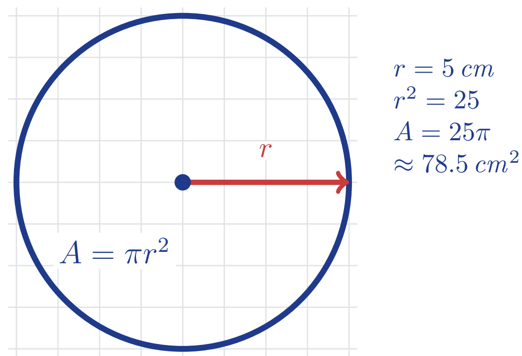
Area of Circles

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!



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) $r = 6\ cm$ (b) $d = 10\ m$. 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: $r = 5\ m$. Then use $A = \pi(5)^2 = 25\pi \approx 78.5\ m^2$. The most common mistake here is forgetting to halve the diameter before squaring.

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

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, $r = 8\ m$. The diameter is twice the radius, so $d = 16\ m$. When solving circle area problems backward, divide first and square-root second.

Answer: $r = 8\ m$; $d = 16\ m$

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 $0.5\ m$.

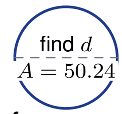
______

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.

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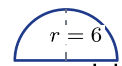

14. Find the area of a semicircle with diameter 10.

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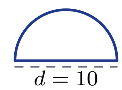

15. Find the exact area of a circle with radius 3.

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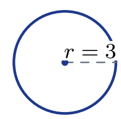

Study Tips

- **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

1) $50.24\ cm^2$
2) $153.86\ m^2$
3) $100\pi\ cm^2$
4) $113.04\ cm^2$
5) $254.34\ m^2$
6) $7.07\ cm^2$
7) $\frac{49\pi}{4}\ m^2$
8) $\frac{25\pi}{4}\ cm^2$
9) 254.34
10) $0.79\ m^2$
11) 5
12) 8
13) 56.52
14) 39.25
15) 9π
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
17) Whole $615.44\ cm^2$; slice $76.93\ cm^2$; volume $384.6\ cm^3$

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 $P = 34°$, $R = 18°$, $Q = 128°$; 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: $6(8) + 4 = 52°$. The remote interior angles are $2(8) + 18 = 34°$ and $3(8) - 6 = 18°$. The interior angle at Q forms a linear pair with the exterior angle, so it is $180° - 52° = 128°$. 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 $B = 158°$; 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: $7(4) - 6 = 22°$. The interior angle at B is adjacent to the exterior angle, so together they make $180°$. That gives $180° - 22° = 158°$. A very large interior angle means the cable meets the ground at a shallow angle.

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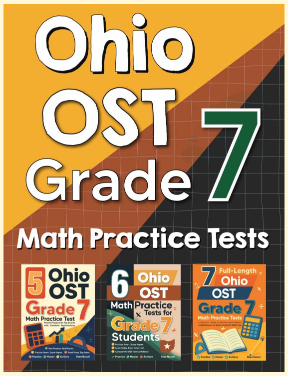

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