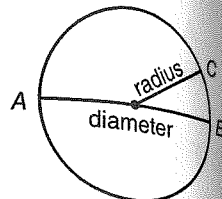# Circumference and Area of Circles

To determine the **circumference** of a **circle**, you need to know either the **diameter** or **radius** of the circle.

The length of the radius is one-half the length of the diameter.

$$r = \tfrac{1}{2}d = \tfrac{d}{2} \quad \text{or} \quad 2r = d$$

For any circle, the ratio of the circumference (C) to the diameter $\left(\tfrac{C}{d}\right)$ is always the same value. This value is represented by the Greek letter π (pi). The value of pi is $\tfrac{22}{7}$, or about 3.14. The GED® Mathematical Reasoning test uses the value 3.14 for pi.

Thus, since $\tfrac{C}{d} = \pi$, then the formula for calculating circumference is $C = \pi \times d$, where d = diameter.

circumference

the distance around a circle

circle

the curve formed by all the points in a plane that are the same distance (**radius**) from a given point (**center**)

diameter

a line segment with endpoints on a circle that passes through the center of the circle, or the length of such a segment

radius

a line segment whose endpoints are the center of a circle and any point on the circle, or the length of such a segment

Example 1   Flo plans to put a railing around a circular pool. The diameter of the pool is 20 feet. What will be the length of the railing?

Step 1   Choose the formula. $C = \pi d$
Step 2   Substitute the values. $C = 3.14(20 \text{ feet})$
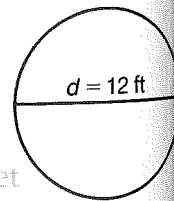**Step 3**   Evaluate. $C = 62.8 \text{ feet}$

← 20 ft →
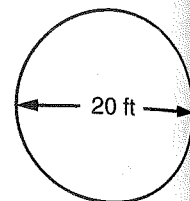
The railing will be about **62.8 feet** long.

The formula for calculating the area of a circle is $A = \pi r^2$, where r is the radius. In other words, the area of a circle is found by multiplying π (3.14) by the square of the radius.

Example 2   Paul wants to paint a circle on a wall of his store as part of a sign. What is the area of the circle in square feet if the diameter is 12 feet?

Step 1   Choose the formula. $A = \pi r^2$

Step 2   Determine the radius. $r = \tfrac{1}{2}d$

$d = 12$ ft

$r = \tfrac{1}{2}(12 \text{ feet}) = 6 \text{ feet}$

Step 3   Substitute the values. $A = 3.14 \times 6 \text{ feet} \times 6 \text{ feet}$
Step 4   Evaluate. $A = 113.04 \text{ square feet}$

3.14 × 6 x^2 ENTER 113.04.

The area of the circle in Paul's sign is about **113 square feet.**

✓ Tip

Estimate the circumference of a circle by multiplying its diameter by 3.

Directions: Choose or write the answer to each question.

Refer to the diagram below to answer questions 1 and 2.

$r = 5\ m$

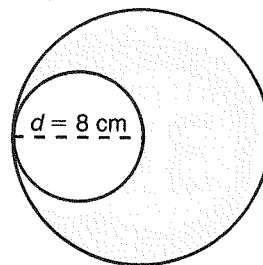Refer to the diagram to the right to answer questions 3 and 4. The diameter of the smaller circle is equal to the radius of the larger circle.
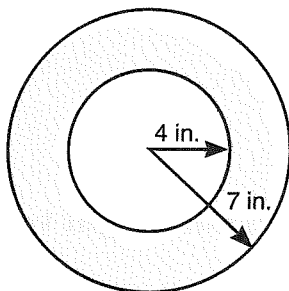
$d = 8\ cm$
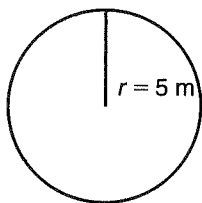
1. What is the area of the circle in m^2?

   A. 15.7   C. 78.5
   B. 31.4   D. 314

3. What is the area of the larger circle in cm^2?

   A. 25.12   C. 200.96
   B. 50.24   D. 803.84

2. What is the circumference of the circle to the nearest tenth of a meter?

   A. 15.7   C. 78.5
   B. 31.4   D. 314

4. What is the area of the shaded region in cm^2?

   A. 25.12   C. 100.48
   B. 37.68   D. 150.72

Refer to the diagram below to answer questions 5 and 6.

4 in.

7 in.

5. What is the circumference of the smaller circle in inches?

   A. 6.28   C. 25.12
   B. 12.56   D. 50.24

6. To the nearest inch, how much longer is the circumference of the large circle than the small circle?

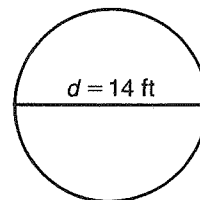   A. 19   C. 10
   B. 18   D. 9

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7. Marilyn needs to buy paint to cover the circular patio floor shown to the right. To calculate the amount of paint required for the job, she must

   first find the | area | circumference | length | width | of the patio using the

   calculation | 3.14×14 | 3.14×14^2 | 3.14×7 | 3.14×7^2 |.

   $d = 14\ ft$

8. Juan's bicycle tire has a diameter of 22 inches. If he wants to find the distance his wheel will travel in

   one full revolution, he would use | 3.14×11 | 3.14×22 | 3.14×44 | 3.14×121 | to calculate

   the | area | circumference | length | width | of the tire in inches.