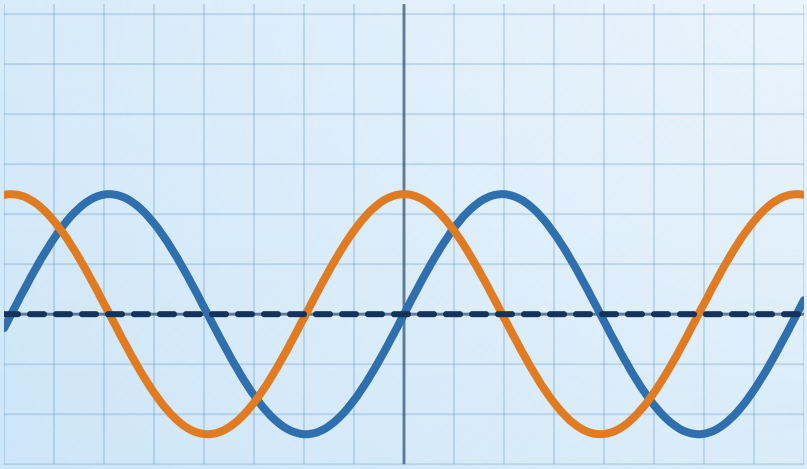
KECUDO

2026 EDITION · COLLEGE MATH SERIES



COLLEGE ALGEBRA & PRECALCULUS

Class A4

Trigonometry

Angles, circles and waves

PREMIUM EDITION · KECUDO · A4

13 CHAPTERS · 120 SELF-ASSESSMENT QUESTIONS

INTERACTIVE EDITION + PRINT PDF

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FOUNDATION

Chapter 1

Angles & Radians

An angle in **standard position** starts on the positive x-axis and turns: counterclockwise for positive angles, clockwise for negative ones. Besides degrees, mathematicians measure angles in **radians**.

WHAT IS A RADIAN?

One radian is the angle that cuts off an arc as long as the radius. A full turn is 2π radians, so $360° = 2\pi$ rad and 1 radian ≈ 57.3°.

$$\text{radians} = \text{degrees} \times \pi/180$$

Degrees	30°	45°	60°	90°	180°	270°	360°
Radians	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$	π	$3\pi/2$	2π

WORKED EXAMPLE **Convert**

1. $150° \cdot \pi/180 = 5\pi/6$.
2. $7\pi/4 \cdot 180/\pi = 315°$.

✓ **$150° = 5\pi/6$; $7\pi/4 = 315°$**

Arc length and sector area

$$s = r\theta \text{ and } A = (1/2)\, r^2\, \theta, \text{ with } \theta \text{ in radians}$$

WORKED EXAMPLE **Kecudo Bikes' wheel, radius 0.35 m**

1. One turn: $s = 0.35 \cdot 2\pi \approx 2.20$ m.
2. At 3 turns a second the wheel sweeps $\omega = 6\pi$ rad/s.
3. Speed: $v = r\omega = 0.35 \cdot 6\pi \approx 6.60$ m/s.

✓ **About 2.20 m per turn and 6.6 m/s (about 24 km/h)**

Coterminal angles

Angles that end in the same place differ by full turns: 400° and 40° are coterminal, and so are $-\pi/3$ and $5\pi/3$.

WATCH OUT

$s = r\theta$ only works with radians. Plug in degrees and the answer is wrong by a factor of 57.3.

FOUNDATION

Chapter 2

Right-Triangle Trig

In a right triangle, each acute angle θ has an **opposite** side, an **adjacent** side and the **hypotenuse**. The six trig ratios compare them. Remember **SOH-CAH-TOA**.

Ratio	Definition	Reciprocal
sin θ	opposite / hypotenuse	csc θ = 1/sin θ
cos θ	adjacent / hypotenuse	sec θ = 1/cos θ
tan θ	opposite / adjacent	cot θ = 1/tan θ

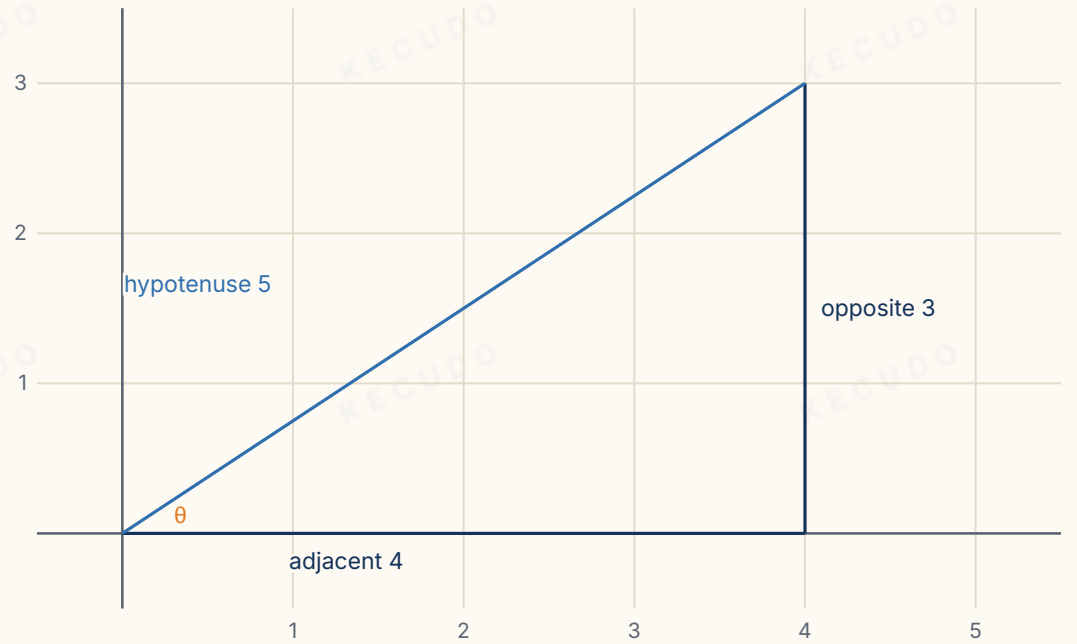


FIG 2.1 A 3-4-5 right triangle: sin θ = 3/5, cos θ = 4/5, tan θ = 3/4.

CHECK YOUR UNDERSTANDING

Chapter 1: Angles & Radians

5 questions · your answer locks when you choose it

1. What is 60° in radians?

- **A** $\pi/6$
- **B** $2\pi/3$
- **C** $\pi/3$
- **D** $\pi/4$

2. What is $3\pi/4$ in degrees?

- **A** 45°
- **B** 120°
- **C** 135°
- **D** 270°

3. What is the arc length when $r = 5$ and $\theta = 2$ radians?

- **A** 25
- **B** 2.5
- **C** 10
- **D** 7

4. Which angle is coterminal with 30°?

- **A** −30°
- **B** 390°
- **C** 210°
- **D** 330°

5. A wheel has radius 0.35 m. About how far does it roll in one turn?

- **A** 0.70 m
- **B** 1.10 m
- **C** 2.20 m
- **D** 0.35 m

FINAL EXAM

25 Questions on the Whole Book

Parts A–E · 5 questions each

Part A · Basics

1. About how many degrees is 1 radian?

A 180° **B** 57.3°
C 3.14° **D** 1°

2. On the unit circle, $\sin\theta$ is the point's:

A distance from the origin **B** slope
C y-coordinate **D** x-coordinate

3. What is the period of $y = \sin x$?

A 2π **B** π
C 1 **D** 360

4. What is the range of $\tan^{-1} x$?

A $[-1, 1]$ **B** all reals
C $(-\pi/2, \pi/2)$ **D** $[0, \pi]$

5. You know all three sides of a triangle. Which law do you use?

A Law of Sines **B** Neither
C Law of Cosines **D** Either one first

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Thank you for learning with Kecudo.

NEXT IN THE SERIES

Class A5 · Systems, Matrices & Sequences