

Area of Circles

Name: _____

Date: _____

Score: _____ / 17

The area of a circle tells you how much surface is inside, and the formula is $A = \pi r^2$. Because the radius is *squared*, even a small change in radius causes a big change in area—double the radius and the area becomes **four times** as large! A common mistake is forgetting to square the radius before multiplying by π , so careful order of operations is your best friend here. Get this formula down and you will be ready for composite-figure and real-world problems in no time!



$$\begin{aligned} r &= 5 \text{ cm} \\ r^2 &= 25 \\ A &= 25\pi \\ &\approx 78.5 \text{ cm}^2 \end{aligned}$$

Key Concepts & Quick Review

$A = \pi r^2$ (radius squared, then multiply by π).

Given diameter: $r = d/2$, then $A = \pi(d/2)^2 = \pi d^2/4$.

Find r from A : $r = \sqrt{A/\pi}$.

Semicircle area: $A = \frac{1}{2}\pi r^2$.

Examples

① Find the area of a circle with: (a) $r = 6 \text{ cm}$ (b) $d = 10 \text{ m}$. Give exact and \approx answers.

Think It Through: For part (a), square the radius first: $6^2 = 36$, so the area is $A = \pi r^2 = 36\pi$. Then approximate with $36 \times 3.14 \approx 113.1$. For part (b), the diameter is 10 m , so convert to radius first: $r = 5 \text{ m}$. Then use $A = \pi(5)^2 = 25\pi \approx 78.5 \text{ m}^2$. The most common mistake here is forgetting to halve the diameter before squaring.

Answer: (a) $36\pi \approx 113.1 \text{ cm}^2$; (b) $25\pi \approx 78.5 \text{ m}^2$

② A circular sprinkler covers an area of 200.96 m^2 . Find its radius and diameter.

Think It Through: Work backward from the area formula. Since $A = \pi r^2$, divide by π to isolate r^2 : $r^2 = \frac{200.96}{3.14} = 64$. Now take the square root to get the radius, $r = 8 \text{ m}$. The diameter is twice the radius, so $d = 16 \text{ m}$. When solving circle area problems backward, divide first and square-root second.

Answer: $r = 8 \text{ m}$; $d = 16 \text{ m}$



Practice Problems

Find the area (use $\pi \approx 3.14$ or leave exact as indicated).

1. Find the area of a circle with radius 4 cm. _____
2. Find the area of a circle with radius 7 m. _____
3. Find the exact area of a circle with radius 10 cm. _____
4. Find the area of a circle with diameter 12 cm. _____
5. Find the area of a circle with diameter 18 m. _____
6. Find the area of a circle with radius 1.5 cm. _____
7. Find the exact area of a circle with radius $\frac{7}{2}$ m. _____
8. Find the exact area of a circle with diameter 5 cm. _____
9. Find the area of a circle with radius 9. _____
10. Find the area of a circle with radius 0.5 m. _____

11. A circle has area 78.5. Find its radius. _____

12. A circle has area 50.24. Find its diameter. _____



13. Find the area of a semicircle with radius 6. _____



14. Find the area of a semicircle with diameter 10. _____



15. Find the exact area of a circle with radius 3. _____



Study Tips

- Square the radius, not π .** Write $\pi \times r^2$, not $(\pi r)^2$. This is the most common algebra error in circle problems.
- Given the diameter?** Halve it *before* squaring: $r = d \div 2$ first.
- If two circles have radii in ratio 1 : 2, their areas are in ratio 1 : 4 (square the scale factor for areas).

Word Problems

16. Two circular ponds are in a park. Pond A has radius 9 m and Pond B has radius 12 m. Find the area of each pond. How much greater is Pond B's area than Pond A's? If a maintenance crew can treat 50 m^2 per hour, how long does each pond take? _____
17. A circular cheesecake has a diameter of 28 cm. It is divided into 8 equal slices. Find the area of the whole cake and the area of one slice. If the cake is 5 cm tall, what is the volume of one slice? (Volume of a sector \approx slice area \times height.) _____



Answer Keys

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| <p>1) 50.24 cm^2</p> <p>2) 153.86 m^2</p> <p>3) $100\pi \text{ cm}^2$</p> <p>4) 113.04 cm^2</p> <p>5) 254.34 m^2</p> <p>6) 7.07 cm^2</p> <p>7) $\frac{49\pi}{4} \text{ m}^2$</p> <p>8) $\frac{25\pi}{4} \text{ cm}^2$</p> <p>9) 254.34</p> <p>10) 0.79 m^2</p> | <p>11) 5</p> <p>12) 8</p> <p>13) 56.52</p> <p>14) 39.25</p> <p>15) 9π</p> <p>16) A 254.34 m^2; B 452.16 m^2; difference 197.82 m^2; A about 5.1 hr; B about 9.0 hr</p> <p>17) Whole 615.44 cm^2; slice 76.93 cm^2; volume 384.6 cm^3</p> |
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Step-by-Step Explanations

Strategy: For Exterior Angle Theorem, add the two remote interior angles or set that sum equal to the exterior angle. Exterior-angle answers need a degree label and should be larger than either remote angle.

Practice 1: A triangle has remote interior angles 40° and 65° . Find the exterior angle. **Answer:** 105°
In the first example, the exterior angle is the total of the two remote interior angles, so the setup is a direct addition equation.

Practice 15: An exterior angle is 100° , and the two remote interior angles are equal. Find each remote interior angle. **Answer:** 50° each

Toward the end, use the theorem in reverse if needed: the remote angles must add to the exterior angle.

Word-problem notes:

16. Answer: $6m + 4 = 5m + 12 \Rightarrow m = 8$; exterior = 52° ; interior $P = 34^\circ$, $R = 18^\circ$, $Q = 128^\circ$; obtuse.

Apply the Exterior Angle Theorem by setting the exterior angle equal to the sum of the two remote interior angles: $6m + 4 = (2m + 18) + (3m - 6)$. Simplify to get $6m + 4 = 5m + 12$, so $m = 8$. Now find the exterior angle: $6(8) + 4 = 52^\circ$. The remote interior angles are $2(8) + 18 = 34^\circ$ and $3(8) - 6 = 18^\circ$. The interior angle at Q forms a linear pair with the exterior angle, so it is $180^\circ - 52^\circ = 128^\circ$. Because one interior angle is greater than 90° , the triangle is obtuse.

17. Answer: $7t - 6 = 4t - 10 + 2t + 8 = 6t - 2 \Rightarrow t = 4$; exterior = 22° ; interior at $B = 158^\circ$; very shallow angle.

The exterior angle at B equals the sum of the two remote interior angles, so write $7t - 6 = (4t - 10) + (2t + 8)$. Simplifying gives $7t - 6 = 6t - 2$, so $t = 4$. Substitute to find the exterior angle: $7(4) - 6 = 22^\circ$. The interior angle at B is adjacent to the exterior angle, so together they make 180° . That gives $180^\circ - 22^\circ = 158^\circ$. A very large interior angle means the cable meets the ground at a shallow angle.



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