

# AP Precalculus - Session 1

## Model Notes: Right Triangle Trig & Radians

Wednesday, January 7, 2026 | Teacher: Lyles

Name: \_\_\_\_\_ Period: \_\_\_\_\_

### PART 1: RIGHT TRIANGLE TRIGONOMETRY

#### Key Vocabulary:

Term	Definition	Diagram Label
Hypotenuse	Longest side (opposite right angle)	Label: c
Opposite	Side across from angle $\theta$	Label: a (opposite)
Adjacent	Side next to angle $\theta$ (not hypotenuse)	Label: b (adjacent)

#### SOH-CAH-TOA: The Three Basic Trig Functions

Function	Formula	Memory Aid
Sine	$\sin(\theta) = \text{opposite/hypotenuse}$	SOH
Cosine	$\cos(\theta) = \text{adjacent/hypotenuse}$	CAH
Tangent	$\tan(\theta) = \text{opposite/adjacent}$	TOA

#### EXAMPLE 1: Classic 3-4-5 Right Triangle

Given: opposite = 3, adjacent = 4, hypotenuse = 5

Find:	Setup	Calculation	Answer
$\sin(\theta)$	opposite/hypotenuse	3/5	0.6 or 3/5
$\cos(\theta)$	adjacent/hypotenuse	4/5	0.8 or 4/5
$\tan(\theta)$	opposite/adjacent	3/4	0.75 or 3/4

#### ■ Key Concept - Why Ratios Stay Constant:

- All 30-60-90 triangles are *similar* (same shape, different sizes)
- Similar triangles have proportional sides
- Therefore  $\sin(30^\circ) = 0.5$  for **ANY**  $30^\circ$  angle, regardless of triangle size!

## PART 2: INTRODUCTION TO RADIANS

### **What is a Radian?**

A **radian** is an angle measurement where the arc length equals the radius of the circle.

#### **Physical Demonstration:**

1. Take a string the length of the radius ( $r$ )
2. Wrap it around the circle's edge
3. The angle formed from center = 1 radian!

#### **Important Radian Facts:**

Fact	Explanation
Full circle = $2\pi$ radians	Because circumference = $2\pi r$ , you can wrap the radius around $2\pi$ times
Half circle = $\pi$ radians	Half of $2\pi$
Quarter circle = $\pi/2$ radians	Half of $\pi$ (this is $90^\circ$ )
$180^\circ = \pi$ radians	THE KEY CONVERSION FACT!

#### **CONVERSION FORMULAS (Memorize These!):**

Convert From	Convert To	Formula	Example
Degrees	Radians	$\text{rad} = \text{deg} \times (\pi/180)$	$60^\circ = 60(\pi/180) = \pi/3$
Radians	Degrees	$\text{deg} = \text{rad} \times (180/\pi)$	$\pi/4 = (\pi/4)(180/\pi) = 45^\circ$

#### **EXAMPLE 2: Convert $120^\circ$ to radians**

$$\text{radians} = 120^\circ \times (\pi/180) = 120\pi/180 = 2\pi/3 \text{ radians}$$

#### **EXAMPLE 3: Convert $3\pi/4$ radians to degrees**

$$\text{degrees} = (3\pi/4) \times (180/\pi) = (3 \times 180)/4 = 540/4 = 135^\circ$$

#### **ARC LENGTH FORMULA:**

When angle  $\theta$  is measured in radians:

$$s = r\theta$$

where:  $s$  = arc length,  $r$  = radius,  $\theta$  = central angle in radians

#### **EXAMPLE 4: Find arc length**

A circle has radius 8 cm and central angle  $\pi/3$  radians. Find the arc length.

$$\text{Solution: } s = r\theta = 8 \times (\pi/3) = 8\pi/3 \approx 8.38 \text{ cm}$$