STEMscopes™
MATH

Take &
Teach

*Accelerate*LEARNING
THE LEADER in STEM EDUCATION

What's Inside This Sample Lesson?

- A fully guided **Explore activity** written to meet rigorous state and national standards
- **Teacher Edition** pages, **Student Workbook** pages, and **other helpful resources** to fully experience a STEMscopes Math Explore activity
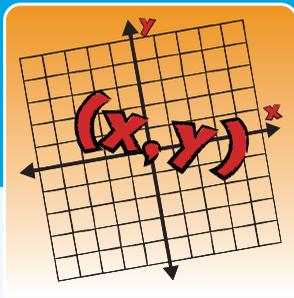
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Grade 6, Coordinate Planes - Explore 1

Go Online!

Explore the digital resources for this lesson.

COORDINATE PLANES

FOCUS STANDARDS

Apply and extend previous understandings of numbers to the system of rational numbers.

- Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- Understand signs on numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the location of the points are related by reflections across one or both axes.
- Find and position integers or other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers or other rational numbers on a coordinate plane

CONNECTING STANDARDS

Apply and extend previous understanding of numbers to the system of rational numbers.

- Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
- Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., -(-3) = 3, and that 0 is its own opposite.

ENGAGE ACTIVITIES

ACCESSING PRIOR KNOWLEDGE - FOUR CORNERS

Students engage in a Four Corners discussion to explore their understanding of a prior standard and identify any misconceptions.

- Students choose a corner of the classroom that best represents their understanding of the locations of the bank, library, and post office.
- They discuss their reasoning with peers in their chosen corner, fostering collaborative learning and critical thinking.
- The teacher facilitates a class discussion to address misconceptions and clarify correct understanding.
- If necessary, the Foundation Builder is used to reinforce foundational knowledge before progressing further.

HOOK

Students explore the concept of locating ordered pairs on a coordinate plane through a real-world scenario involving maps.

- Students are introduced to a scenario where they use a map to navigate, encouraging them to think about the mathematical concepts involved.
- They engage in discussions about the presence of math in maps, including coordinates, longitude, and latitude.
- After completing related exploratory activities, students revisit the scenario to apply their new understanding of coordinate planes.
- The activity concludes with a practical exercise where students draw a map of the classroom on a coordinate plane and identify coordinates of specific locations.

JUMP IN HERE

EXPLORE ACTIVITIES

EXPLORE 1 - NUMBER LINES AND COORDINATE PLANES

Students explore the relationship between number lines and coordinate planes through a city planning scenario.

- Students work in groups to use number lines and location cards to plan the layout of main buildings in a city, centering around a courthouse.
- They transition from using number lines to assembling a coordinate plane map, locating and labeling additional buildings.
- The activity includes guided discussions, reflection questions, and a Math Chat to reinforce understanding of coordinate planes and ordered pairs.
- Students complete an Exit Ticket to assess their grasp of the concepts, with opportunities for additional support and extension activities.

EXPLORE 2 - REFLECTIONS ON A COORDINATE PLANE

Students explore the relationship between the signs of numbers and their locations in quadrants using a city map. They also learn about reflections across axes through hands-on group work.

- Students work in groups to plot and label buildings on a coordinate plane using Building Location Cards, identifying the quadrant locations based on ordered pairs.
- They engage in discussions and answer guiding questions to deepen their understanding of coordinate planes and the significance of positive and negative values.
- In the second part, students determine the locations of new buildings by reflecting existing locations across the axes, reinforcing their understanding of reflections.
- The activity concludes with a Math Chat and an Exit Ticket to assess students' comprehension and encourage reflection on their learning strategies.

COORDINATE PLANES **GRADE 6**

SCOPE **BIG IDEAS**

DISTANCE & DIRECTION
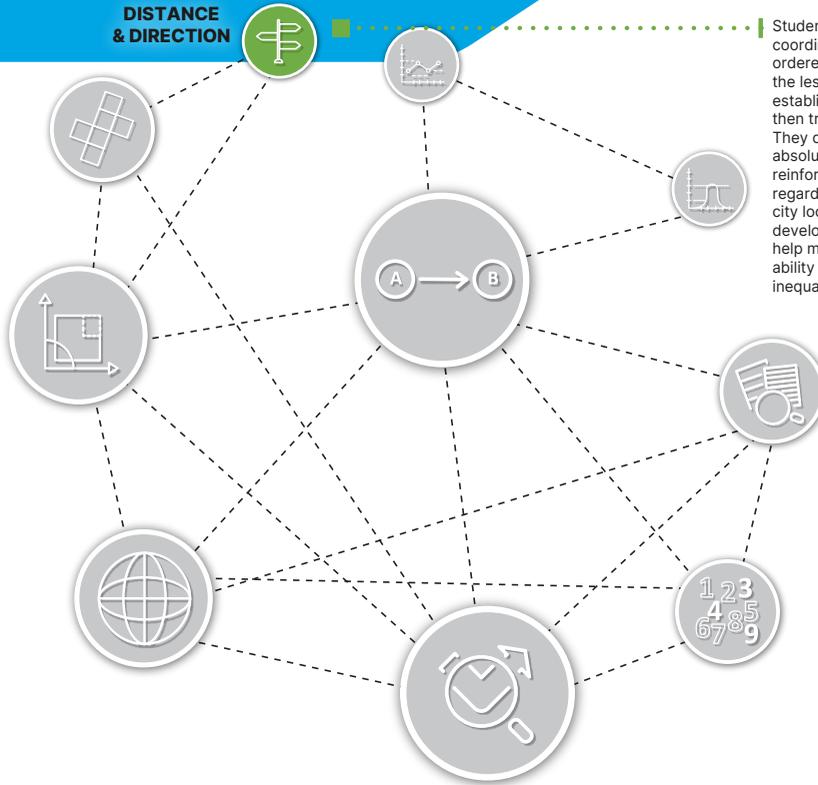
Students explore distance and direction by using coordinate planes to understand the relationship between ordered pairs and their locations in different quadrants. In the lessons, they begin by working with number lines to establish the concept of positioning values relative to zero, then transition to placing points on a coordinate plane. They determine distances between points by interpreting absolute values and recognizing reflections across axes, reinforcing the idea that distance is always positive regardless of direction. Through activities such as mapping city locations and identifying reflected points, students develop a deeper understanding of how coordinate planes help measure and compare distances, supporting their ability to describe relationships between numbers using inequality statements.

KEY CONCEPTS

- I can explain that a rational number is a point on the number line.
- I can extend number line diagrams to represent points on the line with negative number coordinates.
- I can extend coordinate axes to represent points in the plane with negative number coordinates.
- I can indicate locations of ordered pairs in quadrants of the coordinate plane based on the signs of the numbers.
- I can recognize that when two ordered pairs differ only by signs, the location of the points are related by reflections across one or both axes.
- I can find and position integers or other rational numbers on a horizontal or vertical number line diagram.
- I can find and position pairs of integers or other rational numbers on a coordinate plane.

FUNDAMENTAL QUESTIONS

- How can you represent negative numbers on a number line?
- Describe how to determine which quadrant an ordered pair belongs in.
- Describe how to position pairs of integers on a coordinate plane.
- Explain how number lines are related to coordinate planes.

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SCAN HERE for the Teacher Prep Video

COORDINATE PLANES **GRADE 6**

EXPLORE > EXPLORE 1

INSTRUCTIONAL LESSON

EXPLORE 1 - NUMBER LINES AND COORDINATE PLANES

Standard(s)

- **Apply and extend previous understandings of numbers to the system of rational numbers.** Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates.
  - **b.** Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the location of the points are related by reflections across one or both axes.
  - **c.** Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane.

Big Ideas	Standards for Mathematical Practice	Content Connections	Drivers of Investigation
Distance and Direction	**MP.5** Use appropriate tools strategically. **MP.6** Attend to precision. **MP.7** Look for and make use of structure.	**CC4** Discovering Shape and Space	**DI1** Make Sense of the World (Understand and Explain)

DESCRIPTION

The students make connections between number lines and coordinate planes.

MATERIALS

PRINTED

- 1 Student Journal (per student)
- 1 Set of Quadrant Cards (per group)
- 1 Horizontal and Vertical Number Lines (per group)
- 1 Set of Main Buildings Cards (per group)
- 1 Set of Building Cards II (per group)
- 1 Exit Ticket (per student)

REUSABLE

- 2 Gallon-sized resealable bags (per group)
- 8 Sheets of white card stock (per group, optional)
- 1 Set of colored pencils (per group)
- 1 Dry-erase marker (per group, optional)

PREPARATION

- Plan to have students work in groups of 4 or 5 to complete this activity.
- Print a copy of the Student Journal and Exit Ticket for each student.
- Print a copy of the Main Buildings Cards and the Horizontal and Vertical Number Lines for each group. Optionally, print on card stock and laminate for durability. Cut out and place these cards in a resealable bag labeled "Part I."
- Make a copy of the Building Cards II and the Quadrant Cards for each group. Optionally, print on card stock and laminate for durability. Cut out and place the cards in a resealable bag labeled "Part II."
- Gather a set of colored pencils for each group. If the Horizontal and Vertical Number Lines and Quadrant Cards are laminated, you will need to gather dry-erase markers for each group instead of a set of colored pencils.
- For students who need more support in recalling information, see our First-Quadrant Coordinate Plane and Four-Quadrant Coordinate Plane Supplemental Aids elements in the Intervention section.

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GRADE 6 COORDINATE PLANES

EXPLORE > EXPLORE 1

PROCEDURE AND FACILITATION POINTS

PART I: NUMBER LINES TO QUADRANTS

1. Read the following scenario to the class: You recently decided to become a city developer and are now being tasked with planning a new city! You want to center your work around the courthouse and start with the main intersection to determine where to place important buildings in the city. You will need to work with your team to use the location cards and number lines to develop the layout of main buildings in the city.

2. Help students access the task by asking the following guiding questions:

   a. What do you already know about city developers? What do they consider when planning a new city?

   b. What do you remember about number lines?

3. Give a set of colored pencils and the Part I bag containing a set of the Main Buildings Cards and Horizontal and Vertical Number Lines to each group.

4. Students work in their groups to determine how the number lines fit together with the courthouse being at the center of the number lines. Students can use the cardinal directions to help determine how the number lines fit together.

5. Monitor and talk with students as needed to check for understanding by using the following guiding questions:

   a. **DOK-2** Why would the courthouse be in the center of the town? *Answers will vary. The courthouse is the most important city building.*

   b. **DOK-2** How can the cardinal directions help determine how the number lines fit together? *I knew the order of the cardinal directions, so I was able to place all of the number lines in order according to the cardinal directions.*

   c. **DOK-3** Did you try any other ways to line up the number lines that didn't work? How did you know it would not work? *Answers will vary. When I first placed the number lines, I noticed the numbers were upside down.*

6. Then, have students mark the other 6 building locations using their colored pencils on the number lines and label each building with its name. If number lines are laminated, have students label using their dry-erase markers.

7. Distribute the Student Journals to students.

8. Allow time for students to complete Part I of the Student Journal and its reflection questions.

9. After Part I, invite the class to a Math Chat to share their observations and learning.

STUDENT JOURNAL
ANSWER KEY

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Student Journal Answer Key

Explore
Coordinate Planes
Explore 1

Reflect

1. When finding ordered pairs on the map, you must first move left/west or right/east, and then you will move up/north or down/south.

2. The coordinate plane is divided into four **quadrants**. Refer to the Quadrant Cards as you reflect.

   a. What do you notice about all of the ordered pairs that were located in Quadrant I?
   In Quadrant I, both the x- and y-coordinates are positive.

   b. What do you notice about all of the ordered pairs that were located in Quadrant II?
   In Quadrant II, the x-coordinates are negative and the y-coordinates are positive.

   c. What do you notice about all of the ordered pairs that were located in Quadrant III?
   In Quadrant III, both the x- and y-coordinates are negative.

   d. What do you notice about all of the ordered pairs that were located in Quadrant IV?
   In Quadrant IV, the x-coordinates are positive and the y-coordinates are negative.

3. What is the name of the location (0, 0) on a coordinate plane?
   The location (0, 0) is called the origin.

4. A library is being built at (−6, 0). What quadrant would the library be located in?
   Coordinates on the x- and y-axes do not lie in any quadrant.

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**STUDENT JOURNAL
ANSWER KEY**

Show What You Know
Coordinate Planes
Part 1

Name: _____ Date: _____

Number Lines and Coordinate Planes

The locations of various city landmarks are represented on a coordinate plane. Plot and/or label each landmark, and complete the missing information.

Landmark	Coordinates	Quadrant
Art Gallery	(4, –3)	IV
Train Station	(–1, –5)	III
Post Office	(–4, 3)	II
Baseball Park	(2, 2)	I

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**SHOW WHAT YOU KNOW PART 1
ANSWER KEY**

MATH CHAT

- **Choose a Structured Conversation routine to facilitate the following question:**
  - **DOK-1** How are number lines and coordinate planes similar? Coordinate planes are one horizontal number line and one vertical number line placed together to intersect at 0 on both number lines.

- **DOK-1** What is the ordered pair for the courthouse? The courthouse is located at zero horizontally and zero vertically; therefore, the ordered pair is (0, 0).

- **DOK-2** Do you think that one number in the ordered pair must always be zero? Student responses will vary, but students should pull from prior knowledge of first-quadrant graphing to understand that zero does not have to be in the ordered pair.

PART II: MAKING THE MAP

1. Read the following scenario to the class: Your development team will need to put a map together to find the best location for other buildings around the city. You will start with four pieces of a coordinate plane. Determine how to put the coordinate plane together to form the city map. Then, locate and label the other buildings around the city!

2. Help students access the task by asking the following guiding questions:
   a. What do you already know about maps?
   b. What do you remember about number lines?

3. Distribute the Part II bag containing the Building Cards II and Quadrant Cards to each group.

4. Have students work in their groups to put the coordinate plane city map together.

5. Have students locate the next four buildings to be added in the city. Instruct students to use their colored pencils to mark and label the buildings on the coordinate plane city map. If the Quadrant Cards are laminated, have students use their dry-erase markers.

6. After each group locates all of the buildings on their maps, have students mark and label the buildings on the coordinate grid in the Student Journal.

7. Allow time for students to complete the reflection at the end of Part II.

8. Ask students to share their strategies, and encourage them to ask each other questions and make connections. Encourage students to notice the similarities and differences between the strategies used to find ordered pairs on a coordinate plane.

9. After Part II, invite the class to a Math Chat to share their observations and learning.

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GRADE 6 COORDINATE PLANES

EXPLORE > EXPLORE 1

MATH CHAT

- **DOK-1** When finding ordered pairs on the map, you must first move _____ or _____, and then you will move _____ or _____. When finding ordered pairs on the map, you must first move left/west or right/east; and then you will move up/north or down/south.
- How do you know which way to move? You will know which way to move by looking at the signs in front of the x- and y-coordinates.
- **Choose a Structured Conversation routine to facilitate the following question:**
  - **DOK-2** What do you notice about all of the ordered pairs that were located in Quadrant I? In Quadrant I, both the x- and y-coordinates are positive.
- **DOK-2** What do you notice about all of the ordered pairs that were located in Quadrant II? In Quadrant II, the x-coordinates are negative and the y-coordinates are positive.
- **DOK-2** What do you notice about all of the ordered pairs that were located in Quadrant III? In Quadrant III, both the x- and y-coordinates are negative.
- **DOK-2** What do you notice about all of the ordered pairs that were located in Quadrant IV? In Quadrant IV, the x-coordinates are positive and the y-coordinates are negative.
- **DOK-1** What is the name of the location (0, 0) on a coordinate plane? The location (0, 0) is called the origin.
- **DOK-2** A library is being built at (−6, 0). What quadrant would the library be located in? Coordinates on the x-axis and y-axis do not lie in any quadrant.

POST-EXPLORE

1. Have students complete the Exit Ticket to formatively assess their understanding of the concept.
2. Complete the Anchor Chart as a class.

INSTRUCTIONAL SUPPORTS

1. Students may need additional support with visualizing the y-axis as a number line. Use a meterstick as a model by holding the meterstick horizontally and then vertically, demonstrating that the meterstick as a number line is unchanged. Make sure the meterstick is held so that the numbers are increasing as you go up or from left to right as they would on a number line.
2. Students may need support in transitioning from word descriptions in Part I to just coordinates in Part II. Create a bridge for their understanding by asking students to write a coordinate for the verbal descriptions given in Part I. Then ask them to write a verbal description for each coordinate given in Part II. You may need to review with students which number in the ordered pair is the x-coordinate and which number is the y-coordinate.
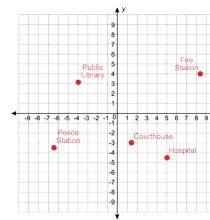

EXIT TICKET
ANSWER KEY

Explore   Coordinate Planes
                                               Explore 1
Name:_____ Date:_____

Graph on a Coordinate Plane
Exit Ticket

Taz wants to locate some of the important buildings around Thompsonville. He will use the map below to locate each building. Label the spot on the map for each building's location. Then, write which quadrant it is located in.

1. At (1.5, −3) you will find the courthouse of our town. Quadrant IV
2. The public library will be located at (−4, 3.25). Quadrant II
3. Six and a half blocks west of the origin and three and a half blocks south you will find the Thompsonville police station. Quadrant III
4. The fire station is 8 and a half blocks east and four blocks north of the origin. Quadrant I
5. Thompsonville General Hospital is located at (5, −4.5). Quadrant IV

3. If students need additional support in plotting ordered pairs that include coordinates that are not whole numbers, then ask students what whole numbers are on either side of the number (for example, 7.5; 7 and 8). This will help them locate the vicinity of the number on the coordinate plane.

4. As an extension, students may add one more building to each quadrant of the city. Have them plot and label their buildings on the coordinate plane. Challenge students to explain the relationship between the ordered pairs and the location in quadrants of the coordinate plane.

LANGUAGE SUPPORTS

Provide an example of a map of your city with specific landmarks. Discuss how they would give someone directions to your school. Compare this to using a coordinate plane to locate buildings. Provide an example of what is meant by blocks when referring to a city.

Review the directions of north, south, east, and west. Use body motions such as holding your arm vertically and pointing up to indicate, "north." Use similar body motions for other directions.

Discuss the meaning of the new vocabulary as it relates to other subjects. For example, how is the origin story of a superhero similar to the origin on the coordinate plane? Do you know what the horizon is? How does that relate to the word horizontal? Discussing the meaning of the individual words in context can help students internalize their meaning.

Take time to unpack the meaning of the term ordered pair. Discuss the impact of the order of the numbers and how the pair of numbers work together to identify the location of a point.

Read the location description for each building. As the description is read, have students trace with their finger from the origin to the location of the specified building.

Encourage students to have a conversation about the different buildings by asking and answering questions like the following:

- How far is _____ from _____?
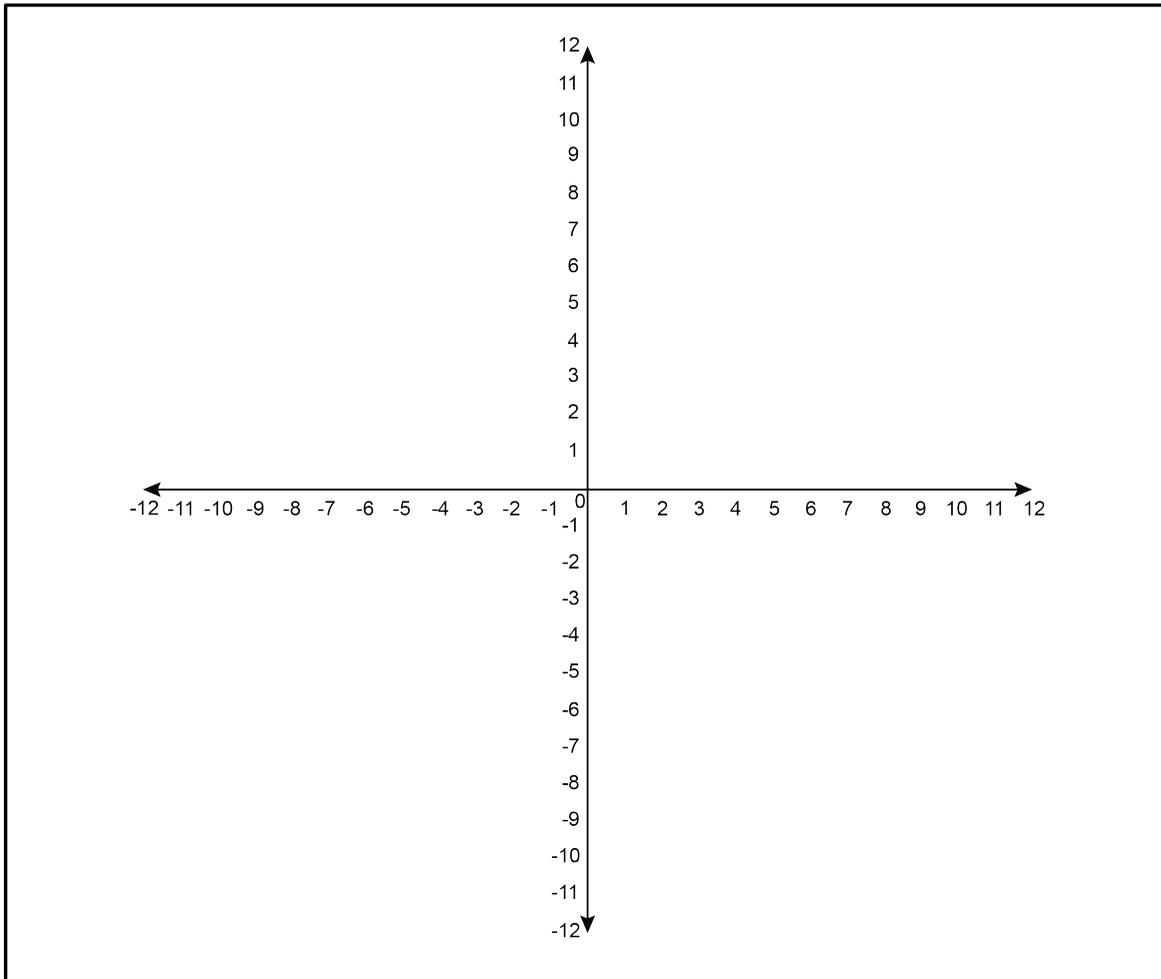- How could you get from the courthouse to _____?

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Explore

Name:_____ Date:_____

Planning a City

Part I: Number Lines to Quadrants

The two main roads intersect at the courthouse. Plot the location of each important building using the Main Buildings Cards. Label each building.

1

Explore

Circle the word to make each statement true.

Traveling east from the courthouse will give you (positive/negative) numbers.

Traveling west from the courthouse will give you (positive/negative) numbers.

Traveling north from the courthouse will give you (positive/negative) numbers.

Traveling south from the courthouse will give you (positive/negative) numbers.

The school is located _____ blocks (east/west) of the courthouse and _____ blocks (north/south) of the courthouse.
The ordered pair for the school will be _____.

Reflect

1. How are number lines and coordinate planes similar?

2. What is the ordered pair for the courthouse?

3. Do you think that one number in the ordered pair must always be zero?

2

Explore

Part II: Making the Map

Draw a model of the city map after being put together. Label the map with each additional building.
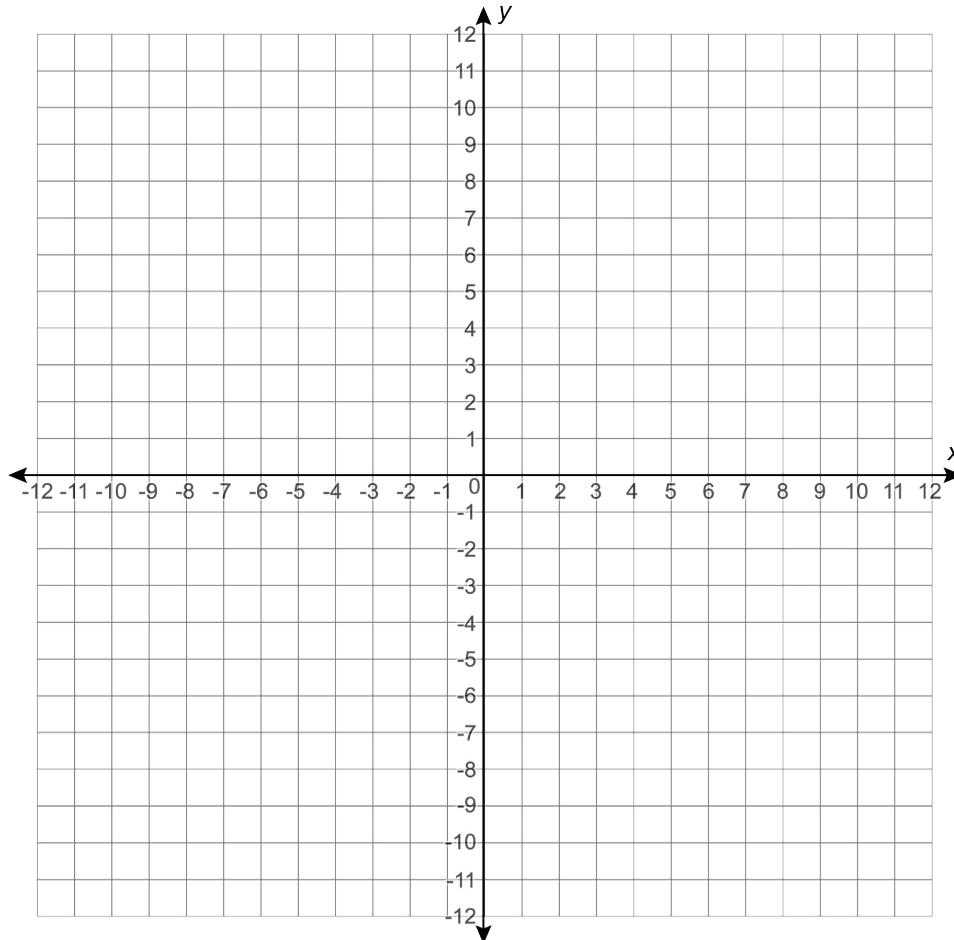
The courthouse is at the center of the city. Locate and label the courthouse on the map.

This location on a coordinate plane is called the origin. What is the ordered pair for the courthouse?

3

Explore

Coordinate Planes
Explore 1

Reflect

1. When finding ordered pairs on the map, you must first move _____ or _____, and then you will move _____ or _____.

2. The coordinate plane is divided into four **quadrants**. Refer to the Quadrant Cards as you reflect.

    a. What do you notice about all of the ordered pairs that were located in Quadrant I?

    b. What do you notice about all of the ordered pairs that were located in Quadrant II?

    c. What do you notice about all of the ordered pairs that were located in Quadrant III?

    d. What do you notice about all of the ordered pairs that were located in Quadrant IV?

3. What is the name of the location (0, 0) on a coordinate plane?

4. A library is being built at (−6, 0). What quadrant would the library be located in?

4

Explore

Name:_____ Date:_____

Graph on a Coordinate Plane
Exit Ticket

Taz wants to locate some of the important buildings around Thompsonville. He will use the map below to locate each building. Label the spot on the map for each building's location. Then, write which quadrant it is located in.
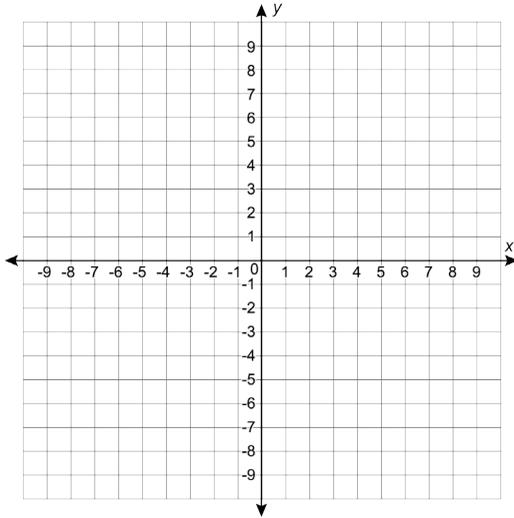
1. At (1.5, −3) you will find the courthouse of our town.

2. The public library will be located at (−4, 3.25).

3. Six and a half blocks west of the origin and three and a half blocks south you will find the Thompsonville police station.

4. The fire station is 8 and a half blocks east and four blocks north of the origin.

5. Thompsonville General Hospital is located at (5, −4.5).

1

Explore

Horizontal and Vertical Number Lines

Cut on dashed lines.
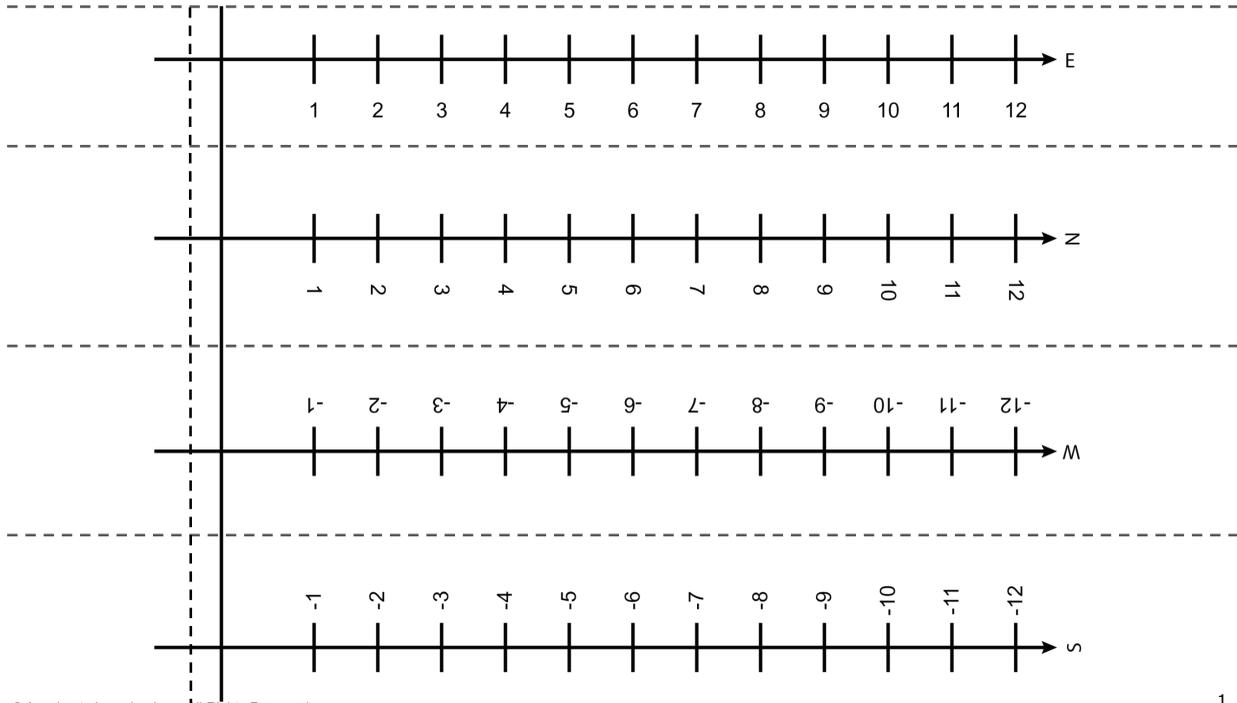
1

Explore

Quadrant I

1

Explore

Quadrant II

A coordinate grid showing Quadrant II. The vertical axis is labeled from 0 to 12 (bottom to top) and the horizontal axis is labeled from -12 to 0 (left to right).

2

Explore

| -12 | -11 | -10 | -9 | -8 | -7 | -6 | -5 | -4 | -3 | -2 | -1 | 0 |

0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12

Quadrant III

3

Explore

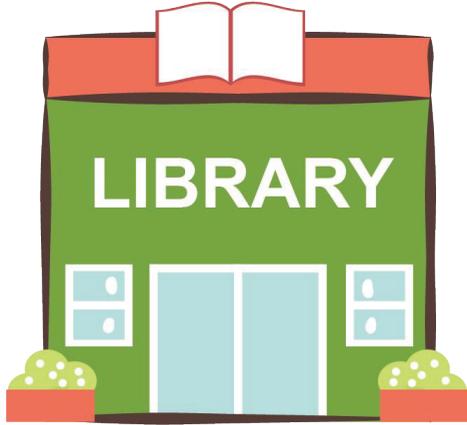| | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |

0
-1
-2
-3
-4
-5
-6
-7
-8
-9
-10
-11
-12

Quadrant IV

4
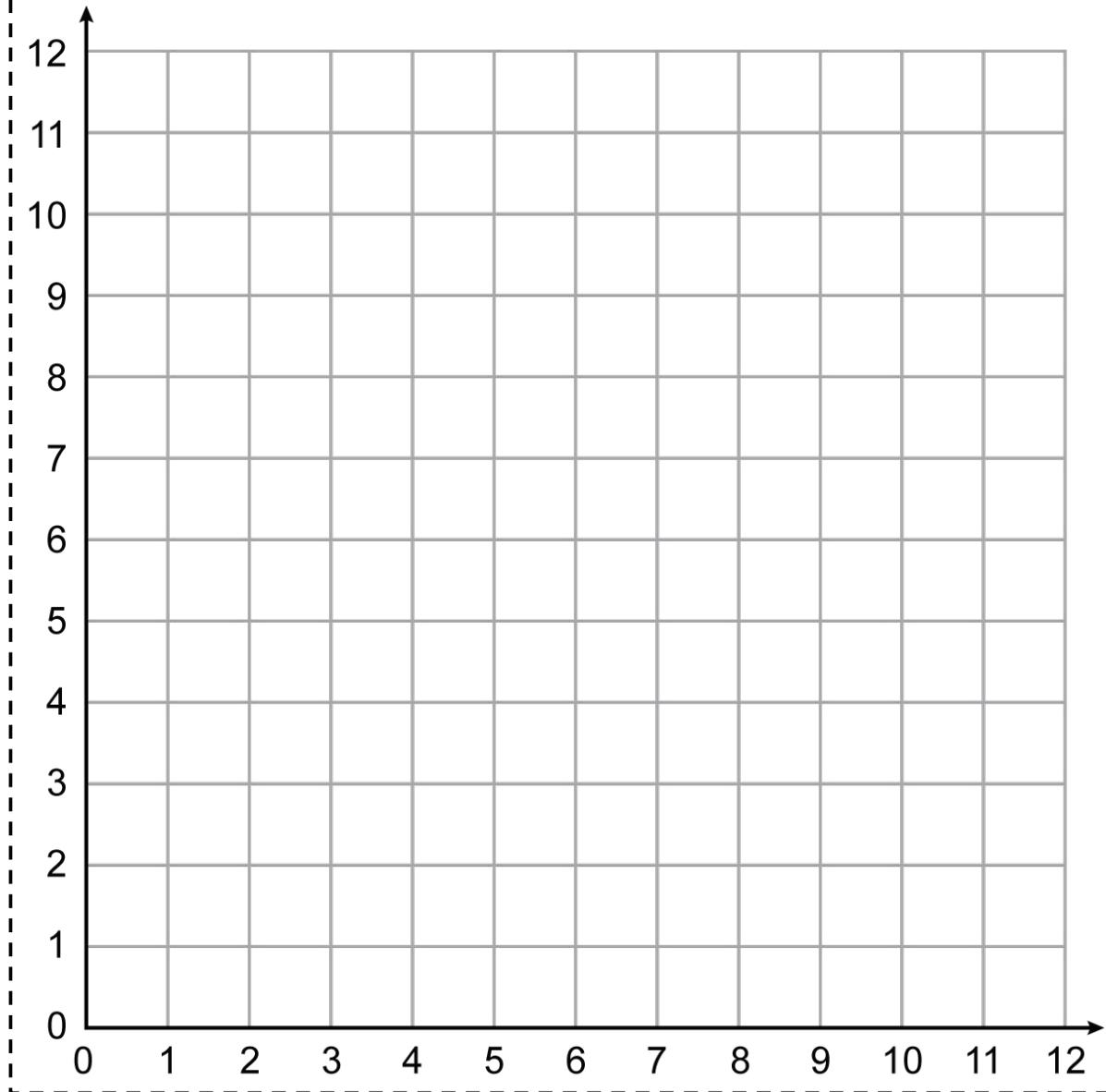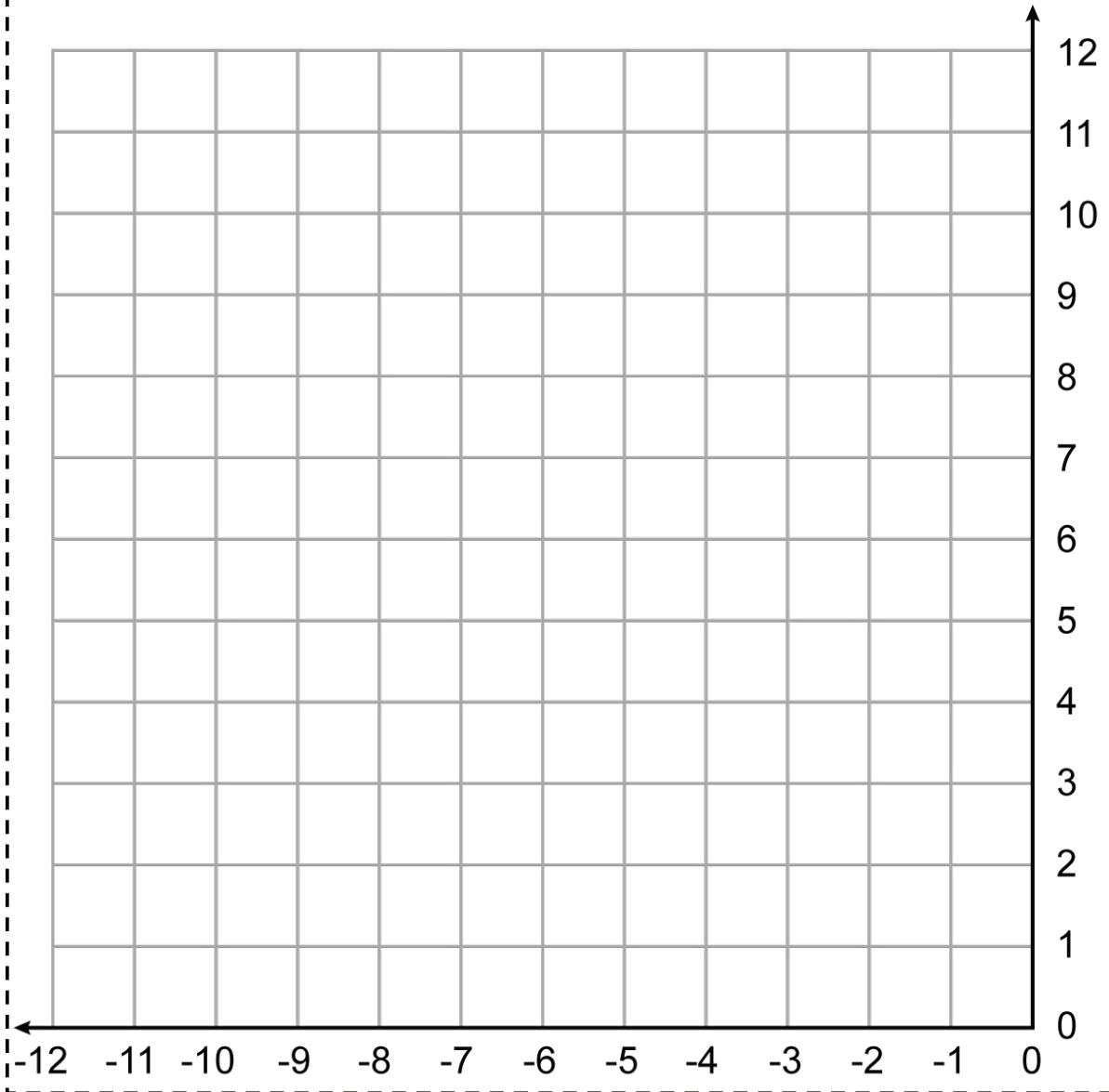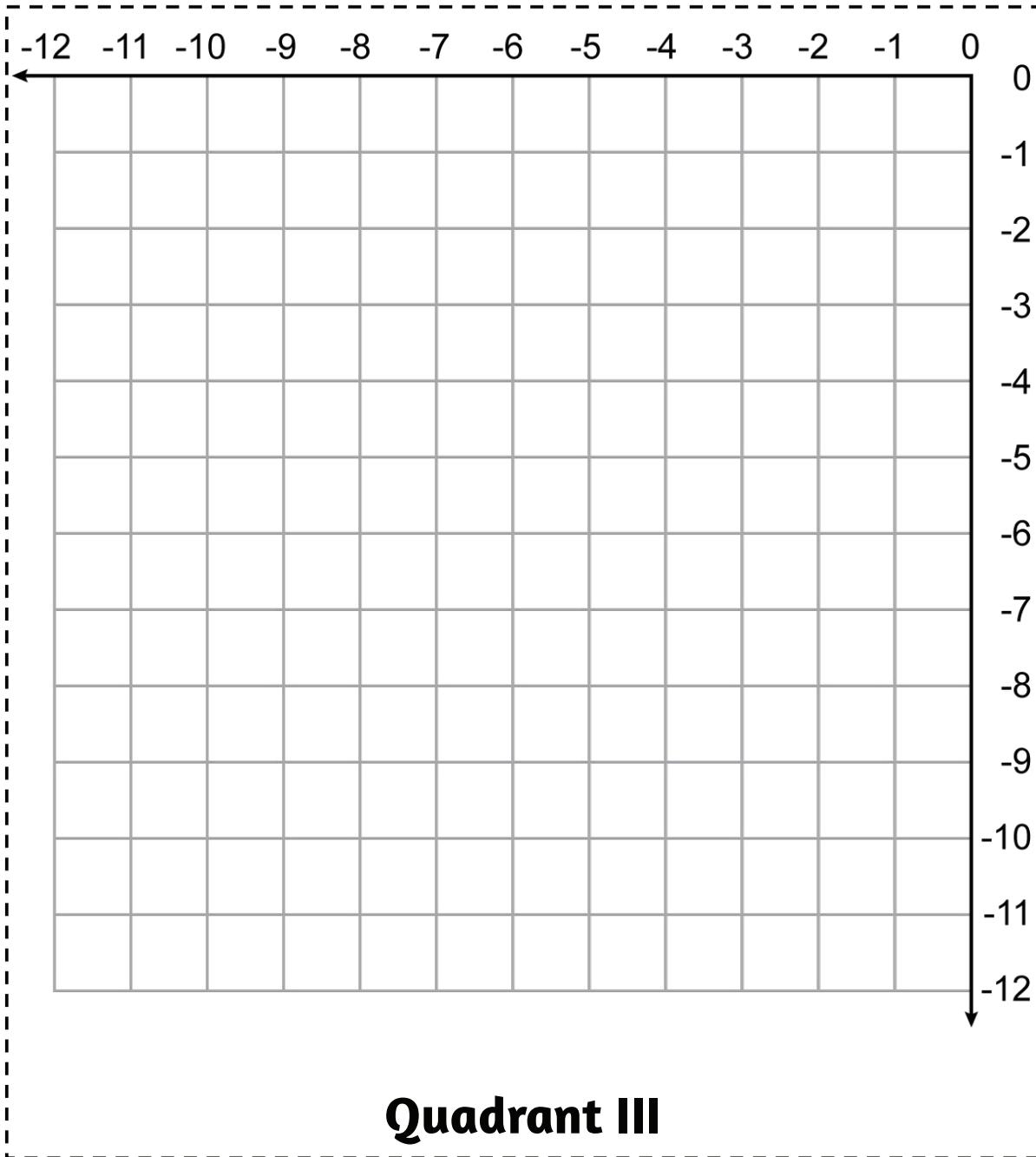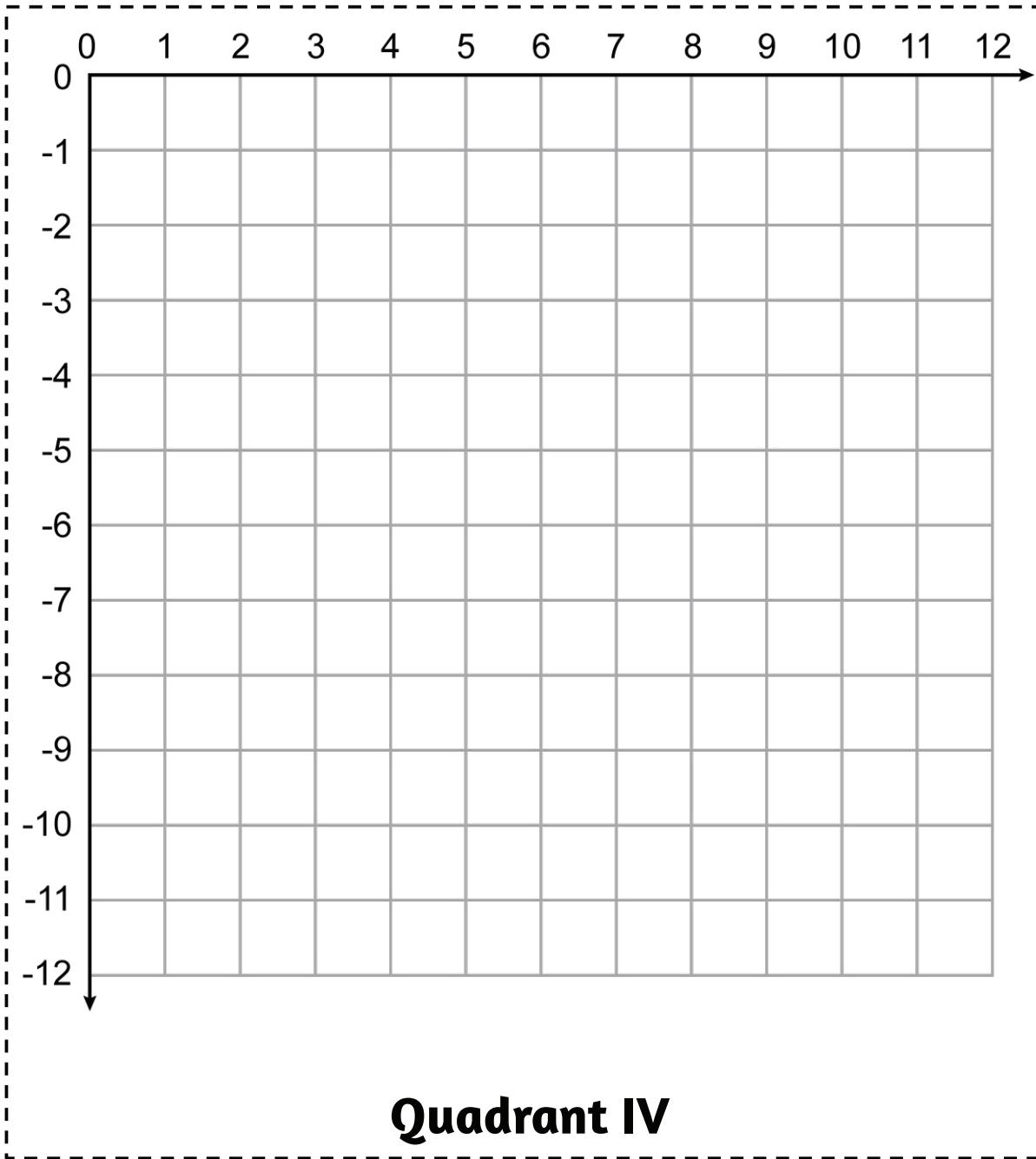
Explore

Main Buildings

The city library will be located 7 blocks north of the courthouse.

The school is 3 blocks east of the courthouse.

The fire station will be 5 blocks west of the courthouse.

The police station is 10 blocks south of the courthouse.

1

💡 Explore

Another hospital will be 11 blocks east of the courthouse.

The first hospital is 8 blocks west of the courthouse.

The courthouse is in the center of the city.

2

Explore

Buildings II

MALL

The new mall is located at (−3, 7.5).

The movie theater will be located at (−5, −7).

CINEMA

HOTEL

The first hotel will be built at the location (8, −5).

A grocery store is at (7.5, 11).
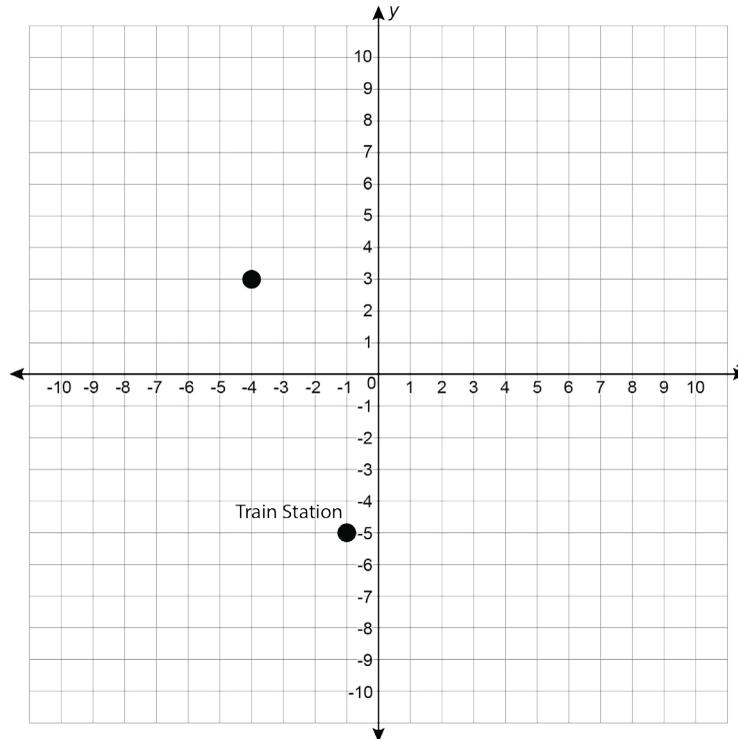
GROCERY STORE

OPEN

1

Show What You Know

Name:_____ Date:_____

Number Lines and Coordinate Planes

The locations of various city landmarks are represented on a coordinate plane. Plot and/or label each landmark, and complete the missing information.

Landmark	Coordinates	Quadrant
Art Gallery	(4, −3)	
		Ⅲ
Post Office	(−4, 3)	
Baseball Park	(2, 2)	

1

Notes

Notes

Notes

Ready to see the full program?

Scan here!

Exploring this lesson with your students?

We'd love to see it in action! Snap a pic, share your classroom experience, and tag us with @AccelerateLearningInc on Facebook.

By sharing, you'll join a community of math educators who are making math meaningful. You might even get featured!

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