A circle is the set of all points in a plane that are the same distance from a given point, called the center. The distance from the center to any point on the circle is called the radius. The distance across the circle through its center is the diameter. The circumference is the distance around the circle. The ratio of the circumference to the diameter of any circle is always \( \pi \) (pi), a Greek letter that represents the number 3.1415926.... Pi is an irrational number; however, 3.14 and \( \frac{22}{7} \) are considered accepted rational approximations for \( \pi \).

### Circumference of a Circle

The circumference of a circle is equal to the diameter of the circle times \( \pi \), or 2 times the radius times \( \pi \).

\[
C = \pi d \quad \text{or} \quad C = 2\pi r \quad \text{(note: } d = 2r \text{ or } r = \frac{d}{2})
\]

### Area of a Circle

The area of a circle is equal to \( \pi \) times the radius squared.

\[
A = \pi r^2
\]

### Examples

#### a. The radius is 3 cm.

- **Formula for circumference:** \( C = 2\pi r \)
- **Substitute 3 for \( r \):**
- **C:** 18.8 cm
- **Formula for area:** \( A = \pi r^2 \)
- **Substitute 3 for \( r \):**
- **A:** 28.3 cm²

#### b. The diameter is 12 in.

- **Formula for circumference:** \( C = \pi d \)
- **Substitute 12 for \( d \):**
- **C:** 37.7 in
- **Formula for area:** \( A = \pi r^2 \)
- **Substitute \( \frac{d}{2} \) for \( r \):**
- **A:** 113.1 in²

### Practice

Find the circumference and area of each circle to the nearest tenth.

1. ![Circle](image1.png)
2. ![Circle](image2.png)
3. ![Circle](image3.png)

4. The diameter is 19 mm.
5. The radius is 25 yd.
6. The radius is 13.8 m.
7. The diameter is 46.2 cm.
8. The radius is \( 3\frac{1}{4} \) in.
9. The diameter is 6.8 m.

10. **Landscaping**
    
    A sprinkler can spray water 10 feet out in all directions. How much area can the sprinkler water?

11. **Standardized Test Practice**
    What is the area of a half circle whose diameter is 8 m?
    
    - **A** 25.1 m²
    - **B** 50.3 m²
    - **C** 100.5 m²
    - **D** 201.1 m²