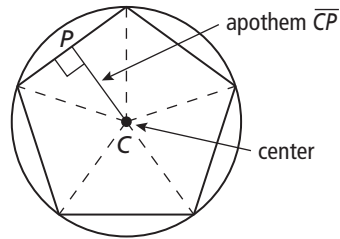Name _____ Date _____

Areas of Polygons
For use with Exploration 11.3

Essential Question   How can you find the area of a regular polygon?

The **center of a regular polygon** is the center of its circumscribed circle.

The distance from the center to any side of a regular polygon is called the **apothem of a regular polygon**.
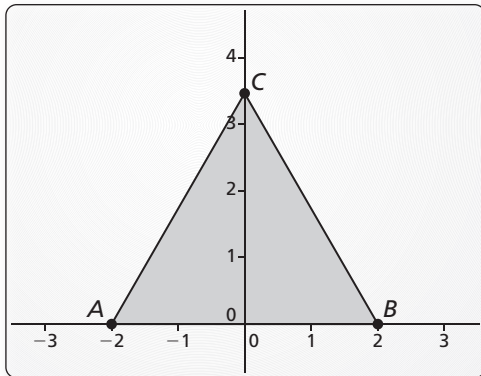
apothem $\overline{CP}$
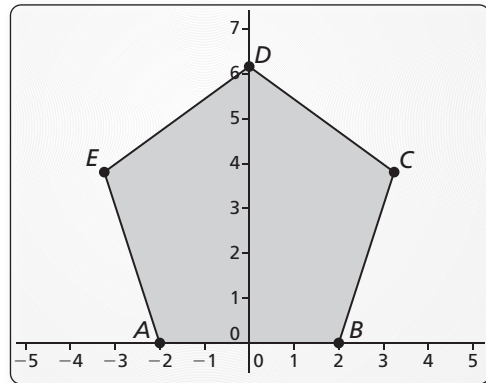
center

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1 **EXPLORATION:** Finding the Area of a Regular Polygon

Go to *BigIdeasMath.com* for an interactive tool to investigate this exploration.

Work with a partner. Use dynamic geometry software to construct each regular polygon with side lengths of 4, as shown. Find the apothem and use it to find the area of the polygon. Describe the steps that you used.
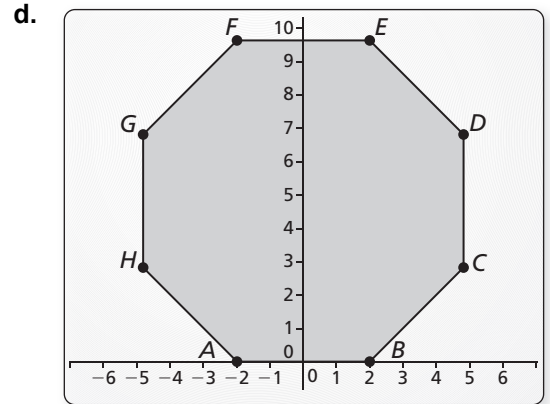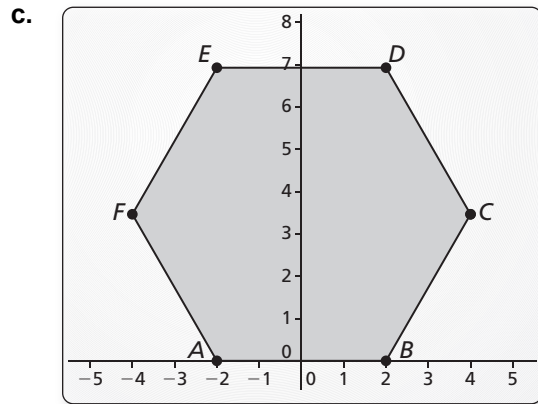
a.

b.

11.3 Areas of Polygons (continued)

1 EXPLORATION: Finding the Area of a Regular Polygon (continued)

c.

d.

2 EXPLORATION: Writing a Formula for Area

Work with a partner. Generalize the steps you used in Exploration 1 to develop a formula for the area of a regular polygon.

Communicate Your Answer

3. How can you find the area of a regular polygon?

4. Regular pentagon *ABCDE* has side lengths of 6 meters and an apothem of approximately 4.13 meters. Find the area of *ABCDE*.

11.3 Notetaking with Vocabulary
For use after Lesson 11.3

In your own words, write the meaning of each vocabulary term.
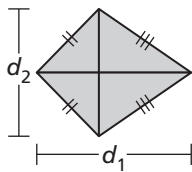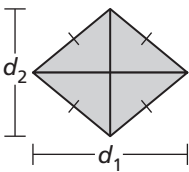
center of a regular polygon

radius of a regular polygon

apothem of a regular polygon

central angle of a regular polygon

Core Concepts

Area of a Rhombus or Kite

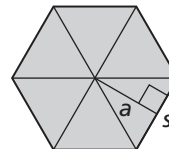The area of a rhombus or kite with diagonals d_1 and d_2 is $\frac{1}{2}d_1d_2$.

Notes:

11.3 Notetaking with Vocabulary (continued)

Area of a Regular Polygon

The area of a regular *n*-gon with side length *s* is one-half the product of the apothem *a* and the perimeter *P*.

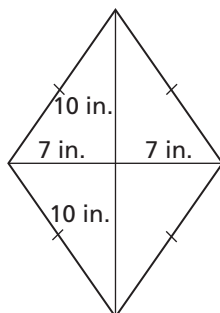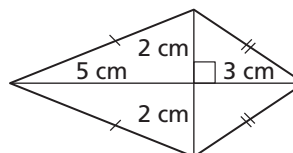$$A = \frac{1}{2}aP, \text{ or } A = \frac{1}{2}a \cdot ns$$

Notes:

Extra Practice

In Exercises 1 and 2, find the area of the kite or rhombus.

1.

10 in.

7 in.   7 in.

10 in.

2.

2 cm

5 cm   3 cm

2 cm

11.3 **Notetaking with Vocabulary** (continued)

3. Find the measure of a central angle of a regular polygon with 8 sides.

4. The central angles of a regular polygon are 40°. How many sides does the polygon have?

5. A regular pentagon has a radius of 4 inches and a side length of 3 inches.

    a. Find the apothem of the pentagon.

    b. Find the area of the pentagon.

6. A regular hexagon has an apothem of 10 units.

    a. Find the radius of the hexagon and the length of one side.

    b. Find the area of the hexagon.