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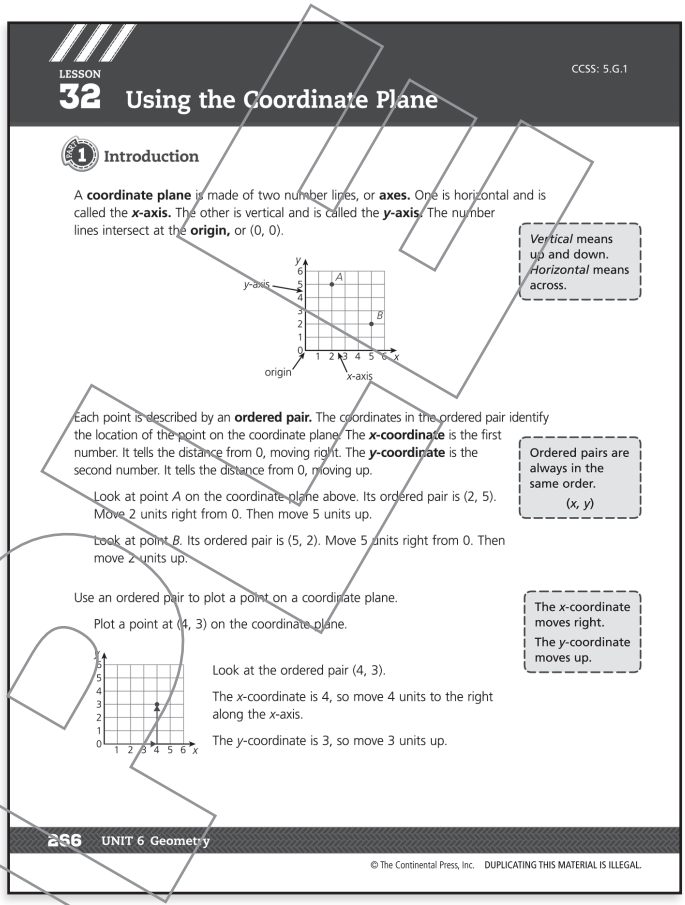
Objective

To locate points in Quadrant I of a coordinate plane

PART 1 Introduction

Discuss the parts of the coordinate plane with students, specifically the axes and the origin. Show students an ordered pair, and specify that the first number is the *x*-coordinate and the second number is the *y*-coordinate. Guide them in identifying the ordered pairs of points *A* and *B* on the given coordinate plane. Then work through the sample to help them locate the ordered pair (4, 3).



LESSON 32 Using the Coordinate Plane

CCSS: 5.G.1

1 Introduction

A **coordinate plane** is made of two number lines, or **axes.** One is horizontal and is called the ***x*-axis.** The other is vertical and is called the ***y*-axis.** The number lines intersect at the **origin,** or (0, 0).

Vertical means up and down. *Horizontal* means across.

y-axis, origin, x-axis, A, B

Each point is described by an **ordered pair.** The coordinates in the ordered pair identify the location of the point on the coordinate plane. The ***x*-coordinate** is the first number. It tells the distance from 0, moving right. The ***y*-coordinate** is the second number. It tells the distance from 0, moving up.

Ordered pairs are always in the same order. (*x*, *y*)

Look at point *A* on the coordinate plane above. Its ordered pair is (2, 5). Move 2 units right from 0. Then move 5 units up.

Look at point *B*. Its ordered pair is (5, 2). Move 5 units right from 0. Then move 2 units up.

Use an ordered pair to plot a point on a coordinate plane.

Plot a point at (4, 3) on the coordinate plane.

The *x*-coordinate moves right. The *y*-coordinate moves up.

Look at the ordered pair (4, 3).

The *x*-coordinate is 4, so move 4 units to the right along the *x*-axis.

The *y*-coordinate is 3, so move 3 units up.

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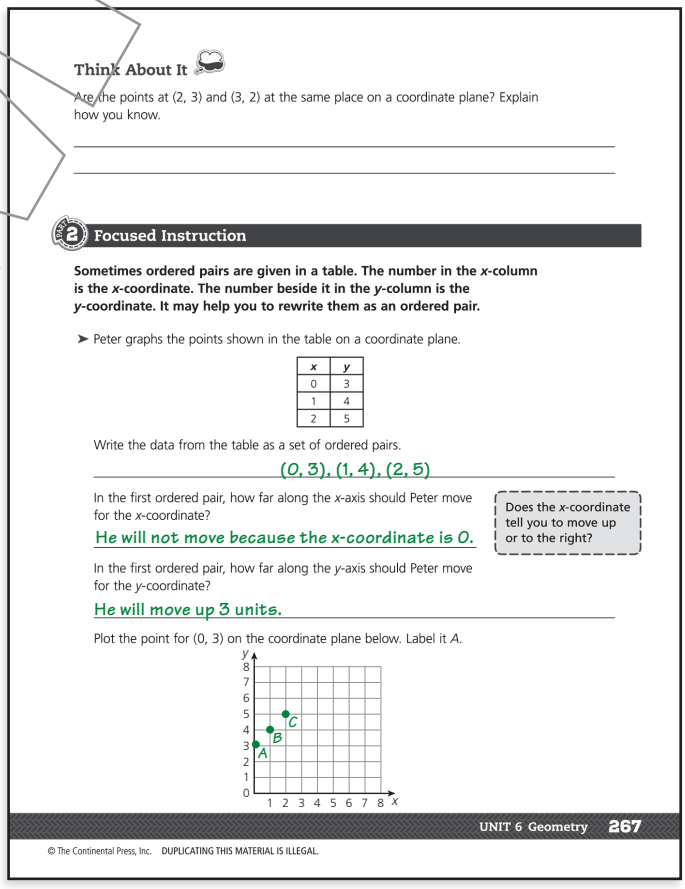
Think About It

Students should show understanding of the numbers in an ordered pair and know that (2, 3) and (3, 2) are not at the same place on a coordinate plane. The point (2, 3) is 2 units to the right of the origin and 3 units up. The point (3, 2) is 3 units to the right of the origin and 2 units up.



Think About It

Are the points at (2, 3) and (3, 2) at the same place on a coordinate plane? Explain how you know.

2 Focused Instruction

Sometimes ordered pairs are given in a table. The number in the *x*-column is the *x*-coordinate. The number beside it in the *y*-column is the *y*-coordinate. It may help you to rewrite them as an ordered pair.

➤ Peter graphs the points shown in the table on a coordinate plane.

x	*y*
0	3
1	4
2	5

Write the data from the table as a set of ordered pairs.

(0, 3), (1, 4), (2, 5)

In the first ordered pair, how far along the *x*-axis should Peter move for the *x*-coordinate?

He will not move because the *x*-coordinate is 0.

Does the *x*-coordinate tell you to move up or to the right?

In the first ordered pair, how far along the *y*-axis should Peter move for the *y*-coordinate?

He will move up 3 units.

Plot the point for (0, 3) on the coordinate plane below. Label it *A*.

A, B, C

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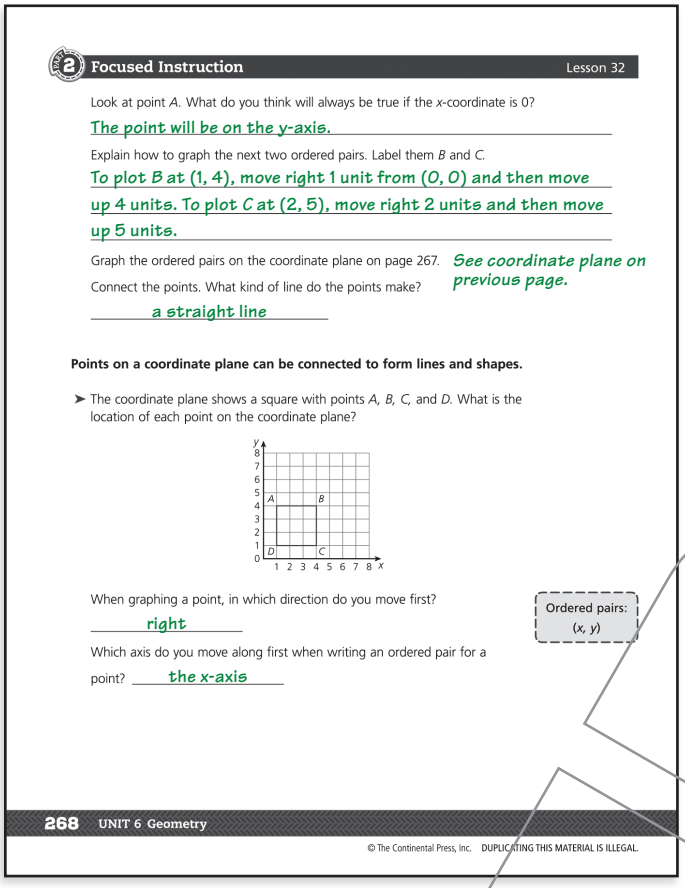
Common Core State Standard

5.G.1 Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).



Focused Instruction Lesson 32

Look at point *A*. What do you think will always be true if the *x*-coordinate is 0?

The point will be on the y-axis.

Explain how to graph the next two ordered pairs. Label them *B* and *C*.

To plot B at (1, 4), move right 1 unit from (0, 0) and then move up 4 units. To plot C at (2, 5), move right 2 units and then move up 5 units.

Graph the ordered pairs on the coordinate plane on page 267. See coordinate plane on previous page.

Connect the points. What kind of line do the points make?

a straight line

Points on a coordinate plane can be connected to form lines and shapes.

➤ The coordinate plane shows a square with points *A*, *B*, *C*, and *D*. What is the location of each point on the coordinate plane?

When graphing a point, in which direction do you move first?

right

Which axis do you move along first when writing an ordered pair for a point? the x-axis

Ordered pairs: (*x*, *y*)

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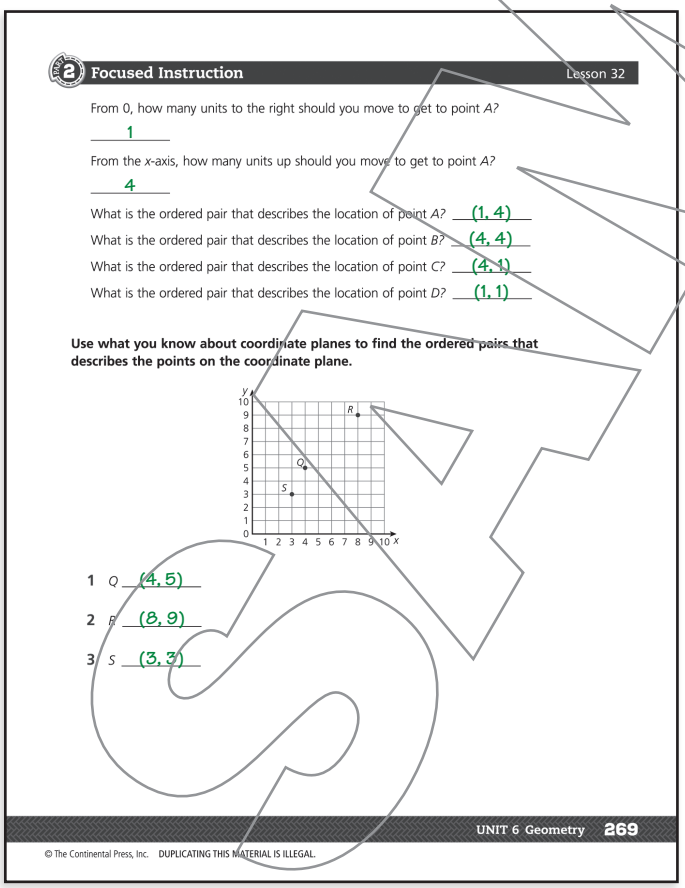

Focused Instruction Lesson 32

From 0, how many units to the right should you move to get to point *A*?

1

From the *x*-axis, how many units up should you move to get to point *A*?

4

What is the ordered pair that describes the location of point *A*? (1, 4)

What is the ordered pair that describes the location of point *B*? (4, 4)

What is the ordered pair that describes the location of point *C*? (4, 1)

What is the ordered pair that describes the location of point *D*? (1, 1)

Use what you know about coordinate planes to find the ordered pairs that describes the points on the coordinate plane.

1 *Q* (4, 5)

2 *R* (8, 9)

3 *S* (3, 3)

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Part 2 Focused Instruction

First, students will use an *x*-*y* table to write ordered pairs before plotting and labeling the points on a coordinate plane. Students should understand that the first coordinate is the *x*-coordinate and the second one is the *y*-coordinate. They should recognize what the coordinates tell about the position of the point on the coordinate plane.

Next, students will find the ordered pairs that represent four points on a coordinate plane. They will answer questions to help them think about how to find the ordered pairs using the given coordinate plane.

Conclude the Focused Instruction section by having students find the ordered pairs for three points on a coordinate plane.

Vocabulary

axes: the number lines used in a coordinate plane

coordinate plane: the space defined by two number lines placed at right angles and used to locate points in space in relation to their distances from the number lines

ordered pair: two numbers that name the location of a point on a coordinate plane; (*x*, *y*)

origin: the center of a coordinate plane, located at the intersection of the *x*- and *y*-axes, having the coordinates (0, 0)

***x*-axis:** the horizontal axis of a coordinate plane

***x*-coordinate:** the first number in an ordered pair, it names the horizontal position of a point

***y*-axis:** the vertical axis of a coordinate plane

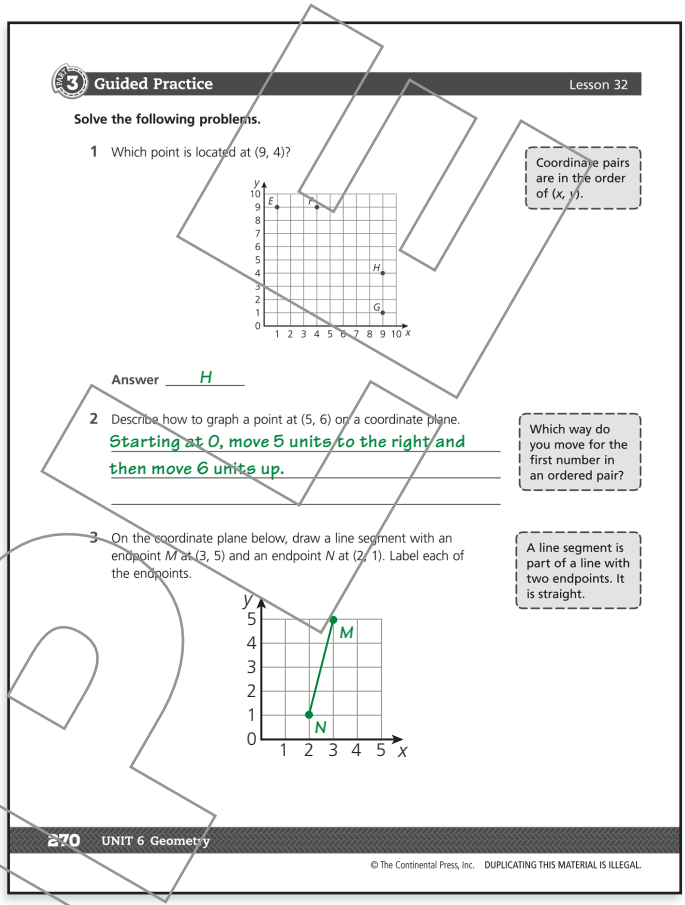
***y*-coordinate:** the second number in an ordered pair, it names the vertical position of a point

Connections to Standards for Mathematical Practice

- Make sense of problems and persevere in solving them.
- Model with mathematics.
- Use appropriate tools strategically.
- Attend to precision.

PART 3 Guided Practice

Students should complete the Guided Practice section on their own. Offer assistance as needed, pointing out the reminder and hint boxes along the right side of the page.



PART 3 Guided Practice Lesson 32

Solve the following problems.

1 Which point is located at (9, 4)?

Coordinate pairs are in the order of (*x*, *y*).

Answer *H*

2 Describe how to graph a point at (5, 6) on a coordinate plane.

Starting at 0, move 5 units to the right and then move 6 units up.

Which way do you move for the first number in an ordered pair?

3 On the coordinate plane below, draw a line segment with an endpoint *M* at (3, 5) and an endpoint *N* at (2, 1). Label each of the endpoints.

A line segment is part of a line with two endpoints. It is straight.

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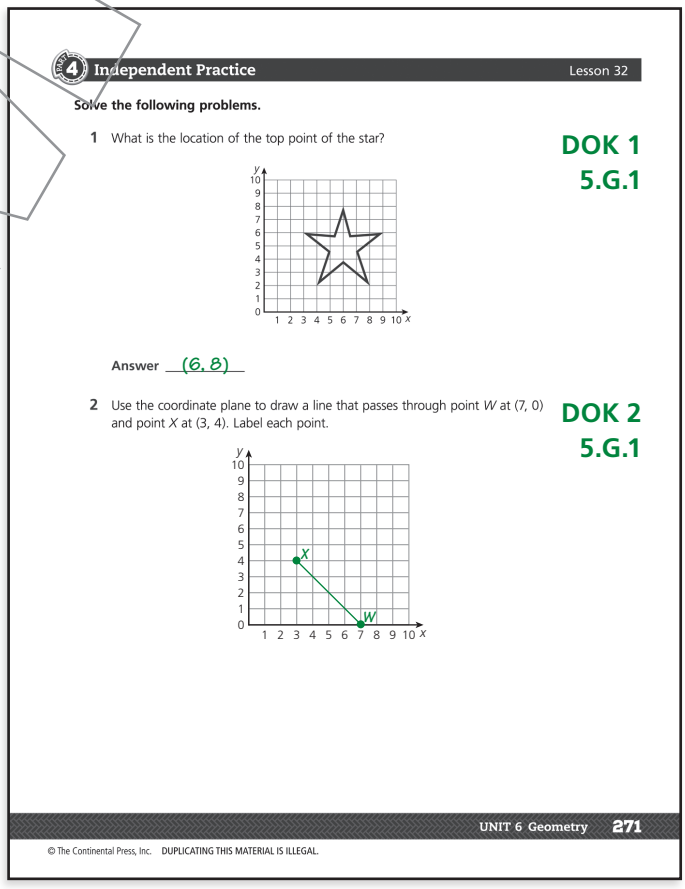
PART 4 Independent Practice Answer Rationales

1 Ordered pairs are written in order from left to right, *x*, and then down to up, *y*. The star's top point is 6 units to the right and 8 units up. The ordered pair is (6, 8).

2 To graph point *W* at (7, 0), start at 0 and move 7 units to the right along the *x*-axis and 0 units up. To graph point *X* at (3, 4), start at 0 and move 3 units to the right along the *x*-axis and 4 units up from that location. Then draw a line to connect the points.



PART 4 Independent Practice Lesson 32

Solve the following problems.

1 What is the location of the top point of the star?

DOK 1
5.G.1

Answer *(6, 8)*

2 Use the coordinate plane to draw a line that passes through point *W* at (7, 0) and point *X* at (3, 4). Label each point.

DOK 2
5.G.1

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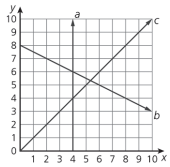
Independent Practice — Lesson 32

Use the coordinate plane below to answer problems 3–5.



3 What ordered pair describes the location at which lines *a* and *b* meet?

DOK 1
5.G.1

Answer (4, 6)

4 Select an option in the set to make the following statement true.

DOK 1
5.G.1

For all the points on line *a*, the [*x*-coordinate, / *y*-coordinate] is always 4.

5 Explain how one line can be moved so that all three lines will meet at the same point.

All the *y*-coordinates of the points on line *c* should be increased by 2, so that the point (4, 4) becomes (4, 6). This will make all three lines intersect at the same point.

DOK 3
5.G.1

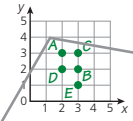
Independent Practice — Lesson 32

6 The list below shows the ordered pairs for some points.

DOK 3
5.G.1

- *A* (2, 3)
- *B* (3, 2)
- *C* (3, 3)
- *D* (2, 2)
- *E* (3, 1)

Part A Graph the points from the list on the coordinate plane below.



Part B A triangle is formed on the coordinate plane above. Its vertices are at (2, 1), (2, 4), and (4, 1). Which of the points that you graphed in Part A do not lie on one of the sides of this triangle? Explain your reasoning.

Points *C* and *B* at (3, 3) and (3, 2) do not lie on a side of the triangle. The side of the triangle that goes straight up and down passes through points *A* and *D*. The side that goes across passes through point *E*.

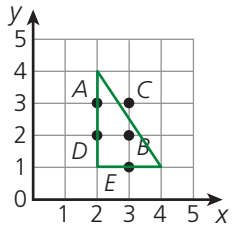
3 Ordered pairs are written in order of the direction and distance along the *x*-axis and then the direction and distance along the *y*-axis. Lines *a* and *b* intersect, or cross, at a point that is 4 units right and 6 units up. The ordered pair is (4, 6).

4 The *x*-coordinate of line *a* is 4 for all points along the line, because the distance from 0 along the *x*-axis is 4 units. The points along line *a* are: (4, 1), (4, 2), (4, 3), (4, 4), (4, 5), (4, 6), (4, 7), (4, 8), (4, 9), (4, 10), etc.

5 Two of the lines intersect at (4, 6), lines *a* and *b*, so line *c* must be changed to intersect at that same point. The point along line *c* that is directly below the intersection of lines *a* and *b* is (4, 4). To move the line up so that it intersects at (4, 6), add 2 to each of the *y*-coordinates of line *c*.

6 PART A To graph each point on the plane, start at 0 and move along the *x*-axis the number of units given by the *x*-coordinate and then move up the number of units given by the *y*-coordinate.

PART B Draw the triangle described by the points and determine which of the points are along the triangle's edges. The points (3, 2) and (3, 3) are not on the edges of the triangle, as shown below.



Extension Activity

Give each student a blank coordinate plane showing Quadrant I only with axes from 0 to 10. Instruct them to plot 10 points on the coordinate plane. Prior to this, prepare cards showing each possible ordered pair on the coordinate plane. After students have plotted their points, give them some counters. Randomly choose an ordered pair from your cards and call it out. If a student has the ordered pair on his or her coordinate plane, he or she should place a counter on it. The first person to have four points marked on his or her coordinate plane wins the game. You may increase or decrease the number of points needed to win depending on time constraints.