

## 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

### What You'll Learn

- Use ordered pairs to locate points.
- Use graphs to represent relations.



### Real-World Link

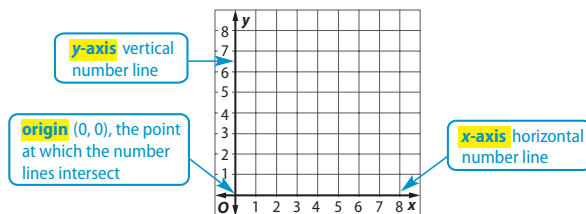
**Bungee Jumping** People bungee jump from bridges, from cliffs, and even into volcanoes! The table describes four bungee jumping sites and the approximate heights and times of the jumps. There are different ways to represent this information.

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

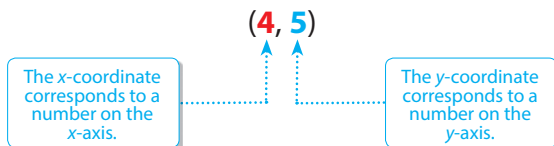


## Ordered Pairs

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.

## Example 1



### Coordinate Planes

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

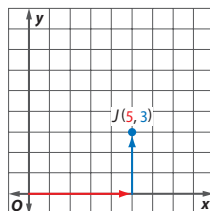
Graph each ordered pair on a coordinate plane.

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.

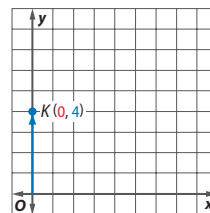


b.  $K(0, 4)$

**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.  $S(3, 1\frac{1}{2})$

1d.  $T(6\frac{1}{2}, 5\frac{1}{2})$

1a–d. See Answer Appendix.

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



Write the ordered pair that names each point.

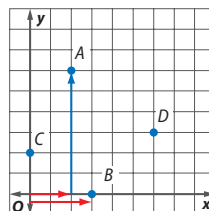
a. A

**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  $(0, 2)$

2b. D  $(6, 3)$

## 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

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

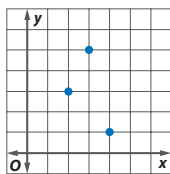
The domain is  $\{2, 3, 4\}$ .

The range is  $\{3, 5, 1\}$ .

#### Table

$x$	$y$
2	3
3	5
4	1

#### Graph



### Example 3



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.

- Express the relation  $\{(2, 4), (0, 3), (1, 4), (1, 1)\}$  as a table. Then determine the domain and range. **See Answer Appendix.**



### Example 4



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

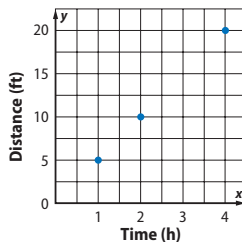
- Make a table of ordered pairs in which the  $x$ -coordinate represents the hours and the  $y$ -coordinate represents the number of feet for 1, 2, and 4 hours.

$x$	$y$
1	5
2	10
4	20

The points appear to lie in a line.

- Graph the ordered pairs and describe the graph.

Seahorses



**Got It?** Do these problems to find out.

- One square mile is equal to six hundred forty acres. **See Answer Appendix.**
  - 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.
  - Graph the ordered pairs. Then describe the graph.

## Guided Practice



Graph each ordered pair on a coordinate plane. (Example 1) **1–4. See Answer Appendix.**

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.  $J$  **(3, 4)**

6.  $K$  **(2, 1)**

7.  $L$  **(5, 2)**

8.  $M$  **(6, 6)**

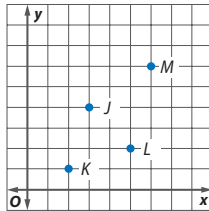
Express each relation as a table. Then determine the domain and range. (Example 3) **9–11. See Answer Appendix.**

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

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

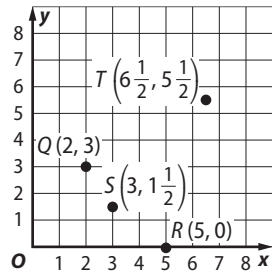
11. One quart is equal to two pints. (Example 4)

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



Pages 32–33 Lesson 1-6 Got It?

1a–d.



3.

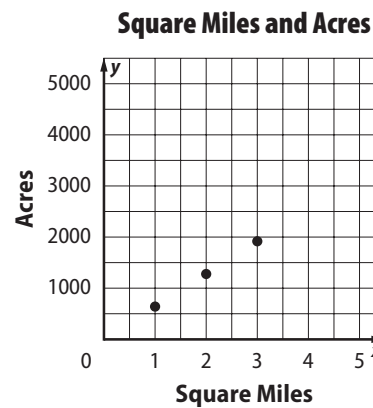
$x$	$y$
2	4
0	3
1	4
1	1

$$D = \{0, 1, 2\}, R = \{1, 3, 4\}$$

4a.

$x$	$y$
1	640
2	1280
3	1920

4b.



The points appear to lie in a line.

Page 33 Lesson 1-6 Need Another Example?

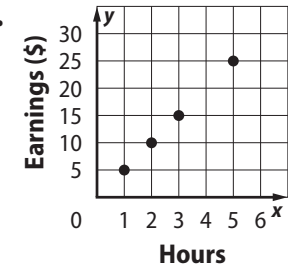
3.

$x$	$y$
1	4
2	2
3	0
0	2

4a.

$x$	$y$
1	5
2	10
3	15
4	25

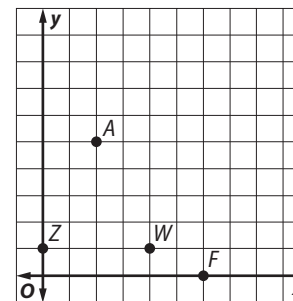
4b.



The points appear to lie on a line.

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1–4.



9.

$x$	$y$
3	4
1	5
4	2

$$D = \{1, 3, 4\}, R = \{2, 4, 5\}$$

10.

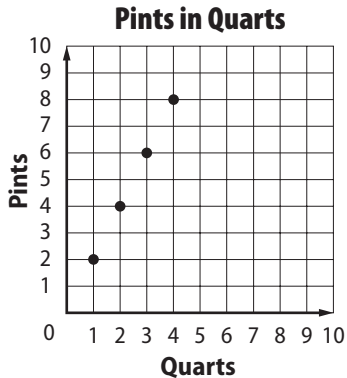
$x$	$y$
1	3
2	6
3	3
4	7

$$D = \{1, 2, 3, 4\}, R = \{3, 6, 7\}$$

**11a.**

$x$	$y$	$(x, y)$
1	2	(1, 2)
2	4	(2, 4)
3	6	(3, 6)
4	8	(4, 8)

**11b.**



The points appear to lie in a line.