

# 2002 National Teacher Training Institute

## The Order of Things on a Coordinate Grid

Grades 9-12

### Master Teacher

Rachel W. Edwards

### Time Allotment

Two 50-minute class periods

### Overview

From early civilizations, we know that people pictured pairs of numbers as points graphed on a plane. About 350 years ago, a French soldier, Rene Descartes, developed a system that used horizontal and vertical number lines to picture points and lines on a plane. His ideas worked so well that today we call this system the Cartesian coordinate system in his honor.





After viewing video clips and completing activities, the students will learn how to construct a coordinate plane, graph ordered pairs, name the coordinates, identify the quadrants, and create a picture using ordered pairs.

### Subject Matter

Mathematics

### Learning Objectives

Students will be able to:

-  identify ordered pairs on coordinate plane
-  graph points on a coordinate plane
-  write an ordered pair for each of the points on a graph
-  create a design or picture using ordered pairs

### South Carolina Standards

(Algebra Standards for grades 9-12 are available online at [http://www.myscschools.com/offices/cso/Standards\\_Page.htm](http://www.myscschools.com/offices/cso/Standards_Page.htm))

I. Understand patterns, relations, and functions.

IB. Understand relations and functions and select, convert flexibly among, and use various representations for them.

IB2. Represent relationships among quantities using concrete models, tables, graphs, diagrams, verbal descriptions, equations, and inequalities including representations involving computer algebra systems, spreadsheets, and graphing calculators.

### Media Components

#### Video

*Algebra: In Simplest Terms*, Lesson 10: "Linear Relations"

### Materials

#### Per student:

graph paper (3 or more sheets)  
ruler  
pencil  
color pencils

Activity Sheet 1: Naming Ordered Pairs

Activity Sheet 2: Graphing Ordered Pairs

Activity Sheet 3: Connecting Points and Naming the Geometric Figure

#### Per class:

Overhead transparencies  
Overhead projector

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## Prep for Teachers

- ✎ Cue the video, *Algebra: In Simplest Terms*, Lesson 10: “Linear Relations.”
- ✎ Make copies of all activity sheets for each student.
- ✎ Collect other materials such as the rulers, graphic calculators and color pencils.
- ✎ When using media, provide students with a **Focus for Media Interaction**, a specific task to complete and/or information to identify during or after viewing of video segments, Web sites, or other multimedia elements.

## Introductory Activity

**Step 1:** Vocabulary. Review the following words with the students and have them write the definitions in their notebook.

real numbers  
horizontal line  
vertical line  
Cartesian coordinate system  
Plane  
x-coordinate  
quadrant  
x-axis  
y-axis  
ordered pairs  
axes  
y-coordinate

**Step 2:** Provide students with a **Focus for Media Interaction**, telling them that in the video they will learn to name and graph ordered pairs on a coordinate plane. They should listen for definitions of some of the words from the vocabulary list given at the beginning of the lesson. The words are: x-axis, y-axis, ordered pairs, horizontal line, vertical line, origin, and coordinate plane.

START the video at the beginning of the program when the cab driver says, “Good morning Mr. Garfunkel.” The picture on the screen is Mr. Garfunkel in a cab. STOP the video when Mr. Garfunkel says, “The ordered pair [6, 4] for instance represents this point where x is 6 and y is 4.” The picture on the screen is a the graph on a sheet of paper. After the video ask the class to name and define the vocabulary words described in the video.

**Step 3:** Pass out sheets of graph paper and rulers to the students to use in this activity and the **Learning Activity**. Guide the students in labeling the vertical axis, horizontal axis and the origin. Explain and demonstrate on the overhead projector how to draw a Cartesian coordinate system on the graph paper.

Tell the students to begin by drawing a number line horizontally in the middle of their paper (if they want to use the whole sheet of graph paper). This is the x-axis. Place the zero point about halfway across the page. This point is the origin. Label this point with the letter O. Now draw another number line perpendicular (making a right angle) to the first, crossing the first line at the origin. This is the y-axis. Notice that the positive numbers are to the right of the origin for the horizontal line and negative numbers are to the left. The positive numbers are up from the origin on the vertical line and down from the origin for the negative numbers. Point out that it is up to the student if they want to write negative and positive numbers on the x and y axis.

## Learning Activity

**Step 1:** Again, students will need graph paper and their rulers. Provide students with a **Focus for Media Interaction** by explaining that as a follow-up to the video they will now learn how to graph a pair of ordered pairs.

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**Step 2:** START the video when the presenter Mr. Garfunkel says, “For instance the point representing the x value 6 and the y value 4 [he counts over 6 and up 4] is here.” The picture on the screen is a graph on a sheet of paper. STOP when he says, “The value of setting up a system like this is.” The picture on the screen is Mr. Garfunkle talking.

**Step 3:** Explain how to name the pair of numbers that identifies any point in the Cartesian system. Instruct students to construct the graph as it is demonstrated on the overhead projector with the following information: To name points or to find the number pair that identifies point A, begin at the origin where the axes cross. Move to the right along the x-axis until you are under point A. As you move, count the number of units from the origin. Write down the number. Then move up along a line parallel to the y-axis until you reach point A. As you move, count the number of units from the x-axis. Write this number to the right of the first number. Place a comma between the pair of numbers and enclose them in parentheses. The pair (3, 2) identifies point A.

**Step 4:** Pass out the Activity Sheet 1: Naming Coordinates. Allow sufficient time for students to practice locating and naming coordinates. Explain that the Cartesian coordinate system is divided into four quadrants. Demonstrate on the overhead projector how to divide coordinate plane into the four quadrants. Show the students that the quadrants are numbered in a counter clockwise direction.

## Reinforcement

**Step 5:** Show the students how to plot points on the graph. Explain that you draw a Cartesian coordinate system, mark your units in all four directions. Use an overhead transparency (coordinate plane) to show the students how to plot the

ordered pair on the graph paper. Explain and demonstrate on the overhead projector. Remind the students that to locate the point begin at the origin. Then move to the left if the number is a negative, move to the right if the number is positive (for the x value). To find the y value move up or down on the y-axis (up for positive numbers and down for negative numbers).

**Step 6:** Pass out a copy of Activity 2: Graphing Ordered Pairs. After students have completed the activity, place the answers on the overhead graph sheet so students can check their completed activity. Collect the papers to check for understanding and comprehension.

**Step 7:** Show the students how to draw a geometric figure and a simple design on the overhead projector. Ask the students to get out another sheet of graph paper. Have the students practice drawing a familiar geometric figure (rectangle) or design (bird), then tell them to name the points. Next tell them to locate the ordered pairs: A (1,5), B (-1,5), C (-1,-5), and D (1,-5). Allow time for the students to plot the ordered pairs on their coordinate grid and connect the dots. Tell them to name the geometric figure.

**Step 8:** Pass out Activity 3: Locate, Connect and Name the Figure. The students will receive a grade for this activity. (20 points each problem correct in Activity 3) total points 60. They will then be instructed to draw their own figure and name the ordered pairs (40 points).

## Culminating Activity

**Step 1:** Instruct the students to review all activities assigned and then tell the students to get out a sheet of graph paper, ruler and color pencils. Each student will create his or her own picture or geometric design and write down the ordered pairs.

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**Step 2:** The ordered pairs will be then given to another student. The student who created the design will be expected to correctly write the ordered pairs that will duplicate the design and the student who graphs the ordered pairs will be expected to correctly duplicate the design or figure. Both students will be graded according to 100 percent accuracy.

## **Cross-Curricular Extensions**

- ✎ Invite teachers from other disciplines to demonstrate how graphs are used in science, geography, economics, vocational education and computers.
- ✎ Visit the C.A.D. class at the Vocational Center to show career choices for using graphing.

## **Community Connections**

- ✎ Invite the weatherman from the local TV station to explain how ordered pairs are used in tracking storms and forecasting the weather.

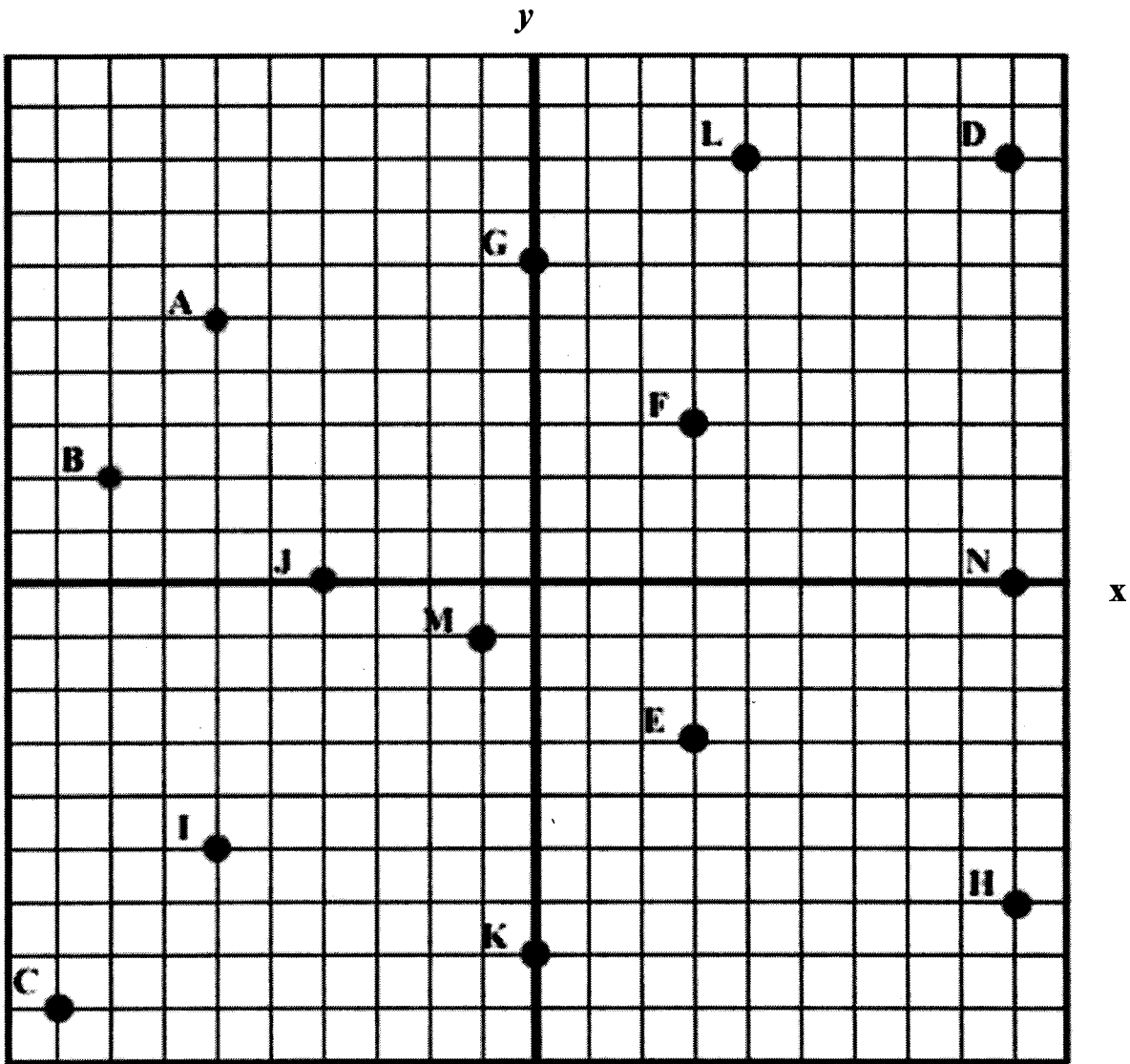
## **Student Materials**

- Student Algebra Textbook
- Activity 1: Naming Ordered Pairs
- Activity 2: Graphing Ordered Pairs
- Activity 3: Connecting Points and Naming the Geometric Figure
- Pack of graph paper

# Activity Sheet 1: Naming Coordinates

**Directions:**

For each ordered pair name the point on the grid.



A. \_\_\_\_\_

B. \_\_\_\_\_

C. \_\_\_\_\_

D. \_\_\_\_\_

E. \_\_\_\_\_

F. \_\_\_\_\_

G. \_\_\_\_\_

H. \_\_\_\_\_

I. \_\_\_\_\_

J. \_\_\_\_\_

K. \_\_\_\_\_

L. \_\_\_\_\_

M. \_\_\_\_\_

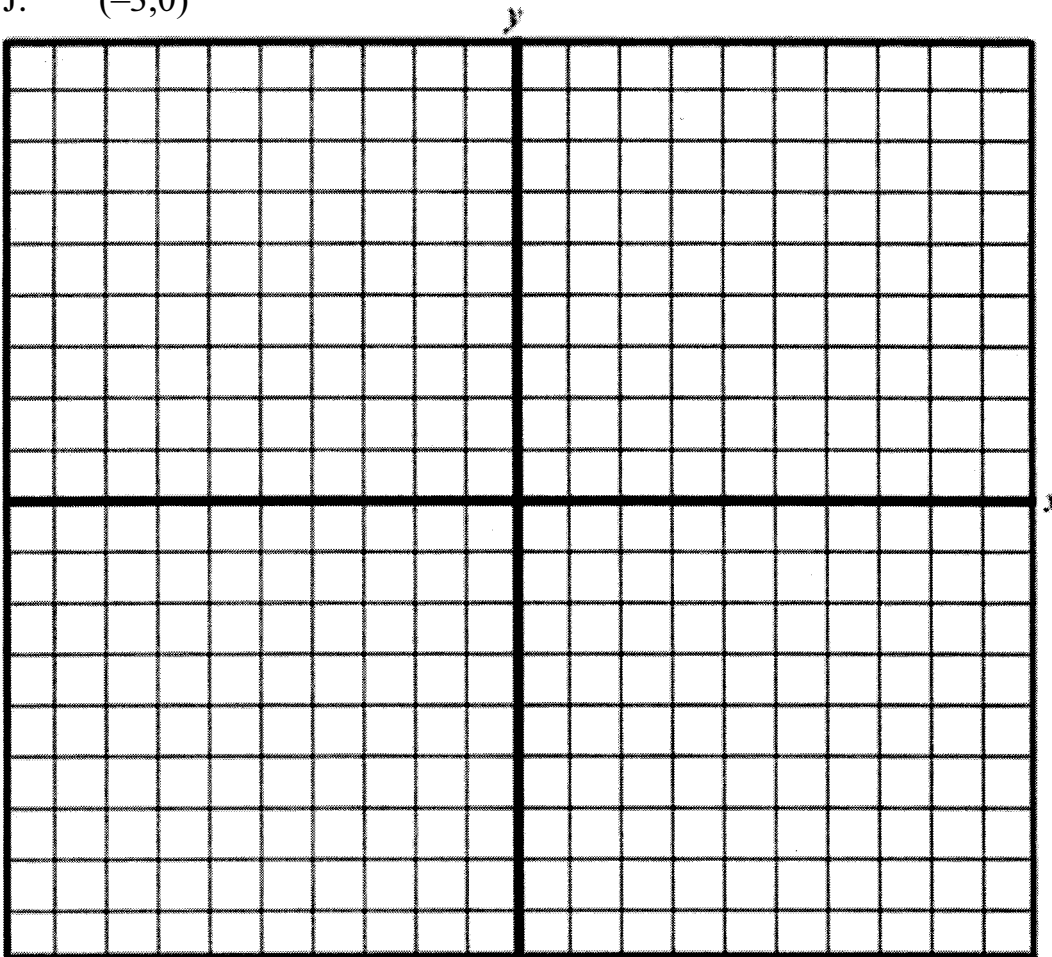
N. \_\_\_\_\_

## Activity Sheet 2: Graphing Ordered Pairs

### Directions:

On a sheet of graph paper plot the following ordered pairs, connect the points and name the geometric figure formed using a straightedge or ruler.

- A. (3,4)
- B. (0,2)
- C. (4,5)
- D. (-2,3)
- E. (0,-4)
- F. (2,-3)
- G. (-3,-4)
- H. (-5,-2)
- I. (3,0)
- J. (-3,0)



## Activity Sheet 3: Connecting Points and Naming the Geometric Figure

### Directions:

On a sheet of graph paper, plot the following ordered pairs, connect the points and name the geometric figure formed, using a straight edge or ruler.

A.  $(-3,2)$        $(8, -2)$        $(2,4)$

B.  $(2,-4)$        $(5,2)$        $(3,7)$        $(6,2)$        $(-4,5)$

C.  $(0,5)$        $(-6,2)$        $(3,-7)$        $(-1,1)$