Name: _____

Trigonometry Essentials

VOCABULARY ESSENTIALS

1. An angle of ___depression___ is an angle that falls from the horizontal; also known as the angle of declination.

2. An angle of ___elevation___ rises from the horizontal; also known as the angle of inclination.

3. ___Theta, θ___ is a symbol often used to represent a missing angle.

4. A ___Right___ triangle has one 90° angle.

5. Any triangle that is not a right triangle is an ___Oblique___ triangle.

6. An ___acute___ triangle has three acute angles.

7. An ___obtuse___ triangle has one obtuse angle.

8. A right angle is ___90°___.

9. An acute angle is ___less than 90°___.

10. An obtuse angle is ___more than 90°___.

11. The sum of all the angles in a triangle is ___180°___.

12. The ___hypotenuse___ is the longest side in a right triangle, across from the right angle.

13. The side labelled ___opposite___ is across from the angle of focus in a right triangle.

14. The side labelled ___adjacent___ is attached to the angle of focus in a right triangle.

15. The ___angle of focus___ is the angle given or the angle to be found in a right triangle.   *not the 90°*
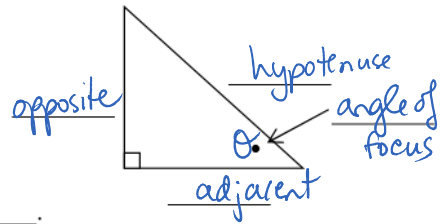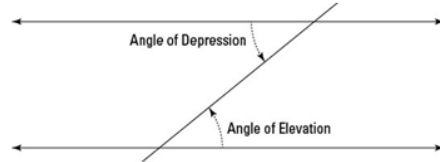
TRIANGLE ESSENTIALS

16. To properly label a triangle, use small letters to represent the sides and capital letters to represent the angles.

17. The sides and angles opposite to each other should be labelled with the same letter.

18. In any triangle, the largest side is always across from the largest angle, the smallest side is always across from the smallest angle, and so on.

19. When a question says to solve a triangle, it means find every missing angle and every missing side.
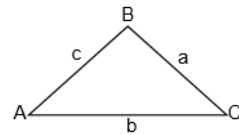
TRIGONOMETRY ESSENTIALS

20. Calculators must be in degree mode.

21. The opposite operations to sin, cos and tan are $\sin^{-1}$, $\cos^{-1}$ and $\tan^{-1}$.

22. When answering questions, round sides to 1 decimal, angles to a whole number and trig ratios to 4 decimals.

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The Primary Trigonometric Ratios

The primary trigonometric ratios are used to find *side lengths* or *angle measures* in ___*right triangles*___.

rise
(_opp_)

slope
(_hyp_)

slope angle
('angle of focus')

run
(_adj_)
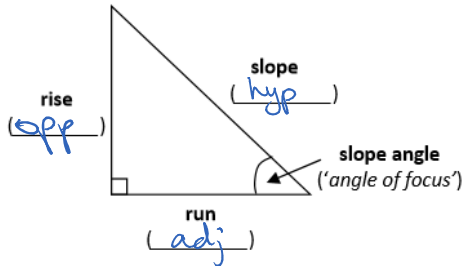
Slope Angle – the angle opposite to the rise and adjacent to the run; considered the angle of focus

Opposite Side – across from the slope angle

Adjacent Side – adjacent to the slope angle

Hypotenuse – the longest side of a right triangle across from the right angle

Complete the table below using the triangles provided. Round answers to a whole degree (no decimals).
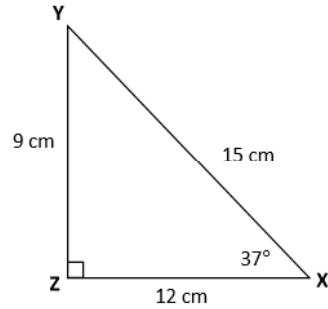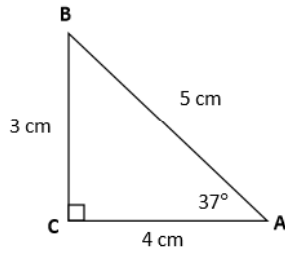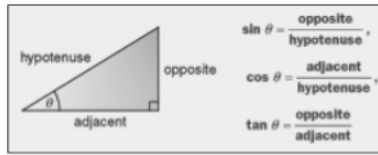

Side doesn't matter for ratios

Triangle	$\dfrac{\text{opposite}}{\text{hypotenuse}}$	sin A	$\dfrac{\text{adjacent}}{\text{hypotenuse}}$	cos A	$\dfrac{\text{opposite}}{\text{adjacent}}$	tan A
ΔABC	$\dfrac{3}{5}=0.6$	sin37 =0.6018	$\dfrac{4}{5}=0.8$	cos37 =0.7986	$\dfrac{3}{4}=0.75$	tan37 =0.7536
ΔXYZ	$\dfrac{9}{15}=0.6$		$\dfrac{12}{15}=0.8$		$\dfrac{9}{12}=0.75$	

1.   What do you notice about the ratios of lengths of sides and the trigonometric ratios in both triangles?

Trig Ratios = Ratios of sides
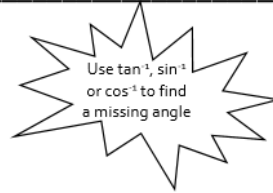
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What are the primary trigonometric ratios?

$$\sin \theta = \frac{opposite}{hypotenuse},$$

$$\cos \theta = \frac{adjacent}{hypotenuse},$$

$$\tan \theta = \frac{opposite}{adjacent}$$

Trigonometric ratios can be used to calculate a side of a right triangle if ___1 acute angle___ and ___1 side___ are known.

Example 1

a.	b.	c.
15 cm (opp), x hyp, 65°	x (opp), 6 cm (adj), 32°	45°, 8 cm (hyp), x (adj)
$\overset{\frown}{SOH}$ CAH TOA	SOH $\overset{\frown}{CAH}$ TOA	SOH $\overset{\frown}{CAH}$ TOA
$\sin 65 = \dfrac{15}{x}$	$\cos 32° = \dfrac{x}{6}$	$\cos 45° = \dfrac{x}{8}$
$\dfrac{0.9063}{1} = \dfrac{15}{x}$	$\dfrac{0.8480}{1} = \dfrac{x}{6}$	$\dfrac{0.7071}{1} = \dfrac{x}{8}$
$0.9063x = 15$	$0.8480(6) = x$	$0.7071(8) = x$
$x = 16.6 \text{ cm}$	$5.1 \text{ cm} = x$	$5.7_{cm} = x$

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Trigonometric ratios can be used to calculate an angle of a right triangle if _____ 2 sides _____ are known.

Use tan⁻¹, sin⁻¹ or cos⁻¹ to find a missing angle

Example 2

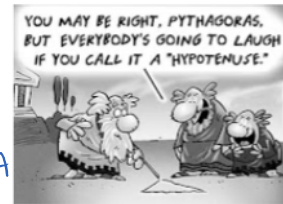| a.	b.	c.
4 cm opp, 2 cm adj, θ°	12 cm hyp, 8 cm adj, θ°	θ° 13 cm hyp, 6 cm opp
SOH CAH **(TOA)** $\tan\theta = \frac{4}{2}$ $\tan\theta = 2$ $\theta = \tan^{-1}(2)$ $\theta = 63°$	SOH **(CAH)** TOA $\cos\theta = \frac{8}{12}$ $\cos\theta = 0.\overline{66}$ $\theta = \cos^{-1}(0.\overline{66})$ $\theta = 48°$	**(SOH)** CAH TOA $\sin\theta = \frac{6}{13}$ $\sin\theta = 0.4615$ $\theta = \sin^{-1}(0.4615)$ $\theta = 27°$

To apply the primary trig ratios:

1. draw a diagram if one is not provided
2. determine the ___ angle of focus ___ (the angle given or missing)
3. label the triangle with ___ hypotenuse ___, ___ opposite ___, and ___ adjacent ___ (label 2 of 3 only)
4. determine which ___ Trig Ratio ___ is to be used SOH CAH TOA
5. solve for the missing ___ angle ___ or ___ side ___
   ↑ inverse buttons   ↑ cross multiply

YOU MAY BE RIGHT, PYTHAGORAS, BUT EVERYBODY'S GOING TO LAUGH IF YOU CALL IT A "HYPOTENUSE."

Example 3

A construction engineer determines that a straight road must rise vertically 45 m over a 250 m distance measured along the surface of the road (this represents the hypotenuse of the right triangle). Calculate the angle of elevation of the road.

hyp 250m   45m opp   θ

(SOH) CAH TOA

$\sin\theta = \frac{45}{250}$

$\sin\theta = 0.18$

$\theta = \sin^{-1} 0.18$

$\theta = 10°$

∴ The road's angle of elevation is 10°