Polygons in the Coordinate Plane

Unit 6 Lesson 7

POLYGONS IN THE COORDINATE PLANE

Students will be able to:

Classify a polygon in the coordinate plane by determining the sides lengths and slopes

Key Vocabulary:

- Distance, Slope and Midpoint
- Triangles
- Quadrilaterals

Re-calling Formulas

- Distance between two points (x_1, y_1) and (x_2, y_2)

$$\sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

- Slope formula given two points

$$\frac{y_2 - y_1}{x_2 - x_1}$$

- Midpoint of two points of a line or a line segment

$$\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

Classification of Triangles

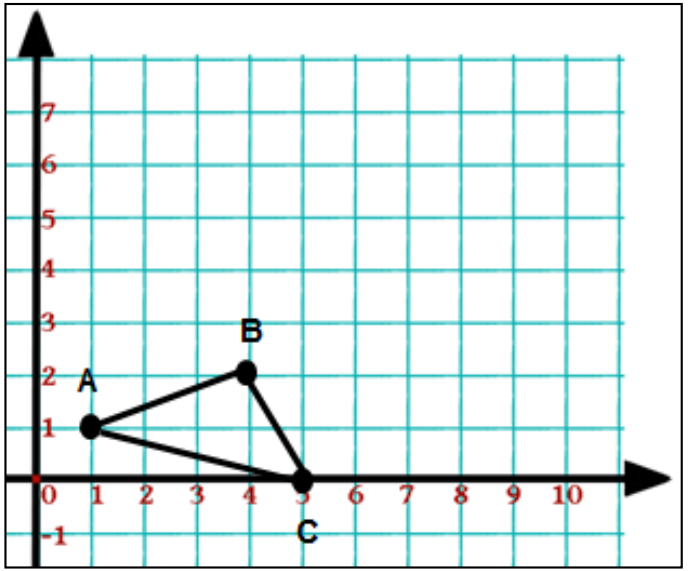
The classification of triangles based on **angles** is:

Acute	All three angles are less than 90°
Obtuse	One of the angles is greater than 90°
Right	One of the angles is equal to 90°

The classification of triangles based on **sides** is:

Scalene	All three sides are of different length
Isosceles	Two sides are of same length
Equilateral	All three sides are of same length

Problem 1: Classify the triangle shown in the figure below.



$A(1,1)$ $B(4,2)$ $C(5,0)$

$\overline{AB} = \sqrt{(4-1)^2+(2-1)^2} = \sqrt{9+1} = \sqrt{10}$

$\overline{BC} = \sqrt{(5-4)^2+(0-2)^2} = \sqrt{1+4} = \sqrt{5}$

$\overline{AC} = \sqrt{(5-1)^2+(0-1)^2} = \sqrt{16+1} = \sqrt{17}$

$\overline{AB} \neq \overline{BC} \neq \overline{AC}$ → Triangle is scalene

POLYGONS IN THE COORDINATE PLANE

Classification of Quadrilaterals

- Parallelogram

  The opposite sides are parallel and have same slopes

- Rectangle

  The diagonals are of same length

- Square

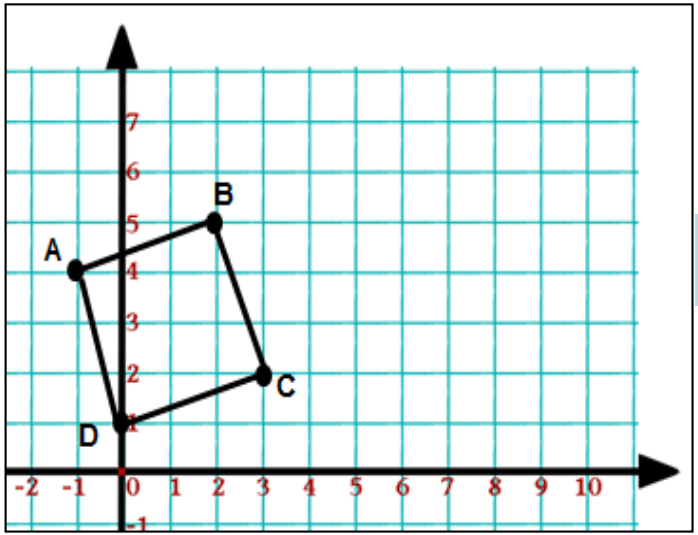
  The sides are perpendicular and all the sides are of equal length

- Rhombus

  The slopes of diagonals are negative reciprocal of each other and all the sides are of equal length

Problem 2: Classify the quadrilateral shown in the figure below.

$A(-1,4)$ $B(2,5)$ $C(3,2)$ $D(0,1)$



$\overline{AB} = \sqrt{(2+1)^2+(5-4)^2} = \sqrt{9+1} = \sqrt{10}$

$\overline{BC} = \sqrt{(3-2)^2+(2-5)^2} = \sqrt{1+9} = \sqrt{10}$

$\overline{CD} = \sqrt{(0-3)^2+(1-2)^2} = \sqrt{9+1} = \sqrt{10}$

$\overline{DA} = \sqrt{(0+1)^2+(1-4)^2} = \sqrt{1+9} = \sqrt{10}$

Slope of $\overline{AB} = \frac{1}{3}$

Slope of $\overline{AD} = \frac{-3}{1}$

$\overline{AB} = \overline{BC} = \overline{CD} = \overline{DA}$

$\frac{1}{3} \times \frac{-3}{1} = -1$

Quadrilateral is a square