

Traveling on a Coordinate Plane

Introduction

When a horizontal and a vertical number line intersect at the zeros of each number line they create a *coordinate plane*. The intersection point is the *origin*. This system is sometimes called the *Cartesian coordinate plane* after the man who first proposed it, Rene Descartes (1596 -1650).

Part 1

The **COORD INTRO** applet can help you investigate the coordinate plane on the HP 39gs. Turn the HP 39gs on, press the APLET key and look for **COORD INTRO**. If you do not have the applet in your applet library, you will have to get it from your teacher.

Highlight the **COORD INTRO** applet and press the START menu key. You will find yourself in the Symbolic view. Press the PLOT key, you will be informed that no equations are checked. Press the OK menu key. You are now ready to explore.

Press the right arrow key several times. Notice that the marker moves to the right and the number labeled x changes its value. By pressing the right arrow and left arrow keys only, can you move the marker to an x value of 2? How about 2.7? Can you move the marker to an x value of 2.75? Why not? Can you move the marker to an x value of -1.3 ? Now move the marker back to a value of 0.

Exercises

1) Move the marker 3 units to the right of and 2 units above the origin. What are the values of x and y ?

The point located at the coordinates $x = 3$ and $y = 2$ can be written as $(3, 2)$. This is often called the point's *ordered pair* because the coordinates are a pair of numbers that are always ordered with the x -value first and the y -value second. The coordinates in an ordered pair uniquely identifies a point on the coordinate plane.

Now move the marker to $x = -1$ and $y = -3$.

2) How many units to the left of the origin is the marker now?

3) How many units down from the origin is the marker now?

Now move the marker to $x = 1$ and $y = -2$.

4) How many units to the right of the origin is the marker now?

5) How many units down from the origin is the marker now?

6) What do all the points to the left of the origin have in common?

- 7) What do all the points above the origin have in common?
- 8) Use the arrow keys to find a point with an x -value of 3. Now move to a different point with an x -value of 3. Describe what it would look like if you plotted every point that had an x -value of 3.
- 9) Use the arrow keys to find a point with a y -value of 2. Now move to a different point with a y -value of 2. Describe what it would look like if you plotted every point that had a y -value of 2.
- 10) Use the arrow keys to find a point in which the x -value and the y -value are equal. Now move to a different point in which the x -value and the y -value are equal. Describe what it would look like if you plotted every point in which the x -value and the y -value were equal.

Part 2

The **COORD TRIP** applet on the HP 39gs can help you explore the Cartesian plane even more. If you don't have the applet in your applet library, you will have to download it from your teacher.

In **COORD TRIP** you will be given a starting point and instructions on how to move from that starting point. Your job is to follow the instructions to locate the coordinates of the final point. Press the **APLET** key and choose **COORD TRIP**. Read the note and then press the **VIEWS** key. Select **Get Trip** and write down the starting point and the instructions below.

11a) Start at _____. Move ____ units _____ and ____ units _____.

Press **OK** and you will see the **PLOT** view with tick marks every one unit. Do you see the starting point? If you want to move the marker around the screen, you will have to turn **TRACE** off. To do this, press the **MENU** key, and then press **TRACE** (the little square will disappear to show that trace is off). You can now move the marker around the screen to follow the instructions. If you press the **MENU** key two more times, you can see the coordinates of the marker on the screen. When you have followed all of the instructions and have located the final point, press the **VIEWS** key again and select **Enter Answer**. Enter the x - and y -coordinates of your answer.

11b) What is your answer? $x =$ _____ $y =$ _____

The HP 39gs will check your answer and draw a plot showing the correct trip. Press VIEWS and select **Get Trip** to start again. If you were correct, you will get a new point and instructions. If you were incorrect, start over using the same set of instructions. Continue until you have correctly done five trips. Record your results.

12) Start at _____. Move ____ units _____ and ____ units _____.

Answer: $x =$ _____ $y =$ _____

13) Start at _____. Move ____ units _____ and ____ units _____.

Answer: $x =$ _____ $y =$ _____

14) Start at _____. Move ____ units _____ and ____ units _____.

Answer: $x =$ _____ $y =$ _____

15) Start at _____. Move ____ units _____ and ____ units _____.

Answer: $x =$ _____ $y =$ _____

Answer questions 16-19 without the HP 39gs.

16) What are the coordinates of the point if you begin at $(-3, -5)$ and move 1 unit to the right and 7 units up?

17) What are the coordinates of the point if you begin at $(5.1, 2.4)$ and move 4 units to the left and 2 units down?

18) What are the coordinates of the point if you begin at $(-3.4, -1.5)$ and move 2.3 units to the right and 1.3 units down?

19) Write a general rule for finding the ending point when given a starting point and instructions.