Date: 9/30/20

Lesson 1.4 Perimeter and Area in the Coordinate Plane

Learning Intent (Target): *Today I will* be able to describe and determine the perimeter and area of polygons in the coordinate plane.

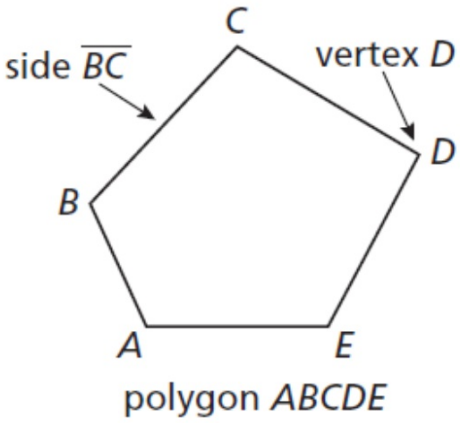
Success Criteria: *I'll know I'll have it when* I'll be able to use the formulas to solve and prove the area and perimeter of polygons while applying the distance formula.

Accountable Team Task: *Therefore, I can* practice using formulas from interactive flip charts and apply it to problem solving.

Core Concept

Polygons

In geometry, a figure that lies in a plane is called a plane figure. Recall that a *polygon* is a closed plane figure formed by three or more line segments called *sides*. Each side intersects exactly two sides, one at each *vertex*, so that no two sides with a common vertex are collinear. You can name a polygon by listing the vertices in consecutive order.

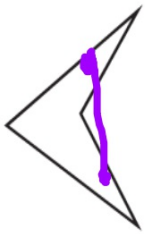


polygon *ABCDE*

Vocabulary: Polygon, Convex, Concave

https://www.mathsisfun.com/definitions/index.html

Classify each polygon by the number of sides. Tell whether it is *convex* or *concave*.

a. 

b. 

SOLUTION

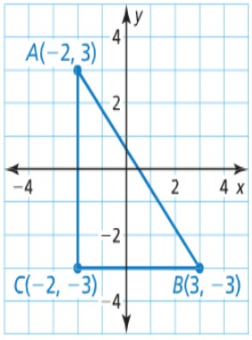
a. The polygon has four sides. So, it is a quadrilateral. The polygon is concave.

b. The polygon has six sides. So, it is a hexagon. The polygon is convex.

Find the perimeter of $\triangle ABC$ with vertices $A(-2, 3)$, $B(3, -3)$, and $C(-2, -3)$.

SOLUTION

Step 1 Draw the triangle in a coordinate plane. Then find the length of each side.



Side $\overline{AB}$

$$AB = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$ Distance Formula

$$= \sqrt{[3 - (-2)]^2 + (-3 - 3)^2}$$ Substitute.

$$= \sqrt{5^2 + (-6)^2}$$ Subtract.

$$= \sqrt{61}$$ Simplify.

$$\approx 7.81$$ Use a calculator.

Side $\overline{BC}$

$$BC = |-2 - 3| = 5$$ Ruler Postulate (Postulate 1.1)

Side $\overline{CA}$

$$CA = |3 - (-3)| = 6$$ Ruler Postulate (Postulate 1.1)

Step 2 Find the sum of the side lengths.

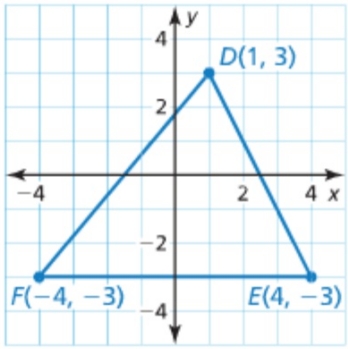
$$AB + BC + CA \approx 7.81 + 5 + 6 = 18.81$$

▶ So, the perimeter of $\triangle ABC$ is about 18.81 units.

Find the area of $\triangle DEF$ with vertices $D(1, 3)$, $E(4, -3)$, and $F(-4, -3)$.

SOLUTION

Step 1 Draw the triangle in a coordinate plane by plotting the vertices and connecting them.



Step 2 Find the lengths of the base and height.

Base

The base is $\overline{FE}$. Use the Ruler Postulate (Postulate 1.1) to find the length of $\overline{FE}$.

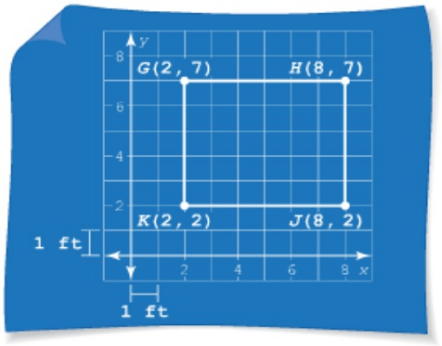
$$FE = |4 - (-4)| \qquad \text{Ruler Postulate (Postulate 1.1)}$$

$$= |8| \qquad \text{Subtract.}$$

$$= 8 \qquad \text{Simplify.}$$

So, the length of the base is 8 units.

You are building a shed in your backyard. The diagram shows the four vertices of the shed. Each unit in the coordinate plane represents 1 foot. Find the area of the floor of the shed.



SOLUTION

1. **Understand the Problem** You are given the coordinates of a shed. You need to find the area of the floor of the shed.

2. **Make a Plan** The shed is rectangular, so use the coordinates to find the length and width of the shed. Then use a formula to find the area.

3. **Solve the Problem**

   Step 1 Find the length and width.

   Length $GH = |8 - 2| = 6$ Ruler Postulate (Postulate 1.1)

   Width $GK = |7 - 2| = 5$ Ruler Postulate (Postulate 1.1)

   The shed has a length of 6 feet and a width of 5 feet.

   Step 2 Substitute the values for the length and width into the formula for the area of a rectangle.

   $A = \ell w$ Write the formula for area of a rectangle.

   $= (6)(5)$ Substitute.

   $= 30$ Multiply.

   ▶ So, the area of the floor of the shed is 30 square feet.

4. **Look Back** Make sure your answer makes sense in the context of the problem. Because you are finding an area, your answer should be in square units. An answer of 30 square feet makes sense in the context of the problem. ✓