Pre-Calculus 11

Basic Trigonometric Functions

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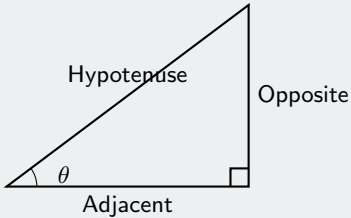
What is Trigonometry?

Introduction

- Study of the relationship between the angles in a right triangle with the lengths of the sides
- Basic trigonometry deals mainly with Right Triangles
- There are three basic trigonometry functions:
  - Sine, Cosine, and Tangent [look for them on your calculator]
- These trig. Functions will give you the ratios of the sides in a right triangle



Basic Trig Ratios

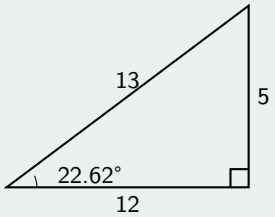
Example

For a right triangle with angle 22.62°:

$$\sin 22.62^\circ = \frac{5}{13} \approx 0.38461538...$$

$$\cos 22.62^\circ = \frac{12}{13} \approx 0.92307692...$$

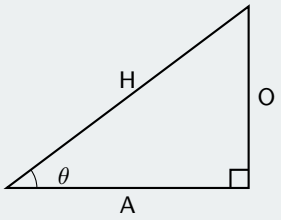
$$\tan 22.62^\circ = \frac{5}{12} \approx 0.41666666...$$



Naming Sides of a Right Triangle

Important Notes

- When naming the sides of a R.T., they are relative to the angle that you are using
- The Adjacent and Opposite side can be switched around depending on which angle you use
- The Hypotenuse must be the longest side and opposite from the "box"
- When using Trig, make sure your calculator is on "DEG" mode



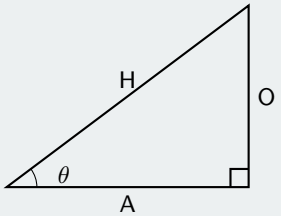
SOH-CAH-TOA

Trigonometric Ratios

$$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$$

$$\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$$

$$\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$$

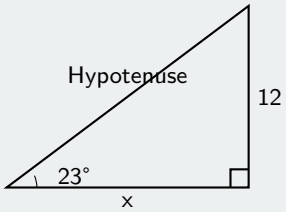


- Use SINE when working with Opposite or Hypotenuse
- Use COSINE when working with Adjacent or Hypotenuse
- Use TANGENT when working with Opposite or Adjacent

Finding Missing Sides

Steps to Find Missing Sides

1. Identify which sides are given (name them based on the angle)
2. Determine which trig function to use: SOH - CAH - TOA
3. Write the equation and use algebra to find the missing side
4. Make sure your calculator is in DEG mode!

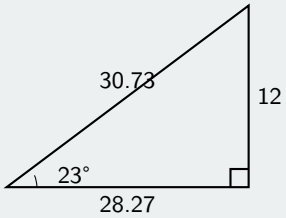


Example: Finding Missing Side

Example

Find x:

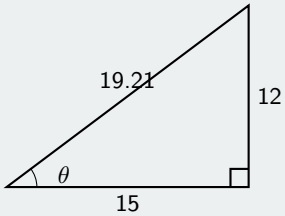
$$\tan 23^\circ = \frac{12}{x}$$
$$0.4244748162 = \frac{12}{x}$$
$$x = \frac{12}{0.4244748162}$$
$$x \approx 28.2702$$



Finding Missing Angles

Important Notes

- Use inverse trig functions: $\sin^{-1}$, $\cos^{-1}$, $\tan^{-1}$
- First determine which sides are given and which trig function to use
- Keep at least 3-4 decimal places for your angles
- You can only "Inverse Tan" a ratio, it gives you the angle



Example: Finding Missing Angle

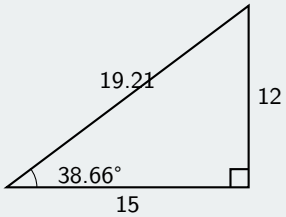
Example

Find θ:

$$\tan\theta = \frac{12}{15}$$

$$\theta = \tan^{-1}\left(\frac{12}{15}\right)$$

$$\theta \approx 38.6598^\circ$$



Practice: Identify Sides Trig Function - Part 1

Indicate Sides (Opp

Indicate which sides are given: Opp, Adj, or Hyp. Then indicate which trig function should be used to solve the triangle.

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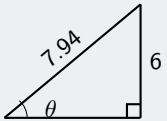

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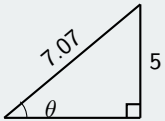

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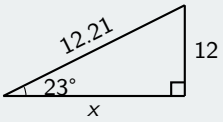
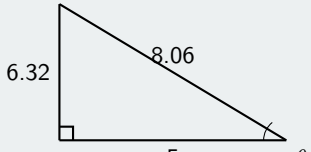


Practice: Identify Sides Trig Function - Part 2

Indicate Sides (Opp

Indicate which sides are given: Opp, Adj, or Hyp. Then indicate which trig function should be used to solve the triangle.

d)



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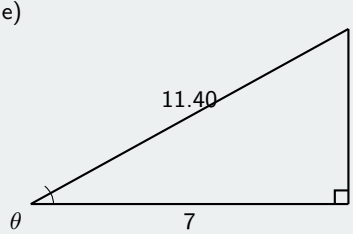

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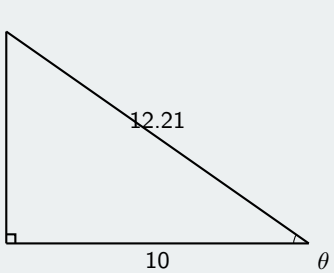
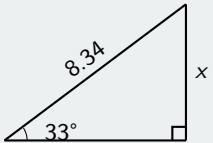


Practice: Finding Missing Sides - Part 1

Find the length of the missing sides

a)



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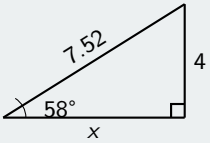

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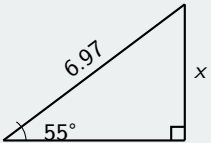
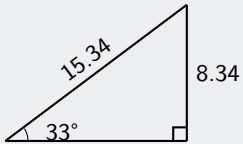


Practice: Finding Missing Sides - Part 2

Find the length of the missing sides

d)



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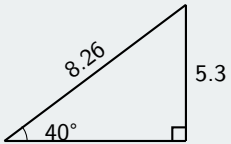

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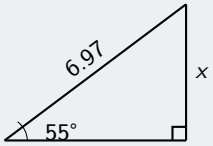
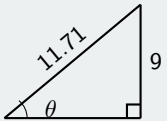


Practice: Finding Missing Angles - Part 1

Find the degree of the missing angle

a)



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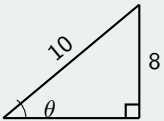

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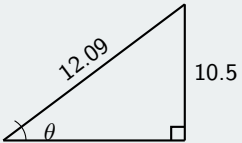
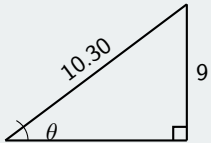


Practice: Finding Missing Angles - Part 2

Find the degree of the missing angle

d)



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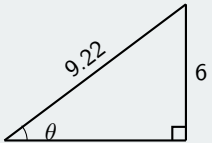

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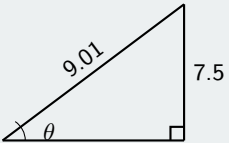
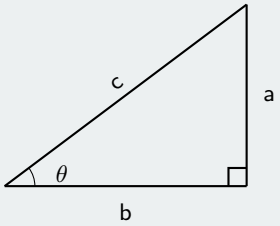


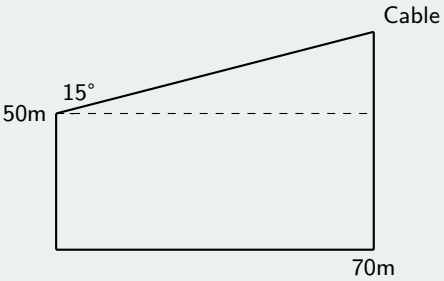
Pythagorean Theorem

Pythagorean Theorem

- Used to find the missing side lengths of a right triangle when two sides are known.
- Formula: $a^2 + b^2 = c^2$, where a and b are the lengths of the two shorter sides (legs), and c is the length of the longest side (hypotenuse).
- Also used in trigonometry for fundamental identities like $\sin^2\theta + \cos^2\theta = 1$.



Challenge Problem

Application of Trigonometry

Two buildings are 70 meters apart. The shorter building is 50m high. A cable is attached to both buildings. The angle of inclination is 15°. How tall is the taller building?