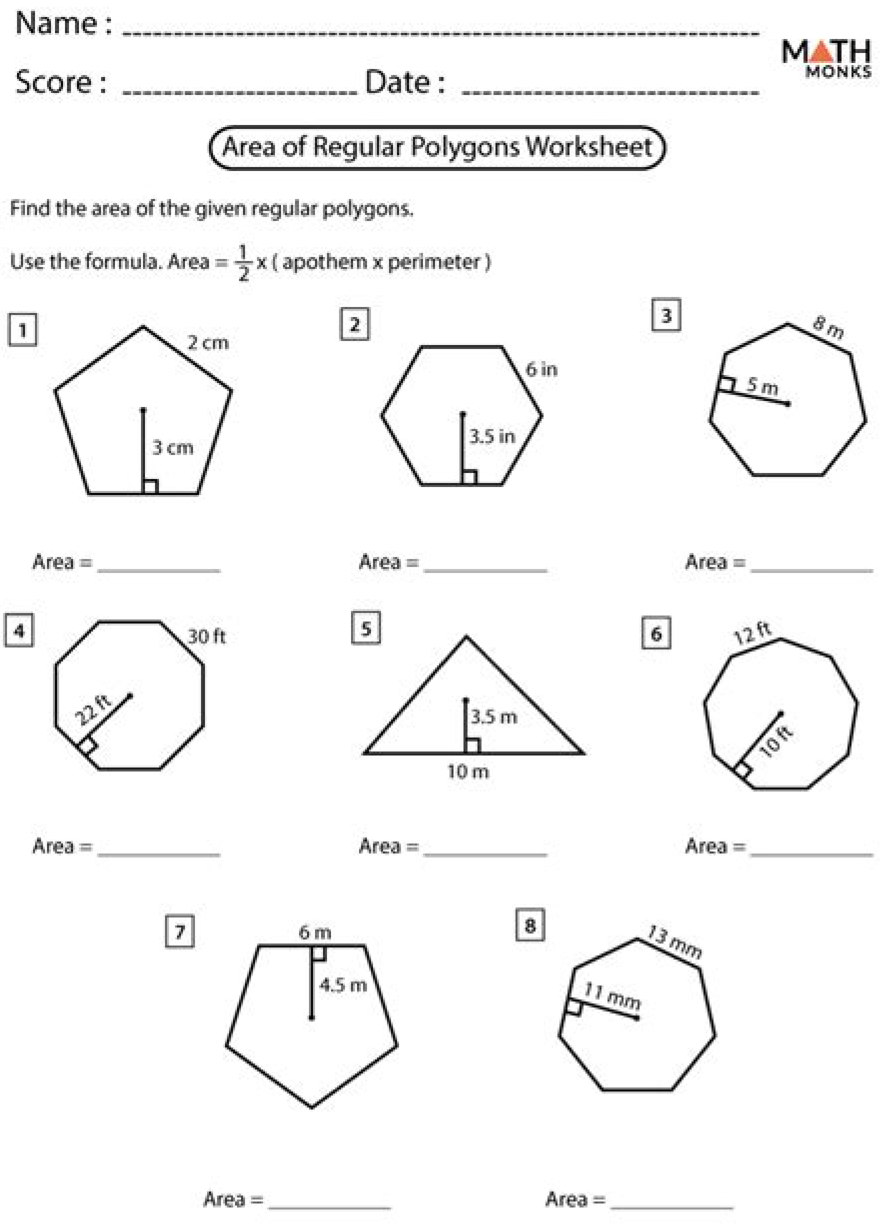
Area Of Regular Polygons Worksheet With Answers



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MATH MONKS

Area of Regular Polygons Worksheet

Find the area of the given regular polygons.

Use the formula. Area = $\frac{1}{2}$ x (apothem x perimeter)

1 2 cm, 3 cm

Area = ________

2 6 in, 3.5 in

Area = ________

3 8 m, 5 m

Area = ________

4 30 ft, 22 ft

Area = ________

5 3.5 m, 10 m

Area = ________

6 12 ft, 10 ft

Area = ________

7 6 m, 4.5 m

Area = ________

8 13 mm, 11 mm

Area = ________

Area of Regular Polygons Worksheet with Answers is a valuable educational resource designed to enhance the understanding of geometric concepts among students. Regular polygons are shapes with equal sides and angles, such as triangles, squares, pentagons, hexagons, and so on. This article will cover the essential aspects of calculating the area of regular polygons, provide a comprehensive worksheet, and include answers for self-assessment.

Understanding Regular Polygons

Regular polygons are defined by their symmetry and equal side lengths. The most common regular polygons include:

1. Equilateral Triangle: A three-sided figure with all sides equal.
2. Square: A four-sided figure with equal sides and four right angles.
3. Regular Pentagon: A five-sided figure with equal sides.
4. Regular Hexagon: A six-sided figure with equal sides.
5. Regular Octagon: An eight-sided figure with equal sides.

Key Properties of Regular Polygons

- Equal Side Lengths: All sides of a regular polygon are of equal length.
- Equal Angles: All interior angles are equal in measure.
- Symmetry: Regular polygons exhibit rotational and reflective symmetry.
- Central Angle: The angle subtended at the center of the polygon by each side.

Formulas for Area Calculation

Calculating the area of regular polygons involves specific formulas based on the number of sides and the length of the sides. Below are the area formulas for common regular polygons:

1. Equilateral Triangle:
\[
\text{Area} = \frac{\sqrt{3}}{4} s^2
\]
Where \(s\) is the length of a side.

2. Square:
\[
\text{Area} = s^2
\]
Where \(s\) is the length of a side.

3. Regular Pentagon:
\[
\text{Area} = \frac{1}{4} \sqrt{5(5 + 2\sqrt{5})} s^2
\]
Where \(s\) is the length of a side.

4. Regular Hexagon:
\[
\text{Area} = \frac{3\sqrt{3}}{2} s^2
\]
Where \(s\) is the length of a side.

5. Regular Octagon:
\[
\text{Area} = 2(1 + \sqrt{2}) s^2
\]
Where \(s\) is the length of a side.

Area of Regular Polygons Worksheet

Below is a worksheet designed to help students practice calculating the area of various regular polygons. Each question will require students to apply the appropriate formulas.

Worksheet: Area of Regular Polygons

1. Equilateral Triangle: Calculate the area of an equilateral triangle with a side length of 6 cm.

2. Square: Find the area of a square with a side length of 5 m.

3. Regular Pentagon: Determine the area of a regular pentagon with a side length of 4.5 inches.

4. Regular Hexagon: What is the area of a regular hexagon with a side length of 3.5 feet?

5. Regular Octagon: Calculate the area of a regular octagon with a side length of 2.5 cm.

6. Challenge Question: A regular dodecagon (12-sided polygon) has a side length of 2 cm. Using the formula:
\[
\text{Area} = 3 \times (2 + \sqrt{3}) s^2
\]
Find the area.

Answers to the Worksheet

1. Equilateral Triangle:
\[
\text{Area} = \frac{\sqrt{3}}{4} (6)^2 = \frac{\sqrt{3}}{4} \times 36 = 9\sqrt{3} \approx 15.59 \text{ cm}^2
\]

2. Square:
\[
\text{Area} = (5)^2 = 25 \text{ m}^2
\]

3. Regular Pentagon:
\[
\text{Area} = \frac{1}{4} \sqrt{5(5 + 2\sqrt{5})} (4.5)^2

\]
\[
\approx \frac{1}{4} \sqrt{5(5 + 4.472)} (20.25) \approx 27.53 \text{ in}^2
\]

4. Regular Hexagon:
\[
\text{Area} = \frac{3\sqrt{3}}{2} (3.5)^2 = \frac{3\sqrt{3}}{2} \times 12.25 \approx 31.49 \text{ ft}^2
\]

5. Regular Octagon:
\[
\text{Area} = 2(1 + \sqrt{2}) (2.5)^2
\]
\[
\approx 2(1 + 1.414) \times 6.25 \approx 31.25 \text{ cm}^2
\]

6. Challenge Question:
\[
\text{Area} = 3 \times (2 + \sqrt{3}) (2)^2 = 3 \times (2 + 1.732) \times 4 \approx 3 \times 3.732 \times 4 \approx 44.78 \text{ cm}^2
\]

Conclusion

The area of regular polygons worksheet with answers serves as a practical tool for students aiming to strengthen their understanding of geometry. By practicing area calculations for different regular polygons, students can enhance their problem-solving skills and develop a deeper appreciation for the subject. It is essential to understand the formulas and apply them correctly, as this knowledge will be foundational for more advanced mathematical concepts. Regular polygons not only appear in mathematics but also in real-world applications, architecture, and art, making them an exciting topic for exploration.

Frequently Asked Questions

What is the formula to calculate the area of a regular polygon?

The area A of a regular polygon can be calculated using the formula A = (1/2) Perimeter Apothem.

How do you find the apothem of a regular hexagon?

The apothem of a regular hexagon can be found using the formula a = s / (2 tan(π/6)), where s is the length of a side.

How can I use a worksheet to practice finding the area of regular polygons?

You can use worksheets that provide various regular polygons with given side lengths or apothems, allowing you to practice calculating their areas using the appropriate formulas.

What is the area of a regular pentagon with a side length of 6 units?

The area of a regular pentagon can be calculated using $A = (5/4) s^2 (1/\tan(\pi/5))$. For $s = 6$, the area is approximately 61.94 square units.

Why is it important to learn about the area of regular polygons?

Understanding the area of regular polygons is essential in geometry and real-world applications, such as architecture, design, and spatial reasoning.

Can I find the area of a regular polygon if I only know the perimeter?

Yes, you can find the area if you also know the apothem. Use the formula A = (1/2) Perimeter Apothem.

What types of problems can I expect on an area of regular polygons worksheet?

Problems may include calculating the area of various regular polygons, finding side lengths or apothems given the area, and solving real-life application problems involving regular polygons.

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