Objectives

You will be able to

- Identify and plot points in all four quadrants of a coordinate plane.

- Use the coordinate plane to draw polygons and apply your understanding to solve real-world problems.

?

How can we use mathematics to design a playground that is both fun and safe?

Evaluation and Feedback

To evaluate your work, you will

- Complete a check for understanding about drawing polygons on a coordinate plane.

Task 3: Coordinate Plane

As a group:

- Understand how a coordinate plane helps you communicate.

- Plot points on a coordinate plane.

- Determine distances on a coordinate plane.

- Determine where to place the equipment and activities you selected.

- Provide drill holes for your playground equipment.

Vocabulary

- coordinate plane (or grid)
- distance
- negative number
- ordered pair
- origin
- plot
- point
- polygon
- quadrant
- vertex
- *x*-axis, *x*-coordinate, *x*-value
- *y*-axis, *y*-coordinate, *y*-value

Connect to the Culminating Project

- Divide your playground floor plan into a coordinate plane.

- Determine where to place the playground equipment and activities you chose.

- Locate the drilling points to secure the equipment.

LESSON 1

WHAT IS A COORDINATE PLANE?

WARM-UP

Where Is the Playground Structure?

- Both you and a team member will each have a blank copy of the playground floor plan that your team chose.

- Sit back to back with your partner.

- Draw a playground structure on your playground floor plan. Without showing your partner the floor plan, explain to your partner exactly where to draw the structure on their own floor plan.

- Then, reverse roles and repeat the process.

PROJECT ACTIVITY

About Descartes

Read the following.

> René Descartes was a French mathematician who lived in the 1600s. When he was a child, he was often sick, so the teachers at his boarding school let him stay in bed until noon. He continued staying in bed until noon for almost all his life. While in bed, Descartes thought about math and philosophy.
>
> One day, Descartes noticed a fly crawling around on the ceiling. He watched the fly for a long time. He wanted to know how to tell someone else where the fly was. Finally he realized that he could describe the position of the fly by its distance from the walls of the room. When he got out of bed, Descartes wrote down what he had discovered. Then he tried describing the positions of points the same way he described the position of the fly. Descartes had invented the coordinate plane! In fact, the coordinate plane is sometimes called the Cartesian plane in his honor.
>
> (*Source*: mathforum.org/cgraph/history/fly.html)

> **LESSON 1** • WHAT IS A COORDINATE PLANE?

Place Equipment on a Coordinate Plane

- Pick a location for the playground equipment on this coordinate plane.

- Without your partner looking at you or your coordinate plane, explain to your partner where to place the equipment on their coordinate plane.
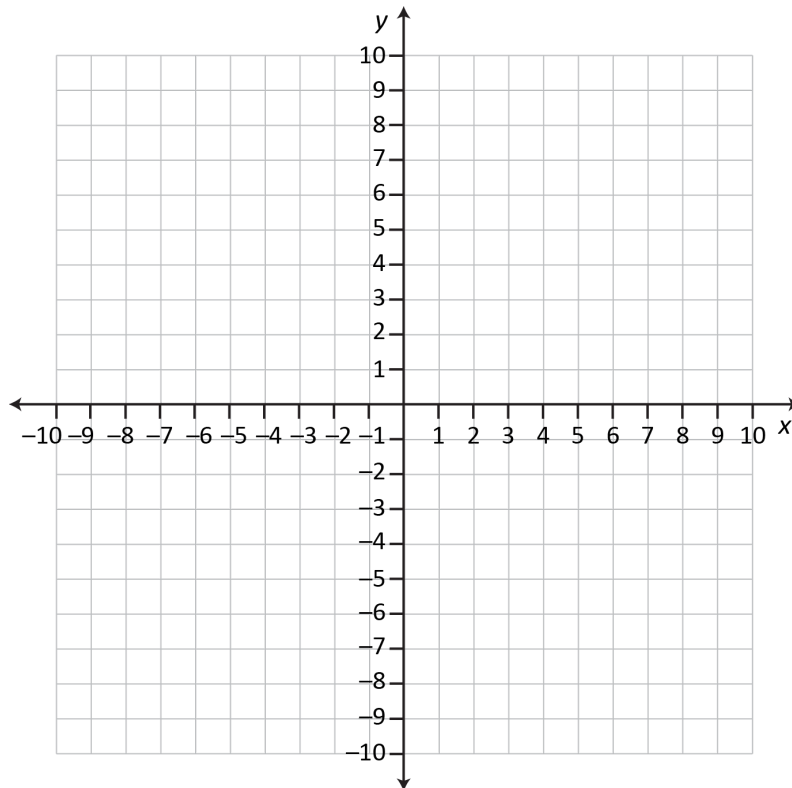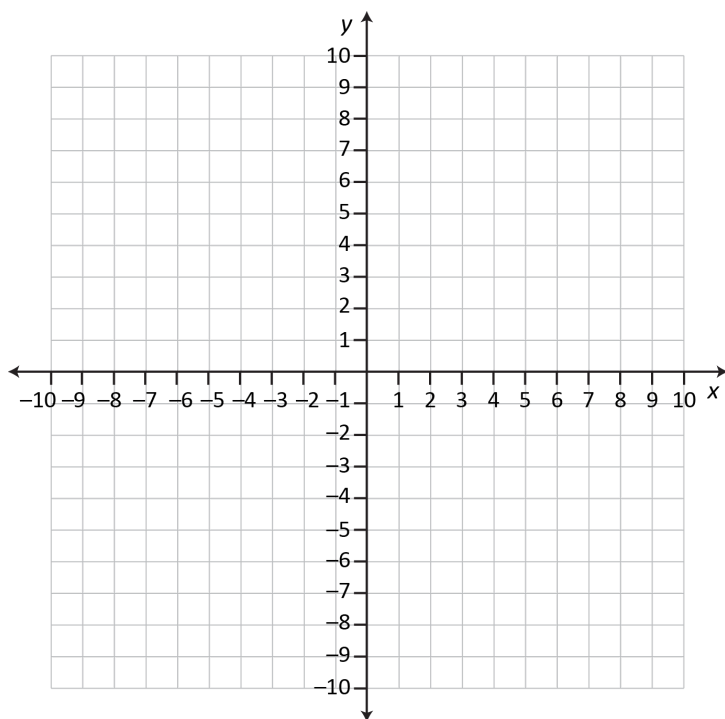
LESSON 2

WHERE SHOULD WE DRILL?

WARM-UP

Plot Points on a Coordinate Plane

Plot these points on the coordinate plane below.

Point *A*	(2, 5)	Point *E*	(7, 5)
Point *B*	(2, 1)	Point *F*	(7, 1)
Point *C*	(−6, −3)	Point *G*	(1, −3)
Point *D*	(−6, 4)	Point *H*	(1, 4)

1. How far away is point *A* from point *B*?

2. How far away is point *C* from point *D*?

3. How far away is point *E* from point *F*?

4. How far away is point *G* from point *H*?

5. How far away is point *A* from point *E*?

6. How far away is point *B* from point *F*?

7. How far away is point *C* from point *G*?

8. How far away is point *D* from point *H*?

Are there any patterns or shortcuts you noticed that can help you determine distances between points?

LESSON 2 • WHERE SHOULD WE DRILL?

PROJECT ACTIVITY

Decide Where to Drill

- Draw the *x*- and *y*-axis on your playground floor plan using a vertex of your reflecting pool as the origin (0, 0).

- Label and number each axis.

- Decide where on the floor plan/coordinate plane to place the playground equipment you chose in the Playground Information Table from Learning Task 1. Your playground equipment should be spread out among all four quadrants of your floor plan.

- Remember, playground equipment needs to be anchored into the ground in order to be safe. You need to drill holes in each corner or vertex of the use zone for each piece of playground equipment. Use the table below to tell the local construction company exactly where they should drill holes to anchor your playground equipment. Remember to label all dimensions and units of measurement!

- Then draw the drill holes on your floor plan/coordinate plane.

| Name of Playground Equipment	Dimensions for Use Zone	Area of Use Zone	Coordinates for Holes

LESSON 3

HOW CAN WE IMPROVE OUR PLAYGROUND?

WARM-UP

Coordinate Plane

Daniela has created a map of her backyard on the coordinate plane so that each unit length is 1 yard. She wants to design a right triangular garden that has an area of 8 square yards. If she plots one vertex of the base of the plant bed at (3, 8) and one vertex at (7, 8) on her coordinate plane, where could she plots the last vertex?
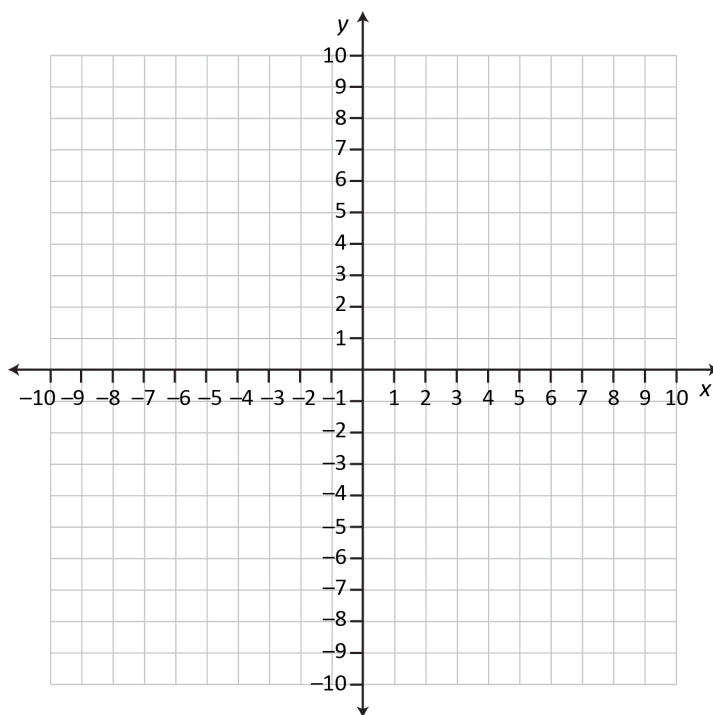
PROJECT ACTIVITY

Decide Where to Drill

Continue to work on the "Decide Where to Drill" activity from the last lesson and on any other unfinished work.

CHECK FOR UNDERSTANDING

Test your knowledge of plotting points on a coordinate plane using the Check for Understanding • Draw Polygons on the Coordinate Plane.