Geometry
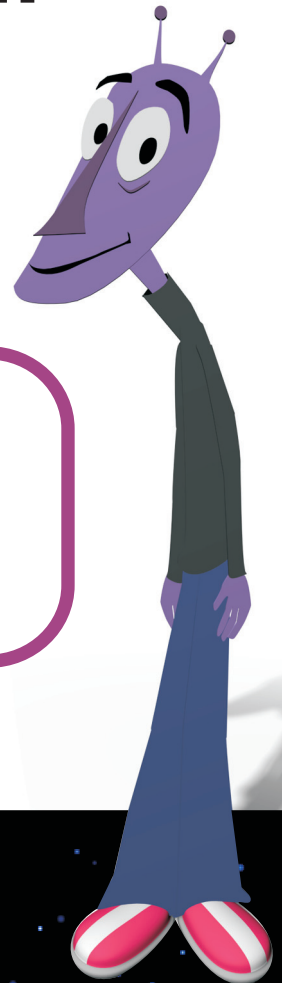
★ Module 10 ★

Coordinate Geometry and Spatial Visualization

**Lesson 2
Classifying Geometric
Figures Using Points**

Objective

♦ Plot points that form the vertices of a geometric figure and draw, identify, and classify the figure.

POWER   TALK   SEND

Prerequisites

Plotting points on a coordinate plane

Identifying, defining, and using basic geometric shapes, polygons, circles, and their properties

Classifying polygons

Vocabulary

Coordinate plane (10.1)
One-dimensional
Line (8.1)
Ray (8.1)
Line segment (8.1)
Infinite (3.1)
Origin (10.1)
Two-dimensional (9.1)
Circle (9.3)
Radius (9.3)
Polygon (9.1)
Quadrilateral (9.1)
Square (9.2)
Rectangle (9.2)
Rhombus (9.2)
Parallelogram (9.2)
Pentagon (9.1)
Regular polygon (9.1)
Trapezoid (9.2)
Right triangle (8.4)
Scalene triangle (8.4)
Hypotenuse (8.7)
Pythagorean Theorem (8.7)

Get Started

- Review classifying triangles by having volunteers go to the board. Each student will draw a triangle and will write its classification underneath it. Continue until exactly one of each of the following is represented: *isosceles right, isosceles acute, isosceles obtuse, equilateral, scalene right, scalene acute, scalene obtuse.*

- Review quadrilaterals by writing the following words across the board and having students draw several correct figures underneath each one: *quadrilateral, parallelogram, rectangle, rhombus, square, trapezoid.*

- Encourage students to draw as many different possibilities as they can. For instance, a square can appear in the rectangle list, as well as the rhombus, square, parallelogram, and quadrilateral lists.

10.2A

Expand Their Horizons

In this subtopic, students graph lines, rays, and line segments on a coordinate plane. To graph a line given two points, plot the two points and connect them. Be sure to draw arrows at each end to indicate that it is a line. To graph a line segment given its endpoints, plot and connect the points. To graph a ray, plot the endpoint and any other point on the ray. Draw a line from the endpoint through the other point. Again, be sure to use an arrow to indicate the one direction that continues without end.

After graphing a line, ray, or segment, ask students to name other points on each figure. This will reinforce their skills with using the coordinate plane.

1 Plot both endpoints and connect them with a straight line. Because it is a segment, do not draw any arrows.

2 Plot both points and draw a straight line through them. Add arrows to both ends of the line.

3 Plot both points. Because (2, 5) is an endpoint, draw a line that starts there and then passes through (-1, 2). Use an arrow on this end to show it continues without end.

Additional Examples

1. **Graph the line segment whose endpoints are the origin and (5, -4).**
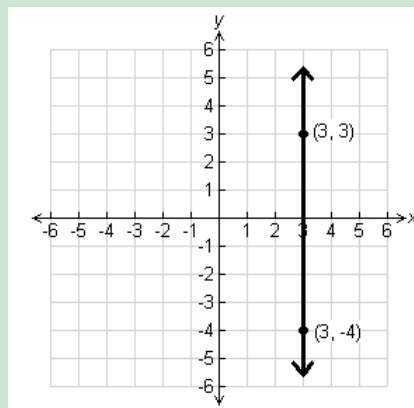
   Plot points at (0, 0) and (5, -4). Connect the points.
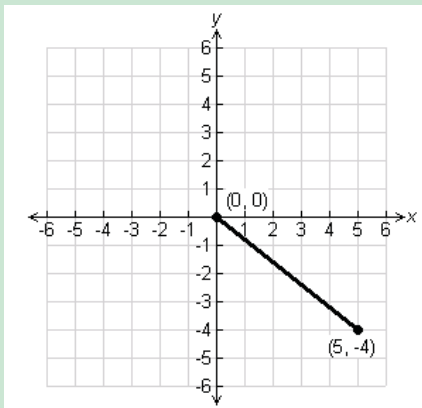
2. **Graph any line that passes through Quadrants I and IV only. Label two points on the line.**

   To be sure the line never passes through the other quadrants, the line must be a vertical line.

   Possible answer:

Expand Their Horizons

In this subtopic, students graph circles and polygons in the coordinate plane. To graph a circle, first plot the center point. Then, sketch a circle based on the given radius. It is usually helpful to locate the four points directly above, below, and to either side of the center point, and then sketch the circle that contains them. Students can also use a compass to sketch a circle by opening the compass to the length of the given radius. Remind students that the center point is not part of the circle itself.

Students also plot vertices of polygons in the plane and then classify the polygon. Use the Get Started activity to review polygons and their classifications.

Common Error Alert:

Students may classify a polygon just by "eyeballing" it. Have students count squares to find actual side lengths and use given facts, such as: *The hypotenuse of a right triangle is always the longest side.*

4 The figure has five vertices and five sides. The polygon is a pentagon. It is not a regular pentagon because the sides and angles are not all congruent.

5 The figure is a quadrilateral because it has four sides. The top and bottom sides are parallel because they are both horizontal lines. The other pair of sides is not parallel. The figure is also a trapezoid.

6 The legs of the right triangle are not congruent. The hypotenuse is longer than either of the legs. The figure is a right scalene triangle.

1. **Three vertices of a square are (-8, -5), (-3, -5), and (-8, 0). What are the coordinates of the fourth vertex?**

   Connect the vertices to form two sides of a square. Count to find the lengths of the sides: five. Count right five units from (-8, 0) and up five units from (-3, -5) to find the fourth vertex: (-3, 0).
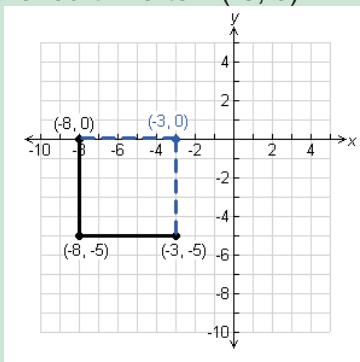
2. **A triangle has vertices at (-4, 1), (0, 6), and (5, 6). Classify the triangle by its angle measures.**

   The triangle has one obtuse angle, making it an obtuse triangle.
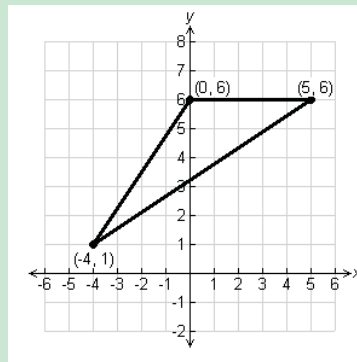
Look Beyond

In the next lesson, students will verify that lines on a coordinate plane are parallel or perpendicular, even when they are not horizontal or vertical. They will do this by finding the slope of each line. Parallel lines have the same slope. The slopes of perpendicular lines are opposite reciprocals. Students will also use the Pythagorean Theorem to find lengths of segments that are neither horizontal nor vertical.

In more advanced classes, students will work with directed segments called vectors. Vectors can be represented by ordered pairs on a coordinate plane.

Connections

Police and investigators plot and connect points on maps overlaid by a grid. The vertices may be locations of crimes or other places of interest. The police chief may then add more police to patrol the streets that are inside the given area, or they may draw a circle around a point where an explosion occurred, establishing the perimeter of the area that is to be evacuated.