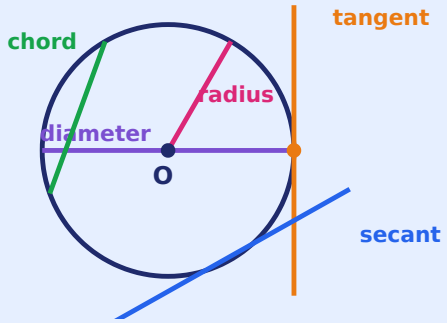
# Unit 9 · Circles Cheat Sheet

**Unit 9 focus:** parts of a circle, circumference, area, arcs and sectors

## 1 KEY VOCABULARY

| | | |
|---|---|---|
| **radius** | Center to a point on the circle. | $r$ |
| **diameter** | Chord through the center: $d = 2r$. | $d = 12$ |
| **chord** | Segment with both endpoints on the circle. | $\overline{AB}$ |
| **tangent** | Touches the circle at exactly one point. | $\perp$ radius |
| **secant** | A line through two points of the circle. | |
| **arc** | Part of the circle between two points. | $\overset{\frown}{AB}$ |

## 2 PARTS OF A CIRCLE




## 3 CIRCUMFERENCE

$C = 2\pi r = \pi d$: the distance around.

**Example:** Radius 5
**Formula:** $C = 2\pi(5) = 10\pi$
**Answer:** $10\pi \approx 31.4$ **units**

## 4 AREA

$A = \pi r^2$: the space inside.

**Example:** Radius 6
**Formula:** $A = \pi(6)^2 = 36\pi$
**Answer:** $36\pi \approx 113.1$ **units²**

## 5 ARC LENGTH & SECTOR AREA

| Find | Formula | Example: $60°$, $r = 9$ |
|---|---|---|
| **arc length** | $\frac{\theta}{360°} \cdot 2\pi r$ | $\frac{1}{6}(18\pi) = 3\pi$ |
| **sector area** | $\frac{\theta}{360°} \cdot \pi r^2$ | $\frac{1}{6}(81\pi) = 13.5\pi$ |

## 6 QUICK REMINDERS & COMMON MISTAKES

**✓ Do remember**

- Radius is half the diameter.
- Use degrees in the arc and sector fractions.
- Leave answers in terms of $\pi$ unless told to round.

**✗ Common mistakes**

- Using the diameter in $\pi r^2$: halve it first
- Circumference vs area: distance around vs space inside
- Arc measure vs arc length: degrees vs a length

# Unit 9 · Circles Cheat Sheet

**More practice:** inscribed angles, chords, tangents and angles inside and outside a circle

## 1 CENTRAL & INSCRIBED ANGLES

| Angle | Measure |
|---|---|
| central (vertex at center) | = its arc |
| inscribed (vertex on circle) | $\frac{1}{2}$ its arc |
| inscribed in a semicircle | $90^\circ$ |
| tangent and chord | $\frac{1}{2}$ its arc |

Arc $80^\circ$: central $80^\circ$, inscribed $40^\circ$.

## 2 CHORDS

- Congruent chords $\leftrightarrow$ congruent arcs.
- A radius perpendicular to a chord bisects the chord and its arc.
- Chords that cross inside: $a \cdot b = c \cdot d$ (products of the pieces).

## 3 TANGENTS

- A tangent is perpendicular to the radius at the point of tangency.
- Two tangent segments from the same outside point are congruent: $PA = PB$.
- Use the Pythagorean Theorem with the radius, tangent and the segment to the center.

## 4 ANGLES INSIDE THE CIRCLE

Two chords crossing: $m\angle = \frac{1}{2}(\text{arc}_1 + \text{arc}_2)$.

**Example:** Intercepted arcs $80^\circ$ and $100^\circ$
**Average:** $\frac{1}{2}(180^\circ)$

**Answer:** $90^\circ$

## 5 ANGLES OUTSIDE THE CIRCLE

Secants or tangents meeting outside: $m\angle = \frac{1}{2}(\text{far arc} - \text{near arc})$.

**Example:** Arcs $140^\circ$ and $60^\circ$
**Half the difference:** $\frac{1}{2}(80^\circ)$

**Answer:** $40^\circ$

## 6 EQUATION OF A CIRCLE

Center $(h, k)$, radius $r$: $(x-h)^2 + (y-k)^2 = r^2$.

**Example:** Center $(2, -3)$, radius 4
**Substitute:** $(x-2)^2 + (y+3)^2 = 16$

**Answer:** $(x-2)^2 + (y+3)^2 = 16$