Lesson 19

Drawing in the Coordinate Plane (Optional)

Goal

Generate a list of ordered pairs to create an image in the coordinate plane, and explain (orally) the reasoning.

Learning Target

I can use ordered pairs to draw a picture.

Lesson Narrative

In this optional culminating lesson, students use graphing technology to plot ordered pairs and create images. Using graphing technology for this lesson is highly recommended over doing it with pencil and paper. In the first activity, students recreate a given image to help familiarize them with how the graphing technology works. The second activity, where students design their own image, could be lengthened or shortened as needed by instructing students to create an image with more or less detail. Using graphing technology gives students an opportunity to attend to precision because the program graphs exactly what they enter and will not guess at what they might have meant if they input a point incorrectly.

Student Learning Goal

Let's draw on the coordinate plane.

Lesson Timeline

15 min	30 min
Activity 1	Activity 2

Access for Students with Diverse Abilities

- Action and Expression (Warm-up)

Access for Multilingual Learners

- MLR8: Discussion Supports (Activity 1)

Instructional Routines

- MLR8: Discussion Supports

Required Materials

Materials to Gather

- Graph paper: Activity 1, Activity 2
- Graphing technology: Activity 1, Activity 2

Required Preparation

Activity 1:
For the digital version of the activity, acquire devices that can run the applet.

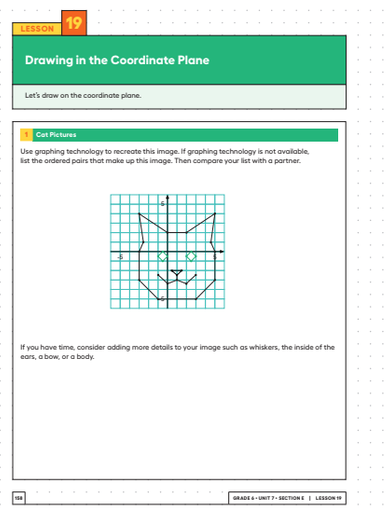
Activity 2:
For the digital version of the activity, acquire devices that can run the applet.

Access for Students with Diverse Abilities (Warm-up, Student Task)

Action and Expression: Internalize Executive Functions.
To support organization, provide students with a checklist that chunks the various steps of the project into a set of manageable tasks. Consider providing students with a starting point and ordered pairs for select key details, such as tips of the ears.

Supports accessibility for: Language, Organization

Student Workbook


LESSON 19

Drawing in the Coordinate Plane

Let's draw on the coordinate plane.

1 Cat Pictures

Use graphing technology to recreate this image. If graphing technology is not available, list the ordered pairs that make up this image. Then compare your list with a partner.

If you have time, consider adding more details to your image such as whiskers, the inside of the ears, a bow, or a body.

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Activity 1

Cat Pictures

15 min

Activity Narrative

There is a digital version of this activity.

In this activity, students identify the coordinates of points necessary to recreate an image. They write a list of ordered pairs that when connected by line segments in order, would recreate a given image.

In the digital version of the activity, students use an applet or graphing technology to recreate an image. The applet allows students to plot points by entering ordered pairs and then connect them using line segments.

Launch

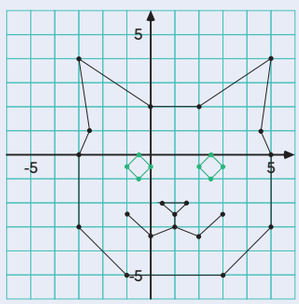
If possible, provide access to graphing technology. Demonstrate how to use the technology available in the classroom to plot coordinate pairs. If using the applet or using Desmos in a web browser, consider using these instructions:

- On a blank graph, add a new table by clicking on the "+" icon in the upper left and select "table" from the drop-down menu.
- Enter pairs of x- and y-values in the table. Corresponding points should appear on the graph.
- Click on the wheel icon on the upper right corner of the left sidebar. The circle next to the y-label in the table will turn into a solid circle.
- Click on the circle next to y, and turn on the "Lines" option in the drop-down menu. Consecutive points on the graph will now be connected by line segments.

Give students 10–12 minutes of quiet work time, and follow with a whole-class discussion.

Student Task Statement

Use graphing technology to recreate this image. If graphing technology is not available, list the ordered pairs that make up this image. Then compare your list with a partner.



If you have time, consider adding more details to your image such as whiskers, the inside of the ears, a bow, or a body.

For the outline of the head:

x	y
0	2
2	2
5	4
4.5	1
5	0
5	-3
3	-5
-1	-5
-3	-3
-3	0
-2.5	1
-3	4
0	2

For the nose and mouth:

x	y
-1	-2.5
0	-3.5
1	-3
1	-2.5
0.5	-2
1.5	-2
1	-2.5
1	-3
2	-3.5
3	-2.5

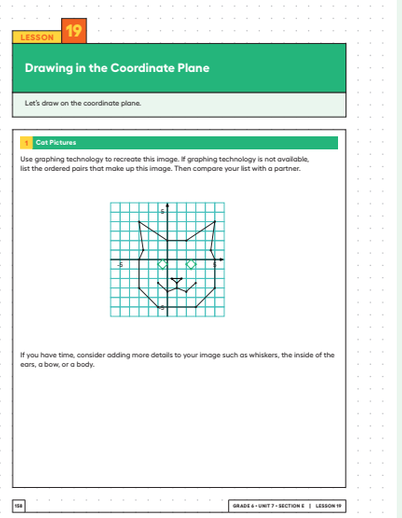
For the left eye:

x	y
-1	-0.5
-0.5	0
0	-0.5
-0.5	-1
-1	-0.5

For the right eye:

x	y
2	-0.5
2.5	0
3	-0.5
2.5	-1
2	-0.5

Student Workbook



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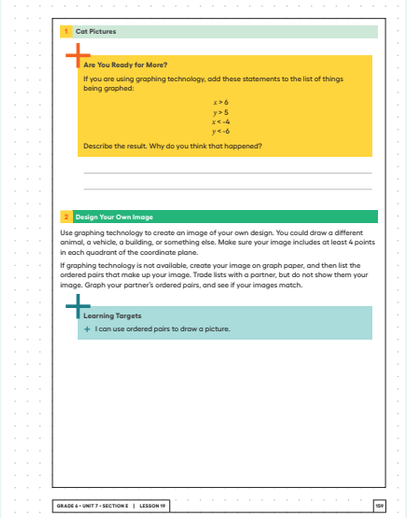

1 Cat Pictures

Are You Ready for More?

If you are using graphing technology, add these statements to the list of things being graphed:

$x > 6$
$y > 5$
$x < -4$
$y < -6$

Describe the result. Why do you think that happened?

2 Design Your Own Image

Use graphing technology to create an image of your own design. You could draw a different animal, a vehicle, a building, or something else. Make sure your image includes at least 4 points in each quadrant of the coordinate plane.

If graphing technology is not available, create your image on graph paper, and then list the ordered pairs that make up your image. Trade lists with a partner, but do not show them your image. Graph your partner's ordered pairs, and see if your images match.

Learning Targets

+ I can use ordered pairs to draw a picture.

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Access for Multilingual Leaners (Activity 1, Synthesis)

MLR8: Discussion Supports
Provide students with the opportunity to rehearse what they will say with a partner before they share with the whole class.

Advances: Speaking

Are You Ready for More?

If you are using graphing technology, add these statements to the list of things being graphed:

$$x > 6$$
$$y > 5$$
$$x < -4$$
$$y < -6$$

Describe the result. Why do you think that happened?

Sample response: There is a frame around the cat's face and everything outside it is shaded. This happened because these are the places where it is true that $x > 6$ or $y > 5$ or $x < -4$ or $y < -6$.

Activity Synthesis

The purpose of this discussion is for students to share the challenges they experienced while graphing the image or determining the coordinates of points and how they overcame them. If not brought up by students, highlight the fact that the image's line of symmetry was not on the axis, and ask them to share how this affected the coordinates.

Activity 2

Design Your Own Image

30 min

Activity Narrative

There is a digital version of this activity.

In this activity, students create an image of their own design in a coordinate plane. While determining the ordered pairs needed to make their image, they have opportunities to think about distances in the coordinate plane, signs in ordered pairs, reflections across an axis, and distances from zero. When listing the ordered pairs that make up the vertices of their image, students must attend to precision so that their image can be recreated by another student.

In the digital version of the activity, students use an applet or other graphing technology to also create an image of their own design in the coordinate plane. The applet allows students to enter ordered pairs and connect points.

Launch

If needed, review how to use the graphing technology to make sure every student feels capable of plotting points and connecting them. Arrange students in groups of 2.

Give students 15 minutes to create their image. Then give students 10 minutes to trade lists of coordinates with their partner and attempt to recreate their partner's image.

Follow with a whole-class discussion.

Student Task Statement

Use graphing technology to create an image of your own design. You could draw a different animal, a vehicle, a building, or something else. Make sure your image includes at least 4 points in each quadrant of the coordinate plane.

If graphing technology is not available, create your image on graph paper, and then list the ordered pairs that make up your image. Trade lists with a partner, but do not show them your image. Graph your partner's ordered pairs, and see if your images match.

Answers vary.

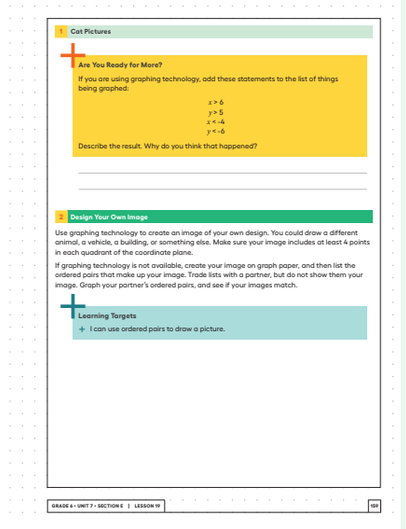
Activity Synthesis

The purpose of this discussion is for students to share their thinking about the decisions they made when creating their image. Invite students to share about choices they made when they were determining the ordered pairs for their image. Here are some possible questions for discussion:

- *"How did you decide what image to create?"*
- *"Did you use any symmetry in your image?"*
- *"How did you incorporate all 4 quadrants?"*
- *"Did you make any changes to your image after you started?"*

If time allows, consider doing a gallery walk so students can see each other's designs.

Student Workbook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