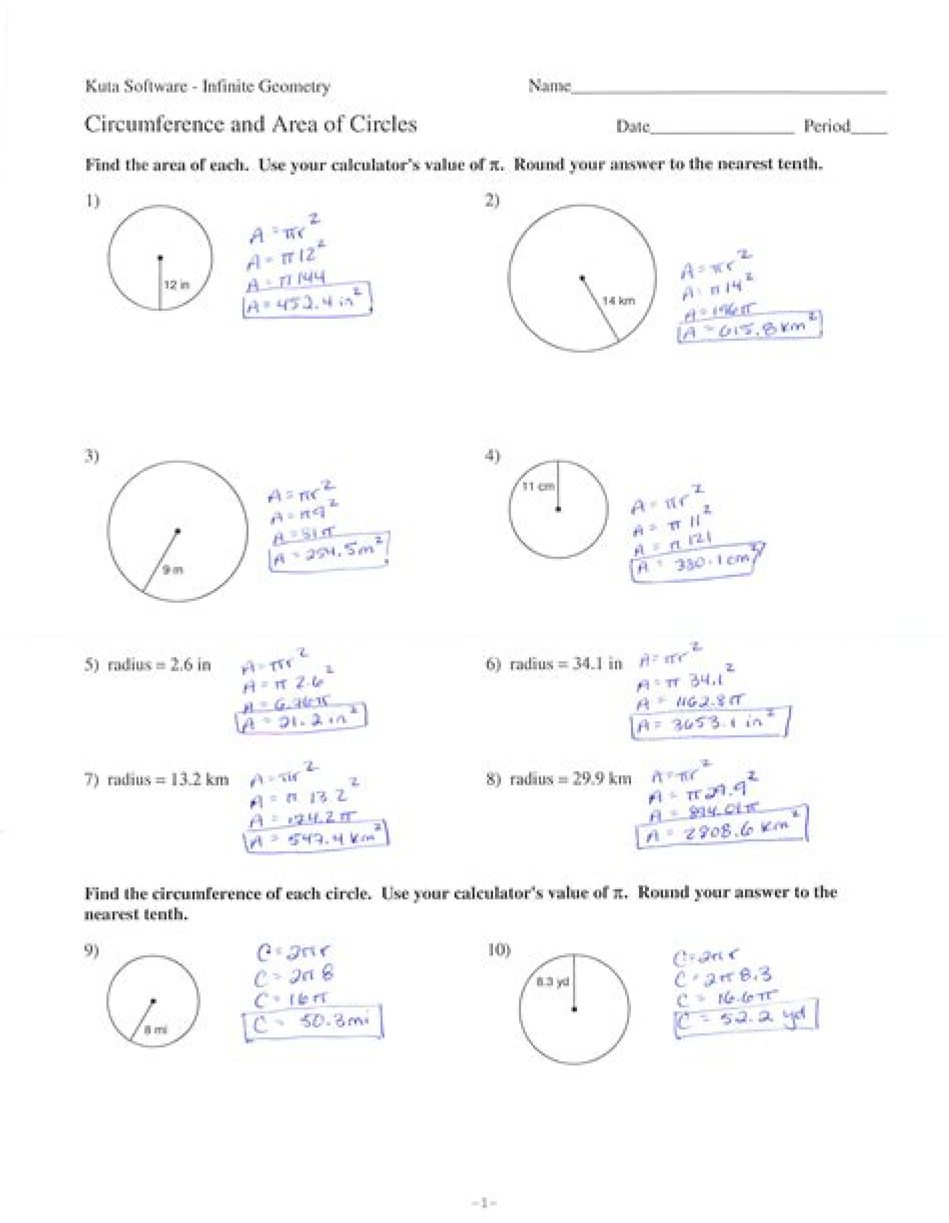
Area Of A Circle Answer Key



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Name______________________________

Circumference and Area of Circles

Date________________ Period____

Find the area of each. Use your calculator's value of π. Round your answer to the nearest tenth.

1)
$A = \pi r^2$
$A = \pi 12^2$
$A = \pi 144$
$\boxed{A = 452.4\ in^2}$

2)
$A = \pi r^2$
$A = \pi 14^2$
$A = 196\pi$
$\boxed{A = 615.8\ km^2}$

3)
$A = \pi r^2$
$A = \pi 9^2$
$A = 81\pi$
$\boxed{A = 254.5\ m^2}$

4)
$A = \pi r^2$
$A = \pi 11^2$
$A = \pi 121$
$\boxed{A = 380.1\ cm^2}$

5) radius = 2.6 in
$A = \pi r^2$
$A = \pi 2.6^2$
$A = 6.76\pi$
$\boxed{A = 21.2\ in^2}$

6) radius = 34.1 in
$A = \pi r^2$
$A = \pi 34.1^2$
$A = 1162.8\pi$
$\boxed{A = 3653.1\ in^2}$

7) radius = 13.2 km
$A = \pi r^2$
$A = \pi 13.2^2$
$A = 174.2\pi$
$\boxed{A = 547.4\ km^2}$

8) radius = 29.9 km
$A = \pi r^2$
$A = \pi 29.9^2$
$A = 894.01\pi$
$\boxed{A = 2808.6\ km^2}$

Find the circumference of each circle. Use your calculator's value of π. Round your answer to the nearest tenth.

9)
$C = 2\pi r$
$C = 2\pi 8$
$C = 16\pi$
$\boxed{C = 50.3\ mi}$

10)
$C = 2\pi r$
$C = 2\pi 8.3$
$C = 16.6\pi$
$\boxed{C = 52.2\ yd}$

-1-

Area of a Circle Answer Key

Understanding the area of a circle is essential in various fields, including geometry, physics, engineering, and everyday applications. This article will provide a comprehensive guide to calculating the area of a circle, including formulas, derivations, examples, and common applications. Whether you are a student, teacher, or simply someone interested in mathematics, this article will serve as a valuable resource to enhance your knowledge of this fundamental concept.

What is a Circle?

A circle is defined as a two-dimensional shape consisting of all points that are equidistant from a fixed point known as the center. The distance from the center to any point on the circle is called the radius. The diameter, another crucial term in circle geometry, is twice the radius and represents the distance across the circle through its center.

Key Terms

- Radius (r): The distance from the center of the circle to any point on its circumference.
- Diameter (d): The distance across the circle, passing through the center, equal to twice the radius ($d = 2r$).
- Circumference (C): The distance around the circle, calculated using the formula $C = 2\pi r$ or $C = \pi d$.
- Area (A): The total space contained within the circle.

Formula for the Area of a Circle

The area of a circle can be calculated using the following formula:

$$
A = \pi r^2
$$

Where:
- A = Area
- π (Pi) = A mathematical constant approximately equal to 3.14159
- r = Radius of the circle

This formula indicates that the area is directly proportional to the square of the radius. As the radius increases, the area increases exponentially.

Derivation of the Area Formula

The derivation of the area formula can be approached through several methods, including geometric reasoning and calculus. Here's a simplified geometric interpretation:

1. Inscribing a Polygon: Imagine inscribing a regular polygon (e.g., a hexagon) within a circle. As the number of sides of the polygon increases, it more closely approximates the circle.
2. Dividing into Triangles: Each segment of the polygon can be divided into triangles, with the circle's center as a common vertex.
3. Calculating Area: The area of each triangle can be calculated using the formula $\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$. As the number of triangles increases, the total area approaches that of the circle.
4. Limit Process: The limit of the area of these triangles as the number of sides approaches infinity results in the area formula $A = \pi r^2$.

Calculating the Area: Step-by-Step Examples

Let's explore some practical examples of calculating the area of a circle using the formula $A = \pi r^2$.

Example 1: Basic Calculation

Problem: Find the area of a circle with a radius of 5 cm.

Solution:
1. Identify the radius (r): 5 cm.
2. Apply the area formula:

$$
A = \pi(5)^2 = \pi(25) \approx 78.54 \text{ cm}^2
$$

Thus, the area of the circle is approximately 78.54 cm^2.

Example 2: Using Diameter

Problem: Find the area of a circle with a diameter of 10 m.

Solution:
1. First, calculate the radius:
$$
r = \frac{d}{2} = \frac{10}{2} = 5 \text{ m}
$$
2. Apply the area formula:
$$
A = \pi(5)^2 = \pi(25) \approx 78.54 \text{ m}^2
$$

The area of the circle is approximately 78.54 m^2.

Example 3: Real-World Application

Problem: A circular garden has a radius of 3 m. What is the area of the garden?

Solution:
1. Identify the radius (r): 3 m.
2. Apply the area formula:
$$
A = \pi(3)^2 = \pi(9) \approx 28.27 \text{ m}^2
$$

The area of the garden is approximately 28.27 m^2.

Common Mistakes When Calculating Area

When calculating the area of a circle, students and practitioners often make several common mistakes:

1. Confusing Diameter and Radius: Ensure that you are using the radius in the formula. If given the diameter, remember to divide by 2.
2. Incorrect Use of π: Use the value of π accurately. While 3.14 is a common approximation, using the more precise 3.14159 or the π button on a calculator yields better results.
3. Neglecting Units: Always include the appropriate units in your final answer (e.g., cm^2, m^2). This is crucial in practical applications.

Applications of the Area of a Circle

Understanding the area of a circle has numerous applications in real life, such as:

- Architecture and Engineering: Calculating the area is essential for designing circular structures, like domes and tanks.
- Landscaping: Estimating the area for planting, lawn maintenance, or paving.
- Manufacturing: Determining material requirements for circular components.
- Sports: Understanding field sizes for games played on circular tracks or areas.
- Art: Designing circular artworks or installations requiring area calculations.

Conclusion

In summary, the area of a circle is a vital mathematical concept with substantial applications across various disciplines. By mastering the formula \(A = πr^2\), understanding the derivation, and practicing calculations, one can confidently approach problems involving circular areas. Always remember to check for common mistakes, and apply this knowledge to real-world scenarios. Whether for academic purposes or practical applications, a solid grasp of the area of a circle will enhance your mathematical proficiency and problem-solving skills.

Frequently Asked Questions

What is the formula for calculating the area of a circle?

The area of a circle is calculated using the formula $A = \pi r^2$, where A is the area and r is the radius of the circle.

If the radius of a circle is 5 cm, what is its area?

Using the formula $A = \pi r^2$, the area would be $A = \pi(5)^2 = 25\pi$ cm², which is approximately 78.54 cm².

How do you find the radius if you know the area of a circle?

To find the radius from the area, you can rearrange the formula: r = ⍰ (A/π). For example, if A = 50 cm², then r = ⍰ (50/π) which is approximately 3.99 cm.

What is the area of a circle with a diameter of 10 m?

First, find the radius by dividing the diameter by 2: r = 10 m / 2 = 5 m. Then, use the area formula: $A = \pi(5)^2 = 25\pi$ m², approximately 78.54 m².

Can the area of a circle be negative?

No, the area of a circle cannot be negative. Area is always a non-negative value since it represents a physical space.

What is the area of a circle in terms of its circumference?

The area can be expressed in terms of the circumference (C) using the formula $A = C^2 / (4\pi)$. For example, if C = 20 cm, then $A = (20)^2 / (4\pi) = 100/\pi$ cm².

How does changing the radius affect the area of a circle?

The area of a circle is proportional to the square of the radius. If the radius is doubled, the area increases by a factor of four.

What are some real-world applications of calculating the area of a circle?

Real-world applications include determining the amount of material needed for round objects, calculating land area in circular plots, and in fields such as engineering, architecture, and agriculture.

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