Lesson 1-6
Ordered Pairs and Relations

Interactive Study Guide
See pages 17–18 for:
- Getting Started
- Vocabulary Start-Up
- Notes

Essential Question
How can you use numbers and symbols to represent mathematical ideas?

Common Core State Standards
Content Standards
Preparation for 7.RP.2a, 7.RP.2b, 7.RP.2d, 8.EE.5

Mathematical Practices
1, 3, 4

Vocabulary
coordinate system
coordinate plane
y-axis
origin
x-axis
ordered pair
x-coordinate
y-coordinate
graph
relation
domain
range

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What You'll Learn
- Use ordered pairs to locate points.
- Use graphs to represent relations.

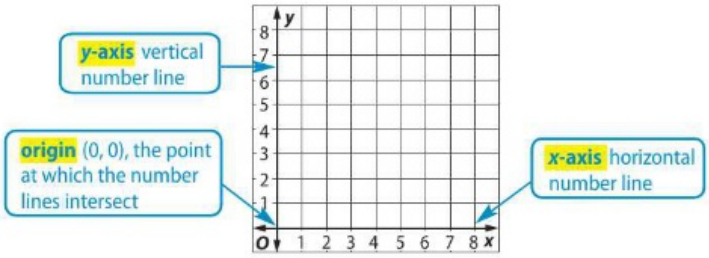
Real-World Link

Bungee Jumping People bungee jump from bridges, from cliffs, and even into volcanoes! The table describes four bungee jumping sites and the approximate heights and times of the jumps. There are different ways to represent this information.

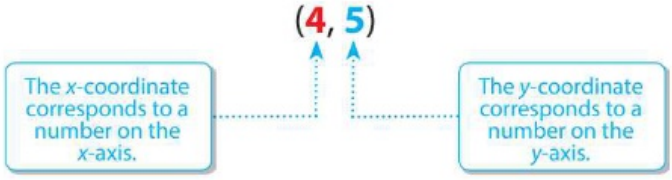
Location	Height (ft)	Time of Fall (s)
Europabrücke, Austria	630	6
Glenns Ferry Bridge, Idaho	170	3
Macau Tower, China	764	7
Navajo Bridge, Arizona	452	5

Ordered Pairs

In mathematics, a **coordinate system** or **coordinate plane** is used to locate points. The coordinate system is formed by the intersection of two number lines that meet at right angles at their zero points.



An **ordered pair** of numbers is used to locate any point on a coordinate plane. The first number is called the ***x*-coordinate**, and the second number is called the ***y*-coordinate**.



To **graph** an ordered pair, draw a dot at the point that corresponds to the ordered pair. The coordinates are your directions to locate the point.

Coordinate Planes
Unless the units are marked otherwise, you can assume that each unit on the *x*-axis and *y*-axis represents 1 unit.

Example 1

Tools Tutor

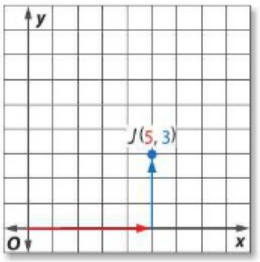
Graph each ordered pair on a coordinate plane.

a. $J(5, 3)$

Step 1 Start at the origin.

Step 2 Since the *x*-coordinate is 5, move 5 units to the right.

Step 3 Since the *y*-coordinate is 3, move 3 units up. Draw a dot.

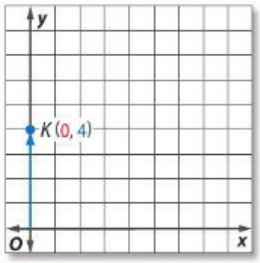


b. $K(0, 4)$

Step 1 Start at the origin.

Step 2 Since the *x*-coordinate is 0, you do not need to move right.

Step 3 Since the *y*-coordinate is 4, move 4 units up. Draw the dot on the axis.



Got It? Do these problems to find out.

1a. $Q(2, 3)$ **1b.** $R(5, 0)$ **1c.** $S\left(3, 1\frac{1}{2}\right)$ **1d.** $T\left(6\frac{1}{2}, 5\frac{1}{2}\right)$

Sometimes a point on a graph is named by using a capital letter. To identify its location, you can write the ordered pair that represents the point.

Example 2

Tutor

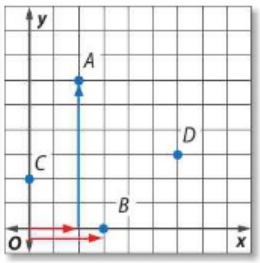
Write the ordered pair that names each point.

a. A

Step 1 Start at the origin.

Step 2 Move right on the *x*-axis to find the *x*-coordinate of point *A*, which is 2.

Step 3 Move up the *y*-axis to find the *y*-coordinate, which is 6.



The ordered pair for point *A* is (2, 6).

b. B

The *x*-coordinate of point *B* is 3, and the *y*-coordinate is 0.

The ordered pair for point *B* is (3, 0).

Got It? Do these problems to find out.

2a. C **2b.** D

Relations

Domain and Range
The domain of a relation is also called the *input*. The range of a relation is also called the *output*.

A set of ordered pairs such as {(2, 3), (3, 5), (4, 1)} is a **relation**. A relation can also be shown in a table or a graph. The **domain** of the relation is the set of *x*-coordinates. The **range** of the relation is the set of *y*-coordinates.

Ordered Pairs

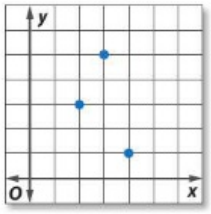
(2, 3)
(3, 5)
(4, 1)

The domain is {2, 3, 4}.
The range is {3, 5, 1}.

Table

x	y
2	3
3	5
4	1

Graph



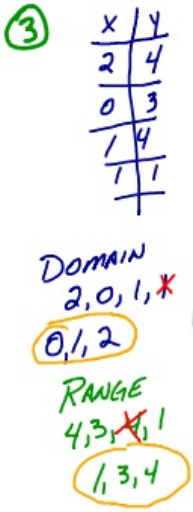
Example 3

Watch Tutor

Express the relation {(0, 2), (1, 4), (2, 5), (3, 8)} as a table. Then determine the domain and range.

x	0	1	2	3
y	2	4	5	8

The domain is {0, 1, 2, 3}, and the range is {2, 4, 5, 8}.



Got It? Do this problem to find out.

3. Express the relation {(2, 4), (0, 3), (1, 4), (1, 1)} as a table. Then determine the domain and range.

Example 4

Tools Tutor

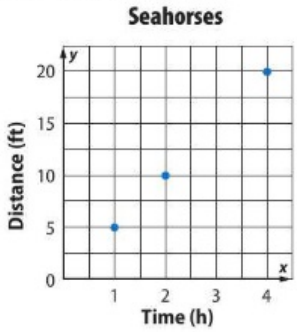
A seahorse swims at a rate of about 5 feet per hour.

a. Make a table of ordered pairs in which the *x*-coordinate represents the hours and the *y*-coordinate represents the number of feet for 1, 2, and 4 hours.

x	y
1	5
2	10
4	20

The points appear to lie in a line.

b. Graph the ordered pairs and describe the graph.



Got It? Do these problems to find out.

4. One square mile is equal to six hundred forty acres.

a. Make a table of ordered pairs in which the *x*-coordinate represents the number of square miles and the *y*-coordinate represents the number of acres in 1, 2, and 3 square miles.

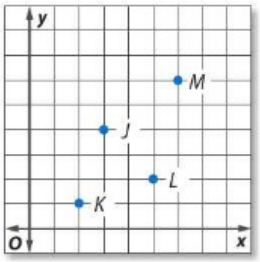
b. Graph the ordered pairs. Then describe the graph.

Guided Practice

Graph each ordered pair on a coordinate plane. (Example 1)

1. $F(6, 0)$ **2.** $A(2, 5)$ **3.** $W(4, 1)$ **4.** $Z(0, 1)$

Refer to the coordinate plane shown at the right. Write the ordered pair that names each point. (Example 2)



5. J **6.** K

7. L **8.** M

Express each relation as a table. Then determine the domain and range. (Example 3)

9. {(3, 4), (1, 5), (4, 2)}

10. {(1, 3), (2, 6), (3, 3), (4, 7)}

10) X: 1, 2, 3, 4 / Y: 3, 6, 3, 7 — DOMAIN, RANGE

DOMAIN 1, 2, 3, 4
RANGE 3, 6, 7

11. One quart is equal to two pints. (Example 4)

a. Make a table of ordered pairs in which the x-coordinate represents the number of quarts and the y-coordinate represents the number of pints in 1, 2, 3, and 4 quarts.

11) QUARTS (X): 1, 2, 3, 4 / PINTS (Y): 2, 4, 6, 8 — DOMAIN, RANGE

b. Graph the ordered pairs. Then describe the graph.

Independent Practice

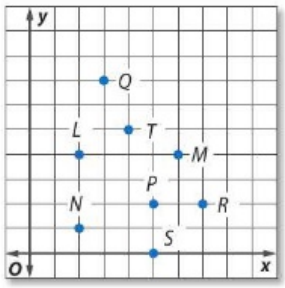
Go online for Step-by-Step Solutions

Graph each ordered pair on a coordinate plane. (Example 1)

12. $A(4, 7)$ **13.** $B(0, 4)$ **14.** $C(7, 3)$ **15.** $D(3, 4)$

16. $F(6, 1)$ **17.** $G(6, 5)$ **18.** $H(3, 0)$ **19.** $J(2, 2)$

Refer to the coordinate plane shown at the right. Write the ordered pair that names each point. (Example 2)



20. L **21.** M

22. N **23.** P

24. Q **25.** R

26. S **27.** T

Express each relation as a table. Then determine the domain and range. (Example 3)

28. {(4, 5), (2, 1), (5, 0), (3, 2)}

29 {(0, 2), (2, 2), (4, 1), (3, 5)}

30. {(6, 0), (4, 5), (2, 1), (3, 1)}

31. {(5, 1), (3, 7), (4, 8), (5, 7)}

32. The cost of a mini pizza is \$7 at Pizza Pizza. (Example 4)

a. Make a table of ordered pairs in which the x-coordinate represents the number of mini pizzas and the y-coordinate represents the cost of 1, 3, 5, and 7 mini pizzas at Pizza Pizza.

b. Graph the ordered pairs. Then describe the graph.