Understand the Coordinate Plane

Dear Family,

This week your child is exploring the coordinate plane.

Your child is learning to use ordered pairs of numbers to find a location on the coordinate plane and to identify locations on the coordinate plane with ordered pairs.

The **coordinate plane** at the right has two axes, the *x*-axis and the *y*-axis.

- The ***x*-axis** is a horizontal number line.

- The ***y*-axis** is a vertical number line.

- The axes intersect, or meet, at a point called the **origin**.
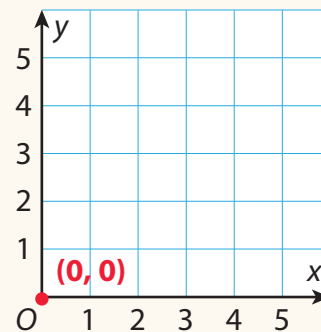
You can find any point on the coordinate plane if you know the *x*-coordinate and *y*-coordinate of the point. These coordinates are given in the **ordered pair** (x, y). The ordered pair (0, 0) tells where the origin is located. It marks a point on the coordinate plane. The point is located at 0 on the *x*-axis and 0 on the *y*-axis.

The ordered pair (3, 4) identifies point *J* on the coordinate plane at the right. Point *J* has an *x*-coordinate of 3 and a *y*-coordinate of 4. To locate point *J*, you start at the origin, move right 3 units on the *x*-axis, and move up 4 units.

Invite your child to share what he or she knows about the coordinate plane by doing the following activity together.
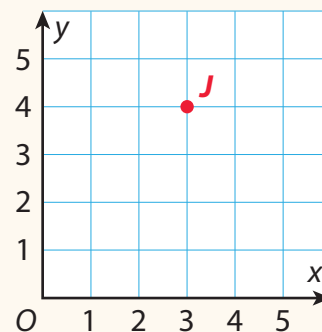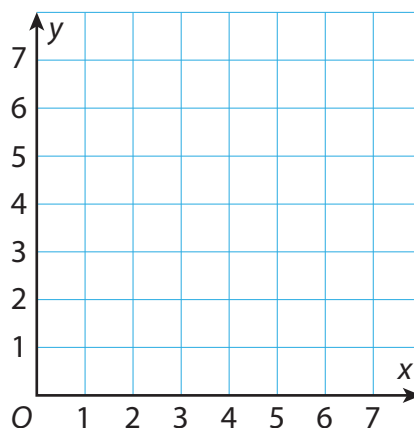
ACTIVITY THE COORDINATE PLANE

Do this activity with your child to understand the coordinate plane.

Materials number cube

Work with your child to use ordered pairs to locate points in the coordinate plane.

• One person rolls a number cube to determine the *x*-coordinate of a point. The other person rolls the number cube to determine the *y*-coordinate.

• Write the coordinates in the table below in the row for point *A*. This is the ordered pair for point *A*.

    • *Example:* Roll a 2 and a 5 with the number cube. Write 2 in the *x* column and 5 in the *y* column of the table. The ordered pair for point *A* is (2, 5).

• Use the ordered pair to locate the point on the coordinate plane below. Describe where you begin, how many units you move, and in which direction you move to locate the point. Mark and label the point as point *A*.

• Repeat the activity three more times to determine coordinates for points *B*, *C*, and *D*.

• Look at the points on the coordinate plane and identify any patterns that you see. (For example, the points might form a line.) Talk about the location of one point in terms of another point. (For example, point *C* might be 2 units to the right and 3 units up from point *B*.) What other things do you notice about the points?

Point	x	y
A		
B		
C		
D		

Explore the Coordinate Plane
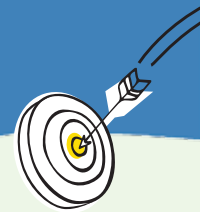
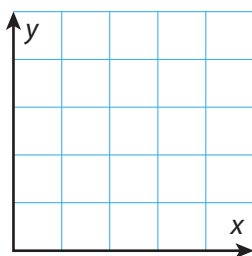What does a point in the coordinate plane represent?

MODEL IT

Complete the problem below.

1 When a horizontal number line and a vertical number line are lined up so that the 0s intersect, a **coordinate plane** is formed.

Coordinate Plane

a. Label the numbers 1–4 on the **x-axis**, the horizontal number line.

b. Label the numbers 1–4 on the **y-axis**, the vertical number line.

c. Label the **origin**, the point where the *x*-axis and *y*-axis intersect, with the letter *O*.

Learning Target

• 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.

SMP 1, 2, 3, 4, 5, 6, 7

DISCUSS IT

• Compare how you labeled the coordinate plane with how your partner labeled the coordinate plane. Are they the same? Are they different?

• I think a coordinate plane is like a number line because . . . I think a coordinate plane is different from a number line because . . .

MODEL IT
Complete the problems below.

2 An **ordered pair** is a pair of numbers, called *coordinates*, that describes the location of a point in the coordinate plane. The coordinates of an ordered pair always appear in the same order: first the **x-coordinate** and then the **y-coordinate**.

Ordered Pair
(x, y)

x-coordinate   y-coordinate
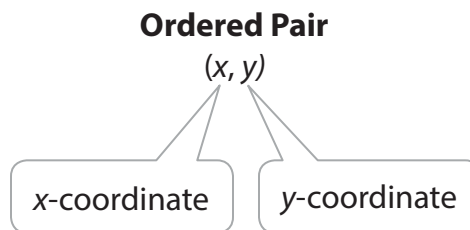
a. If you move only on grid lines, how can you get from the origin to point *B* in the fewest number of moves?
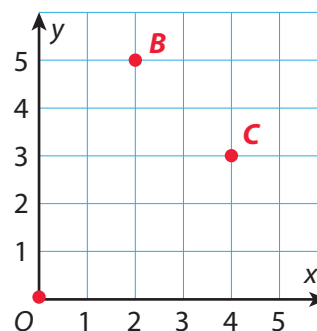
b. The ordered pair (2, 5) is a way to represent the location of point *B*. Use your answer to problem 2a to describe what the *x*-coordinate of an ordered pair tells you about the point's location and what the *y*-coordinate tells you about the point's location.

DISCUSS IT

• How can you and your partner figure out the ordered pair for point *C*?

• I know the *x*-coordinate of any point on the *y*-axis is 0 because . . .

c. What is the ordered pair for the origin, *O*? ....

3 REFLECT

Think about how you have heard the word *origin* used outside of math. Why do you think the point (0, 0) is called the *origin*?

....

....

....

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Prepare for the Coordinate Plane

1   Think about what you know about the coordinate plane. Fill in each box. Use
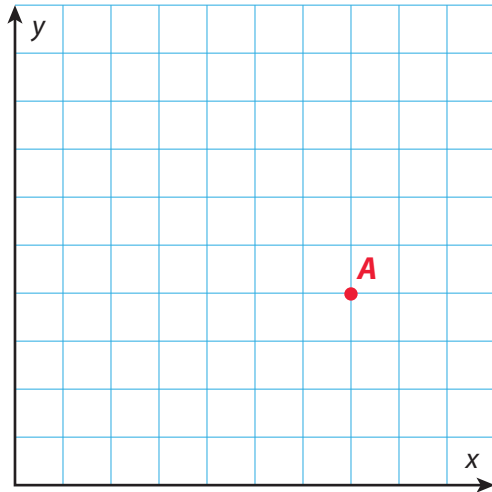   words, numbers, and pictures. Show as many ideas as you can.

Word	In My Own Words	Example
coordinate plane		
x-axis		
y-axis		
origin		
ordered pair		
x-coordinate		
y-coordinate		

2   From the origin, you move three units to the right and six units
    up to point *P*. What ordered pair tells the location of point *P*? ....

Solve.

3 Look at the coordinate plane below.

Coordinate Plane

a. Label the origin with the letter *O*.

b. Label the numbers 1–9 on the *x*-axis.

c. Label the numbers 1–9 on the *y*-axis.

d. Explain what the ordered pair (7, 4) tells you about point *A*.

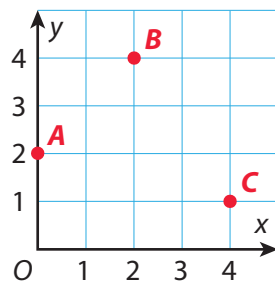# Develop Understanding of the Coordinate Plane

MODEL IT: THE COORDINATE PLANE

Try these two problems.

1 Points *A*, *B*, and *C* are graphed, or plotted, in the coordinate plane below. Use the graph to write the ordered pair for each point.

Point *A* ....

Point *B* ....

Point *C* ....

2 Plot the following points in the coordinate plane in problem 1. Label each point with its letter name.

Point *D*(1, 0)   Point *E*(3, 2)

DISCUSS IT

- Ask your partner to explain how he or she determined the location of points *D* and *E*.

- I think plotting points in the coordinate plane is like plotting points on a number line because . . .

- I think plotting points in the coordinate plane is different from plotting points on a number line because . . .

MODEL IT: TABLES

3 *x*- and *y*-coordinates can be organized in a table like the one below.

Point	A	B	C	D	E	F
x				1	3	4
y				0	2	3

a. Use the coordinate plane on the previous page to complete the table with the coordinates for points *A*, *B*, and *C*.

b. Use the coordinates given for point *F* in the table to graph point *F* in the coordinate plane on the previous page.

c. Explain how you can tell from the table which two points are located on the same vertical grid line in the coordinate plane.
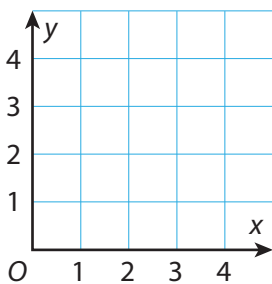
DISCUSS IT

• Compare your answers to your partner's. Do you agree or disagree?

• Looking at points in a table helps me see . . .

CONNECT IT

Complete the problems below.

4 How do the coordinate plane and the table represent points? How are the *x*- and *y*-coordinates of a point shown in each model?

5 Plot point *A*(1, 4) and point *B*(3, 0) in the coordinate plane.

Practice with the Coordinate Plane

Study how the Example shows writing ordered pairs for points in the coordinate plane. Then solve problems 1–9.

EXAMPLE

Write ordered pairs for the origin and point *A* shown in the graph below.

The *x*-coordinate tells how many units from the origin the point is along the *x*-axis. It is the first number in the ordered pair.

The *y*-coordinate tells how many units from the origin the point is along the *y*-axis. It is the second number in the ordered pair.

Origin

The ordered pair for the origin is (0, 0).
The ordered pair for point *A* is (3, 1).
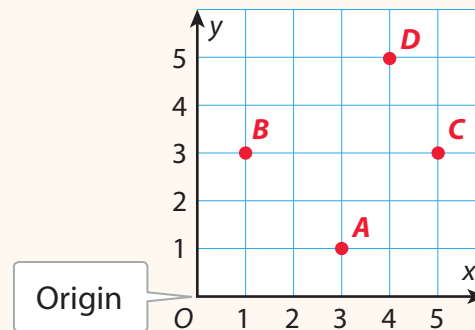
1   Point *B* is .... unit(s) to the right of the origin and .... unit(s) up from the origin.

The ordered pair for point *B* is (........, ...).

2   Point *C* is .... unit(s) to the right of the origin and .... unit(s) up from the origin.

The ordered pair for point *C* is (........, ...).

3   Write the ordered pair for point *D*. Explain your answer.

4   Use the ordered pair (2, 3) to graph and label point *E* on the coordinate plane.

Vocabulary

coordinate plane a two-dimensional space formed by two perpendicular number lines called axes.

ordered pair a pair of numbers, (*x*, *y*), that describes the location of a point in the coordinate plane, where the *x*-coordinate gives the point's horizontal distance from the origin, and the *y*-coordinate gives the point's vertical distance from the origin.

**Use the table and coordinate plane for problems 5–7.**

Point	A	B	C	D	E	F
x				3	4	5
y				4	4	2
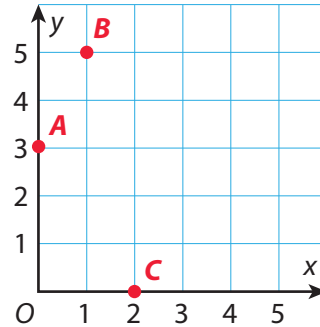
5) In the table, write the coordinates for points A, B, and C, shown in the coordinate plane above.

6) The coordinates for points D, E, and F are shown in the table. Plot and label the points in the coordinate plane.

7) Choose a point in the coordinate plane above. Describe its location compared to the origin.

Use the table and coordinate plane for problems 8 and 9.

Point	R	S	T
x	3	4	5
y	5	0	2
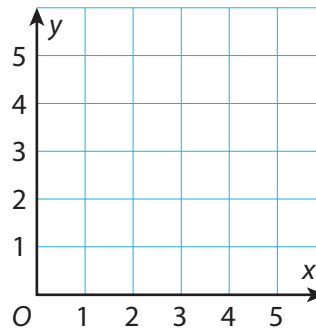
8) The coordinates for points R, S, and T are shown in the table. Plot and label the points in the coordinate plane.

9) Describe the location of point T compared to point S in the coordinate plane.
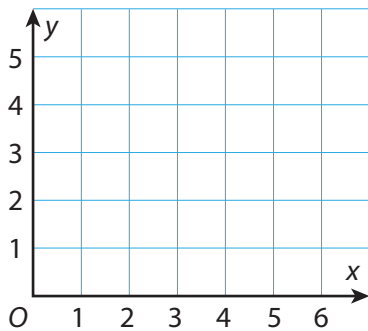
Refine Ideas About the Coordinate Plane

APPLY IT
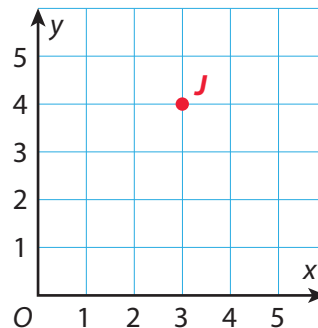**Complete these problems on your own.**

1 SHOW

Look at the table at the right. Plot and label points *M* and *N* in the coordinate plane below. Then write the ordered pairs for points *M* and *N* and describe how to move from (0, 0) to each point.

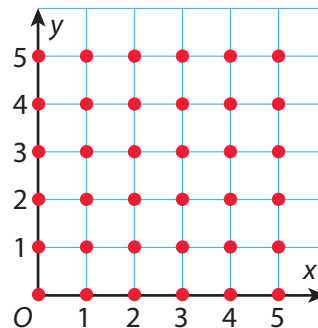| Point	*x*	*y*
M	1	4
N	5	2

2 ANALYZE

Irvin wrote the ordered pair (4, 3) for the location of point *J* in the coordinate plane at the right. Explain Irvin's error.

3 CREATE

Choose three points in the coordinate plane at the right to be the vertices of a triangle. Label the points with letters and draw the triangle. What are the ordered pairs for the vertices of your triangle?
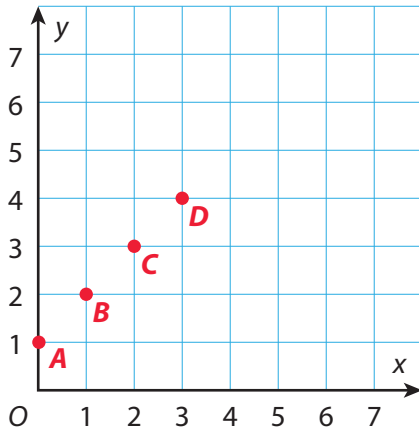
PAIR/SHARE
Discuss your solutions for these three problems with a partner.

Use what you have learned to complete problem 4.

4 **Part A** Use the coordinate plane below to complete the table.

Point	x	y
A		
B		
C		
D		

Part B Describe a pattern you see formed by the points in the coordinate plane above. Then explain how the pattern is shown by the *x*- and *y*-coordinates in the table.

5 **MATH JOURNAL**

Graph and label point *A*(2, 3) and point *B*(3, 2) in the coordinate plane at the right. Then explain how you used the ordered pairs to decide where to place each point.

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