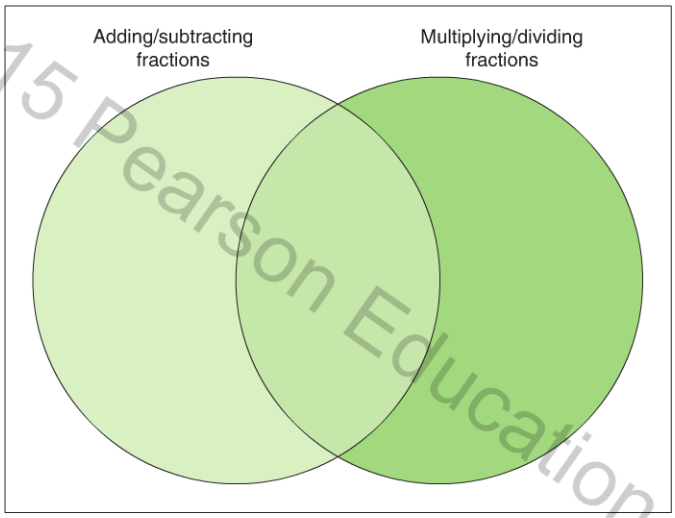
5. **Looking forward, looking back** Think about the operations of adding/subtracting fractions and multiplying/dividing fractions. List some features that these procedures have in common and some differences between them, and then place your statements in the correct position on the following Venn diagram.

   It may be easier to make a numbered list of statements and then place the numbers in the diagram.

Fraction Operations

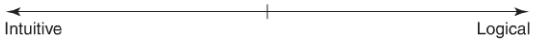


1.4 Getting Started: Groups

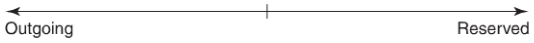
Explore

Group work will be an important component to each lesson. To improve the experience for everyone, it is beneficial to understand how you work as well as how your peers work. There are two key components to how students will work in a group: how you approach problems and how you communicate. The following test is designed to help you see what kind of worker you are.

1. This line represents the range of problem solving approaches, from intuitive to logical. Mark an X to indicate where you fall. Intuitive approaches use feelings whereas logical approaches use reasoning and logic.

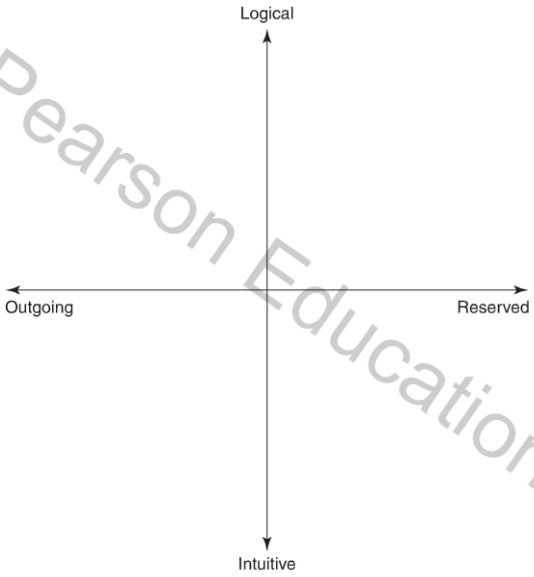


2. This line represents the range of communication styles, from outgoing to reserved. Mark an X to indicate where you fall.



We can rearrange and intersect these lines to form a two-dimensional picture.

3. Redraw the X's you drew above on the lines shown here.



4. Draw a horizontal dashed line through your X on the line for problem solving style. Draw a vertical dashed line through your X on the line for communication style. Where these dashed lines cross is your position on this graph. Draw a dot at the intersection. It is possible for this point to be on one line.

This picture is an example of the **Cartesian coordinate system**. We will return to the personality assessment and see how understanding personality types can help your group function more smoothly. First, though, we need to learn more about graphing on the Cartesian coordinate system.

Discover

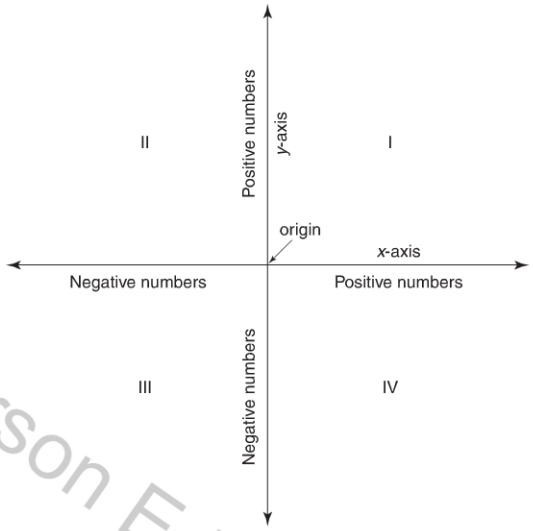
Graphs are visual ways of displaying information. The Cartesian coordinate system provides one method of graphing that is very useful for displaying mathematical information. In upcoming lessons we will learn ways to use it to help picture a situation or information.

look IT UP

Cartesian Coordinate System

The **Cartesian coordinate system** is made up of two number lines called **axes** that intersect at a right angle. The number lines increase from left to right and from bottom to top. The name "Cartesian" comes from René Descartes, who is credited with inventing this type of graphing in the 17th century.

The horizontal number line is usually called the ***x*-axis**. The vertical number line is usually called the ***y*-axis**. Their point of intersection is called the **origin**. When these lines cross, they cut the plane into four areas called **quadrants**. Roman numerals are used to label quadrants, starting in the upper right quadrant and moving counterclockwise.



Additionally, if all of the information appears in one quadrant, we can draw only that quadrant to focus the graph on what is important.

The labels *x* and *y* are arbitrary and will not always be used for the axes. The horizontal axis and the vertical axis can be denoted with other letters that have more meaning to a given situation. The axis labels are examples of **variables**.

look IT UP

Variable

A **variable** is a letter used to represent an unknown quantity and can take on various values.

For example, in the ordered pair (*x*, *y*), *x* and *y* are letters that represent numbers that can change.

Every point on the Cartesian coordinate system has a position, or an address, that is given by an **ordered pair**. Let's look more closely at reading and graphing ordered pairs.

A CLOSER LOOK

LEARN

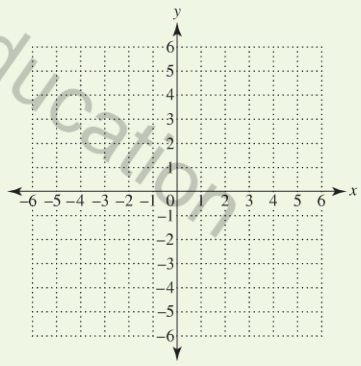
EXAMPLE 1 Ordered pairs identify the position of points on the Cartesian coordinate system. The term "ordered pair" means just what it says. A *pair* of numbers describes the point's position, and the numbers' *order* tells how to move from the _____ to this position.

For example, (2, 3) is an ordered pair. The first number describes movement from the _____ along the _____ axis. The second number describes movement from the previous ending position in the _____ direction.

In a Cartesian coordinate system made up of a horizontal x-axis and a vertical y-axis, positive numbers indicate movement _____ for x or _____ for y and negative numbers indicate movement _____ for x or _____ for y.

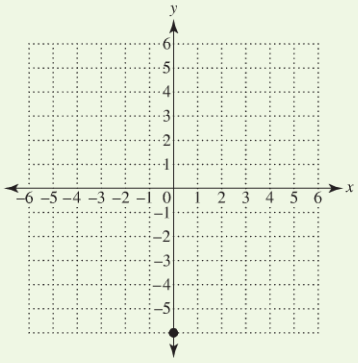
If we are working with x- and y-axes, we say the ordered pair has the form (x, y). If we are working with axes that have different names, the letter representing the horizontal axis is listed first in the ordered pair, and the vertical axis letter is listed second. For ease in this lesson, we will refer to x and y for axis labels since we are using a generic situation.

EXAMPLE 2 To plot the point (–3, 4), start at the origin, move _____ _____, and then move _____ _____ from there. At that location, draw a point.



Where is it located? List an axis or quadrant.

EXAMPLE 3 To read a point on a graph, determine the movement needed to get from the origin to the point. It is easier to think of how you would move horizontally, and then how you would move vertically, since the ordered pair is listed in that order. For the point on the graph, list its ordered pair.



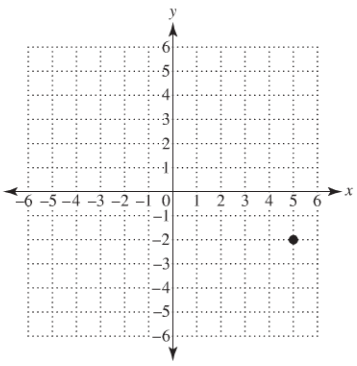
Where is it located? List an axis or quadrant.

List the ordered pair for the origin:

How it works

To plot an ordered pair:

1. Start at the origin, the intersection of the two axes.
2. Move horizontally using the first number in the pair. Positive numbers mean move right; negative numbers mean move left.
3. From the ending position in Step 2, move vertically using the second number in the pair. Positive numbers mean move up; negative numbers mean move down.
4. Draw a point at the location.

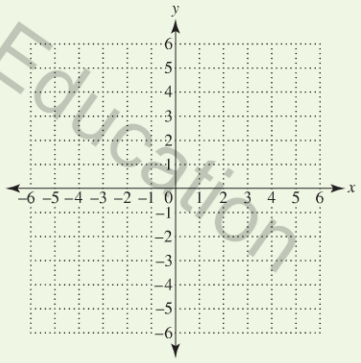


For example, we can graph the point (5, –2).
Starting from the origin, move right 5 and down 2. Draw a point.

PRACTICE

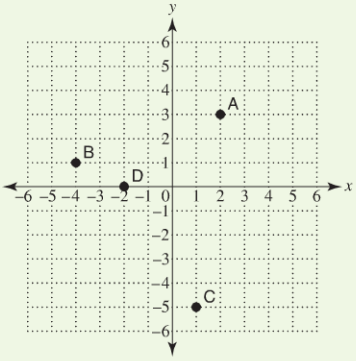
PRACTICE 1 Plot each of the following points on the graph provided. Write the letter next to the point. For each point, list which quadrant it is in or the axis it is on.

Letter	Point	Axis/Quadrant
A	(3, 4)	_____
B	(5, 1)	_____
C	(2, –4)	_____
D	(–5, –4)	_____
E	(0, 1)	_____
F	(–3, 0)	_____



PRACTICE 2 For each point on the graph provided, list its ordered pair and quadrant/axis.

Letter	Point	Axis/Quadrant
A		_____
B		_____
C		_____
D		_____



Connect

5. Look back at the *Explore* personality test. Describe the location of your point by giving a quadrant or an axis.

6. Compare your result with the results of your group members.

   a. Why might it be ideal for each quadrant from the personality test to be represented by at least one member of the group? What should you do if your group is made up of predominantly one personality type?

   b. If you see one person doing nothing or one person doing everything during your group work this semester, what should you do?

Group Guidelines

When a cycle begins and your group is formed, do the following:

1. Get contact information for each group member (first and last names, phone and cell numbers, email address).
2. Compare quadrants from the *Explore* section of this lesson to see the composition of your group.
3. Designate a "group manager" to do such things as mediate conflict, keep the group on task, pull in members who are not participating, etc.

NOTE: The group manager is not the group leader; rather, his/her role is an additional one that keeps the group on course.

Abiding by these rules will help the group function well:

1. Listen as well as talk; compromise and show respect.
2. Share group tasks in class and be accountable for out-of-class work.
3. Understand that while your group may share points on some assignments, you will not benefit from that sharing if you do not contribute equally.

STICKY note

Everyone brings something, but no one brings everything. Learning to work well within a group will do much to increase your success in this course and in the rest of your life.

lesson WRAP-UP

What's the point?

In order to make your class groups function well, you need to understand how you and your peers think and communicate. We visualized this with a graph that used the Cartesian coordinate system.

What did you learn?

How to plot and read ordered pairs
How to work successfully as a group

Cycle 1 Question: What can be learned?

Aristotle said, "The whole is greater than the sum of its parts." When you work together as a group, the collective effect is greater than what could be achieved by working alone. Nevertheless, group work can sometimes be frustrating, and students may seek instructor intervention or separation of the group. However, instructors will usually preserve the group and encourage the members to deal with their issues, as learning how to work with others is valuable in both school and the workplace.

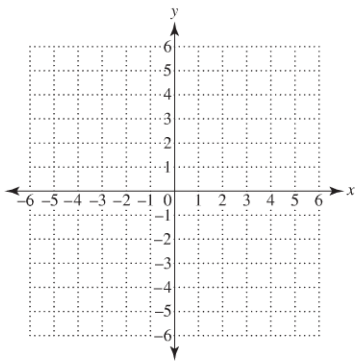
What can *you* do if you see that your group is not working well together?

1.4 Homework

Skills MyMathLab

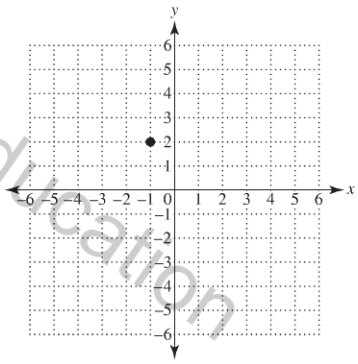
- Plot and read ordered pairs.

1. Plot (2, –1). List its location (quadrant or axis).



2. List the ordered pair of the point on the grid.

Where is it located? List the axis or quadrant.



Concepts and Applications

- Work successfully in groups.

3. Use the *Explore* personality test from this lesson to answer these questions. In each case, be descriptive in your response.

a. What does it mean to be on the positive vertical axis?

b. Negative horizontal axis?

c. At the origin?

d. Quadrant III?

4. What makes a group work well? Which personality quadrants would an ideal group have as its makeup?

5. You overhear a student in your class complaining about an instructor's use of group work. He says that working in groups at a job is nothing like working in groups in a class because employees pull their own weight, knowing they are paid to do so. Do you agree? Why or why not? What issues that appear with class-related group work also arise in the workplace?

6. In this lesson, we had individual, class, and group work, all of which will be required in most lessons. This experience may be different from those you had in past math classes since the role of lecture is smaller in this book. Some students like having fewer lectures, while others like the more direct approach that lectures provide.

With this book's approach, the group dynamic is important to your learning. However, you may leave class with some ideas not completely clear to you. What can *you* do to address this issue?

7. When a flower tries to grow, it has to push its roots through the soil. To do that, the soil has to be upturned and disrupted. How does this analogy relate to learning? What can you take away from this analogy when you are feeling confused in a class?