Lesson 5-4 · Session 1

Area of Regular Polygons

Name _____ Date _____ Period _____

Maryland Standard 6.GR.1 · Learning target — I can find the area of a regular polygon by finding the area of one triangle and multiplying.

Use the given rounded heights to estimate areas. Mark estimated answers with ≈.
Show a model, calculation, or explanation. Answer every part and label units when needed.

Exercises 1–12 earn 1 point for a correct response and 1 for supporting work. Spiral Review and Test Practice earn 1 point each.

Learn from a model

REMEMBER

- Area of a regular polygon = 1/2 x perimeter x apothem (the distance from the center to the middle of a side).
- First find the perimeter, then multiply by the apothem, then divide by 2.
- Watch out — a regular polygon has equal sides and equal angles, so all its triangles match.
- Check it — the number of triangles always equals the number of sides.

WORKED EXAMPLE

Area of a Regular Polygon A regular octagon has sides of 12 in. A triangle drawn from the center to one side has an approximate height of 14.5 in. Estimate the area.

Step 1 A regular octagon has eight equal sides, so it decomposes into eight congruent triangles.

Step 2 Find the area of ONE triangle. ½ × 12 × 14.5 = 87

Step 3 Every triangle matches, so multiply by how many there are. 87 × 8 = 696

Answer The estimated area is 696 square inches (696 in²).

Practice

1. A regular hexagon has a side length of 6 cm (perimeter 36 cm) and an approximate apothem of 5.2 cm. Find its area.

Answer _____

SHOW YOUR THINKING

2. A regular pentagon has a perimeter of 40 in and an approximate apothem of 5.5 in. Find its area.

Answer _____

SHOW YOUR THINKING

3. Why do you need the apothem (not just the side length) to find the area of a regular polygon?

Answer _____

Extra practice (not scored). Find each perimeter in parts a–c. In part d, use the supplied perimeter and apothem.

a. regular hexagon, sides of 8 cm perimeter _____ cm

b. regular pentagon, sides of 9 in. perimeter _____ in.

c. regular octagon, sides of 5 m perimeter _____ m

d. perimeter 48 cm, apothem 6 cm: area ≈ ½ × 48 × 6 = _____ cm²

Answer _____

EXPLAIN WITH MATHEMATICAL EVIDENCE

4. Gazebo Deck. A gazebo deck is a regular hexagon with sides of 12 ft and an approximate apothem of 10 ft. Find its area.

Answer _____

SHOW YOUR THINKING

5. Sign Face. A regular octagon sign has sides of 9 in. and an approximate apothem of 11 in. Find its area.

Answer _____

SHOW YOUR THINKING

6. Tile Pattern. A floor tile is a regular pentagon with sides of 14 cm and an approximate apothem of 10 cm. Find its area.

Answer _____

SHOW YOUR THINKING

7. A regular hexagon has sides of 10 m and an approximate apothem of 8.7 m. Malik found one center triangle, ½ × 10 × 8.7 = 43.5 m², and stopped. Explain what he still has to do, then find the hexagon's area.

Answer _____

EXPLAIN WITH MATHEMATICAL EVIDENCE

8. A regular pentagon has sides of 10 in. and a triangle height of 6.9 in. Find its area.

Answer _____ in²

SHOW YOUR THINKING

9. A regular hexagon has sides of 12 cm and a triangle height of 10.4 cm. Find its area.

Answer _____ cm²

SHOW YOUR THINKING

10. Work Backward. A regular octagon has an area of 480 m². Find the area of one of its 8 identical triangles.

Answer _____ m²

SHOW YOUR THINKING

11. Find the Mistake. For a regular hexagon with triangle area 15 cm², Tia multiplied by 10 because the side is 10 cm. Explain the mistake.

Answer _____ the mistake and the area

EXPLAIN WITH MATHEMATICAL EVIDENCE

12. Mosaic Border. A regular octagon tile has sides of 6 in. and a triangle height of 7.2 in. Find the area of one tile, then the area of 12 tiles.

Answer _____ one tile, then twelve

SHOW YOUR THINKING

Spiral review

13. From Lesson 5-3 Session 2. A trapezoid has bases 8 m and 14 m and height 5 m. Find its area.

Answer _____

SHOW YOUR THINKING

14. From Lesson 5-1 Session 2. A rhombus has diagonals of 14 in. and 6 in. Find its area.

Answer _____

SHOW YOUR THINKING

15. From Lesson 4-1 Session 1. Write 17 out of 20 as a percent.

Answer _____

SHOW YOUR THINKING

Test practice

16. A regular pentagon splits into how many triangles?

□ A. 5	□ B. 3
□ C. 6	□ D. 10

17. One triangle of area 9 m² in a regular hexagon gives a hexagon area of —

□ A. 9 m²	□ B. 54 m²
□ C. 18 m²	□ D. 36 m²

18. A regular polygon has all sides —

□ A. curved	□ B. different
□ C. equal	□ D. parallel

Check and revise

CHECK YOUR MATHEMATICS	HOW DID IT GO?
Use the apothem, not the distance from the center to a vertex, as the triangle height. Every part answered / Work shown / Units labeled when needed	I can do this: Independently / With a hint / With help Question to revisit: _____

One correction or question I want to discuss: _____

Check each labeled measure and required face or region. Use square units for area and cubic units for volume.