

Geometry • Unit 4 Worksheet

Right Triangle Trigonometry

Name: _____

Date: _____

Trig ratios are *FIXED* for a given acute angle in a right triangle — that's the whole point. They depend on the angle, not on the size of the triangle. Watch out: trig only applies to right triangles in this unit.

Part A • Setting Up Ratios

1. In right triangle ABC with the right angle at C, label which side is the HYPOTENUSE, which is the leg ADJACENT to angle A, and which is the leg OPPOSITE angle A.

Right triangle ABC, right angle at C

Side BC is opposite angle A
Side AC is adjacent to angle A
Side AB is the hypotenuse

Now repeat the labels with respect to angle B (the OTHER acute angle).

Which sides switch labels? Which stays the same?

2. For a right triangle with the angle theta marked, give the trig ratio.

a. $\sin \theta =$ _____

b. $\cos \theta =$ _____

c. $\tan \theta =$ _____

What's the mnemonic that helps you remember?

Part B • Computing

Round to the nearest tenth. Use a calculator in degree mode.

3. Find the missing side.

Right triangle with hypotenuse 15, angle of 38 degrees between hypotenuse and one leg. Find the leg ADJACENT to the 38 degree angle.

Which trig ratio relates 38 degrees, the adjacent leg, and 15?

Set up the equation:

Adjacent leg = _____ units (to nearest tenth)

4. A right triangle has legs of length 7 and 24.

a. Find the hypotenuse. _____

b. Find the measure of the angle OPPOSITE the side of length 7. (Use arctan or arcsine.)

c. Find the measure of the OTHER acute angle. _____

Without computing, what should the two acute angles sum to? Why?

Part C • Sine/Cosine Complement Identity

5. In a right triangle, $\sin 30^\circ = 1/2$. What is $\cos 60^\circ$?

$\cos 60^\circ =$ _____

Explain why $\sin(\theta) = \cos(90^\circ - \theta)$ for any acute angle θ . (Hint: think about which leg is opposite vs adjacent for each angle.)

Part D • Application

6. From the top of a 60-ft lighthouse, the angle of depression to a boat is 22 degrees. How far is the boat from the BASE of the lighthouse?

Draw a labeled diagram.

Which trig ratio applies? (Hint: 22 degree angle, 60 ft height, looking for horizontal distance.)

Set up and solve. The boat is _____ ft from the base.

7. A wheelchair ramp must have an angle of incline no greater than 4.8 degrees. If the ramp must rise 30 inches, what is the minimum horizontal length?

Set up and solve. Round to the nearest inch.

If your answer is in inches, convert to feet (to the nearest tenth): _____ ft

Part E • Error Analysis

8. Diego writes: "In triangle ABC, angle B = 60 degrees and sides AB = 8, BC = 5. Using $\sin 60 = AC / 8$, $AC = 8 \cdot \sin 60 \approx 6.9$." Diego is solving for the side opposite angle B. Is he correct?

Yes / No:

What CRUCIAL piece of information has Diego assumed about the triangle? Is the problem solvable from the given information?

9. Lin says: " $\sin 30 + \sin 30 = \sin 60$." Is she correct?

Compute each: $\sin 30 =$ _____, $\sin 60 =$ _____. Does $2 \cdot \sin 30 = \sin 60$?

What's the underlying misconception? (Why is sine NOT a linear function of angle?)

Part F • Synthesis

10. Prove: in any right triangle, $\sin^2 \theta + \cos^2 \theta = 1$ (the Pythagorean identity).

Hint: write $\sin \theta = \text{opp}/\text{hyp}$ and $\cos \theta = \text{adj}/\text{hyp}$. Square and add.

How does the Pythagorean Theorem appear in your argument?

11. OPEN MODELING: A 12-ft ladder leans against a wall. The ladder may slip if the angle between the ladder and the ground is less than 60 degrees. What is the minimum horizontal distance the BASE of the ladder must be from the wall? What is the maximum?

Set up — what's the constraint?

Compute min and max distance. Show work.

Sanity check: does the ladder reach the higher position when its base is closer or farther from the wall? Why?
