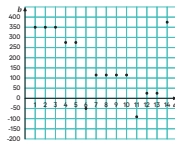
MLR5: Co-Craft Questions

This activity uses the *Co-Craft Questions* math language routine to advance reading and writing as students make sense of a context and practice generating mathematical questions.

Student Workbook

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?

GRADE 6 • UNIT 7 • SECTION C | LESSON 13

Student Workbook

Account Balance

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

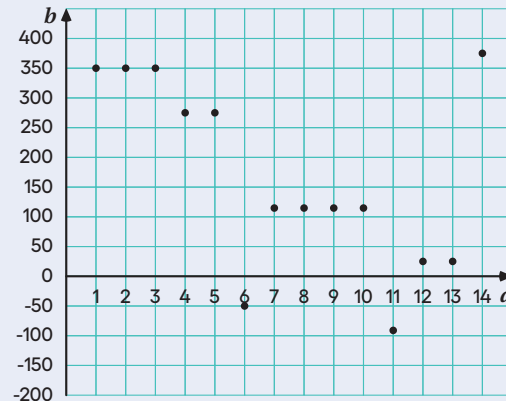
4. How can we interpret $|-50|$ in the context?

144

GRADE 6 • UNIT 7 • SECTION C | LESSON 13

Student Task Statement

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?

The greatest balance was about \$375, and it occurred on the 14th day.

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

The least balance was about \$-90, and it occurred on the 11th day.

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

The point $(6, -50)$ tells us that the account balance was -\$50 on the 6th day.

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

$|-50| = 50$ is the amount of money the person owes the bank on the 6th day.

Activity Synthesis

The purpose of the discussion is for students to share their responses when interpreting the coordinate plane in context. Begin by asking for students to explain their responses to each question. To include more students in the discussion, consider asking:

“Do you agree or disagree? Why?”

“Who can restate _____’s reasoning in a different way?”

“Does anyone want to add on to _____’s reasoning?”

If time allows, bring attention to the days when the account balance changed. Ask students to come up with a story of what might have happened on those days.

Activity 2

High and Low Temperatures

10

min

Activity Narrative

In this activity, students reason abstractly and quantitatively about temperatures over time graphed in a coordinate plane. The goal of this activity is for students to use inequalities to describe the location of points on a coordinate grid in one direction. This activity also introduces the idea of vertical difference on the coordinate plane, using a familiar context. Students may use previous strategies, such as counting squares, but are not expected to explicitly add or subtract using negative numbers.

Launch

- Arrange students in groups of 2.
- Give students 3 minutes of quiet work time and 1–2 minutes to discuss with their partner.
- Follow with a whole-class discussion.

Student Task Statement

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

1. What was the warmest high temperature?

28 °F

2. What was the coldest low temperature?

-3 °F

3. a. On which day(s) did the largest difference between the high and low temperatures occur? What was this difference in degrees Fahrenheit?

Days 3, 6, and 7

The difference was 10 °F.

b. On which day(s) did the smallest difference between the high and low temperatures occur? What was this difference in degrees Fahrenheit?

Day 1

The difference was 2 °F.

Access for Students with Diverse Abilities (Activity 1, Launch)

Engagement: Develop Effort and Persistence.
Connect a new concept to one with which students have experienced success. For example, remind students about their work with sea level and elevation number lines.
Supports accessibility for: Social-Emotional Functioning, Conceptual Processing

Building on Student Thinking

If some students do not notice that day 7 also had a difference of 10 degrees between the high and low temperatures, consider asking:
“How did you determine the differences between the high and low temperature for each day?”
“Would tracing paper be helpful to compare the distance between points?”

Student Workbook

High and Low Temperatures

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

1. What was the warmest high temperature?

2. What was the coldest low temperature?

3. a. On which day(s) did the largest difference between the high and low temperatures occur? What was this difference in degrees Fahrenheit?

b. On which day(s) did the smallest difference between the high and low temperatures occur? What was this difference in degrees Fahrenheit?

GRADE 6 • UNIT 7 • SECTION C | LESSON 13

Activity Synthesis

The goal of this discussion is for students to use inequalities to express the range of values for the low and high temperatures. Begin by inviting students to share their response for the warmest high temperature (28°F) and the coldest low temperature (-3°F). Then discuss the following questions:

- “How can we use math statements to describe the high temperatures, H , over the 8-day period?”

$$H < 28 \text{ or } H = 28$$

- “Are there any other ways to describe this set of temperatures?”

$$H > 2 \text{ or } H = 2$$

- “How can we use math statements to describe the coldest low temperature over the 8-day period?”

$$L > -3 \text{ or } L = -3$$

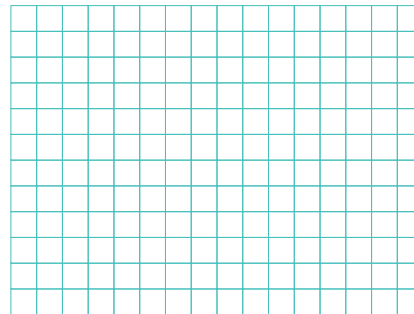
- “Are there any other ways to describe this set of temperatures?”

$$L < 26 \text{ or } L = 26$$

If time allows, ask students to share their strategies for finding the vertical distance between points. Encourage them to explain how they took the scale of the vertical axis into account.

Lesson Synthesis

The goal of this discussion is to practice selecting and drawing an appropriate scale for axes and using them to interpret the meaning of an ordered pair in context. Begin by displaying this blank grid for all to see:



Discuss the following questions, and update the grid as necessary:

- “How could we draw and scale the axes of a coordinate plane if we wanted to display both points $(4, 450)$ and $(4, -50)$?”

Answers vary.

Since the x -coordinate for both points is 4, we could label the x -axis with numbers from 0 to 10, counting by 1s. Since the y -coordinates are 450 and -50 , we could label the y -axis with numbers from -100 to 500, counting by 50s or 100s.

- “If these 2 points represented a banking situation, what could the numbers on the x - and y -axes represent?”

The numbers on the x -axis could represent the day, and the numbers on the y -axis could represent the account balance.

“These 2 points represent two people who opened bank accounts on the same day. What does each point mean in this situation?”

This means the first person has \$450 on day 4 and the other person owes \$50 that same day.

If time allows, ask students to sketch a graph to represent this situation: The high temperature on day 6 of a 10-day period is 30 degrees Celsius, and the low temperature on that same day is 12 degrees Celsius. Ask students how much warmer the high temperature is than the low temperature.

Lesson Summary

Points on the coordinate plane can give us information about a situation. One common situation is about money.

For example, to open a bank account, money has to be added to 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 plane can be used to display both the balance and the day or time. This allows us to see how the balance changes over time or to compare the balances of different days. Similarly, if we plot data such as temperature over time in the coordinate plane, we can see how temperature changes over time or compare temperatures at different times.

Student Workbook

13 Lesson Summary

Points on the coordinate plane can give us information about a situation. One common situation is about money.

For example, to open a bank account, money has to be added to 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 plane can be used to display both the balance and the day or time. This allows us to see how the balance changes over time or to compare the balances of different days. Similarly, if we plot data such as temperature over time in the coordinate plane, we can see how temperature changes over time or compare temperatures at different times.

+

Learning Targets

- + I can explain how rational numbers represent balances in a money context.
- + I can explain what points in a four-quadrant coordinate plane represent in a situation.
- + I can plot points in a four-quadrant coordinate plane to represent situations and solve problems.

160

GRADE 6 • UNIT 7 • SECTION C | LESSON 13

Responding To Student Thinking

More Chances
Students will have more opportunities to understand the mathematical ideas addressed here. There is no need to slow down or add additional work to the next lessons.

Cool-down

Time and Temperature

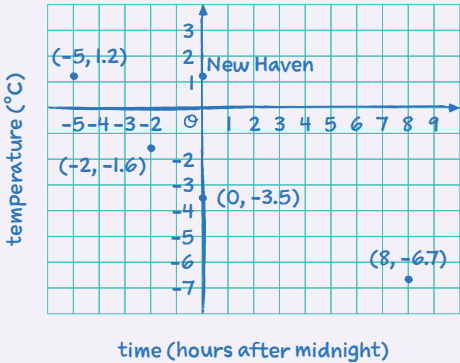
5 min

Student Task Statement

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

time (hours 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, CT, the temperature at midnight was 1.2 °C. Plot and label this point.
- See graph.
3. Which town was warmer at midnight, Princeton or New Haven? How many degrees warmer was it?
- New Haven is warmer by 4.7 degrees Celsius
4. If the point (3, -2.5) were also plotted on the diagram, what would it mean?
- (3, -2.5) means that 3 hours after midnight, the temperature was -2.5 degrees.

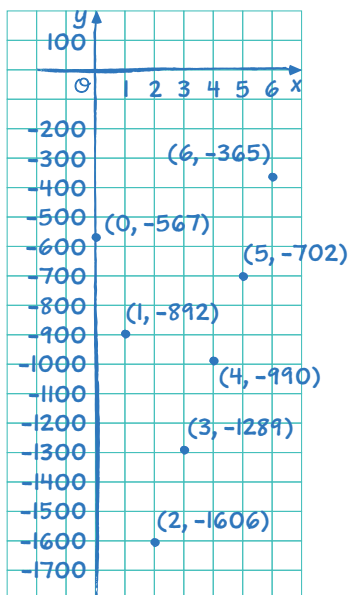
Practice Problems

4 Problems

Problem 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



Problem 2

from Unit 7, Lesson 8

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.

Sample response: To ride, a person must be more than 3 feet 6 inches tall and no taller than 5 feet.

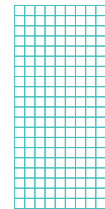
Student Workbook

LESSON 13

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 from Unit 7, Lesson 8
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.

GRADE 4 • UNIT 7 • SECTION C • LESSON 13

162

Student Workbook

Practice Problems

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 in which quadrant the point should be plotted.

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

Student Workbook

Practice Problems

from Unit 6, Lesson 4

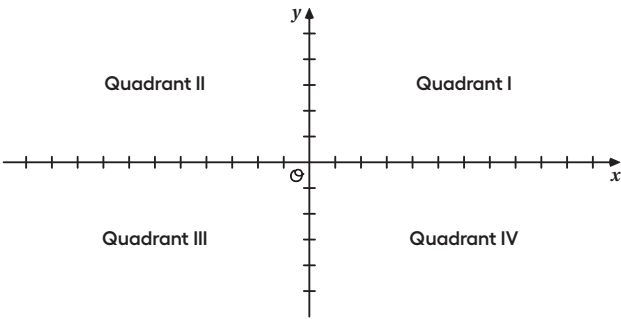
Solve each equation.

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

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

Problem 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?
Quadrant III
- b. At 11 a.m., it was 10°C . In what quadrant would this point be plotted?
Quadrant II
- c. Choose another time and temperature. Then tell in which quadrant the point should be plotted.
Sample response: At 11 p.m., the temperature was -5°C . This point would be plotted in Quadrant IV.
- d. What does the point $(0, 0)$ represent in this context?
A point at $(0, 0)$ would represent a freezing temperature (0°C) at noon.

Problem 4

from Unit 6, Lesson 4

Solve each equation.

- a. $3a = 12$
 $a = 4$
- b. $b + 3.3 = 8.9$
 $b = 5.6$
- c. $1 = \frac{1}{4}c$
 $c = 4$
- d. $5\frac{1}{2} = d + \frac{1}{4}$
 $d = 5\frac{1}{4}$
- e. $2e = 6.4$
 $e = 3.2$