

Unit 7

Lesson 3

Solving for Sides of a Right Δ

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Math 2 – Honors

Unit 7 – Right Triangle Trigonometry

Lesson 3 → Solving for a Side of a Right Triangle

Name _____

Date _____ Pd _____

Trigonometry: branch of mathematics that studies relationships involving the sides and the angles of triangles. Trigonometry is often divided into two subgroups: Right Triangles & Nonright (Oblique) Triangles

- **Sine, Cosine and Tangent** – three trigonometric functions that are related to angles and triangles
- To evaluate an expression means to substitute a given value in for the variable and simplify.
 - We can also evaluate **sine**, **cosine** and **tangent** using buttons on the calculator.
 - When evaluating sine, cosine and tangent, we must remember that the value we are substituting into the expression represents an **angle measure**.
- ❖ Angles can be measured in two different units:
- ✓ Degrees: $30^\circ, 45^\circ, 60^\circ, 90^\circ, 180^\circ, 270^\circ, 360^\circ$
 - ✓ Radians: $\frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}, \pi, \frac{3\pi}{2}, 2\pi$
 - ✓ In this class, we will always measure angles in **degrees**.
 - ✓ Unfortunately the calculator is defaulted into radians, so we must make sure to change the MODE → Make sure **DEGREE** is highlighted!!!!!!

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Evaluate each of the following (round to 4-decimal places):

1. $\sin(52^\circ)$.7880	2. $\cos(122^\circ)$ -.5299	3. $\tan(-76^\circ)$ -4.0108	4. $\cos(45^\circ)$.7071
5. $\sin(30^\circ)$.5	6. $\tan(95^\circ)$ -11.4301	7. $\cos(184^\circ)$ -.9976	8. $\tan(45^\circ)$ 1

• To solve an equation means to find the value of the variable.

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- To solve an equation means to find the value of the variable that makes both sides equal by isolating the variable using **inverse** operations.
- Sine, Cosine and Tangent also have inverse operations: \sin^{-1} , \cos^{-1} and \tan^{-1}

2nd Function

Solve each equation (round to tenth of a degree)

1. $\sin(x) = 0.5$ 30	2. $\sin(x) = 0.6$ 36.9	3. $\tan(x) = -6.7$ -81.5
4. $\cos(x) = -0.87$ 150.5	5. $\cos(x) = 0.5$ 60	6. $\tan(x) = 1$ 45

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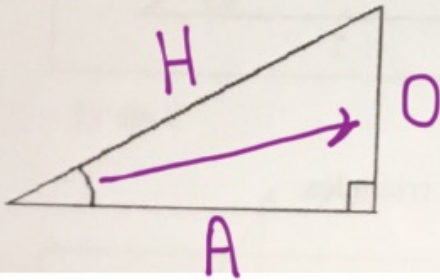


- ❖ Sometimes there is **NOT** enough information to solve for the sides using the Pythagorean Theorem.
- ❖ When this occurs, we use our knowledge of **sine, cosine and tangent**.
- ❖ **SOH CAH TOA** will help to find the missing sides and angles of a right triangle.

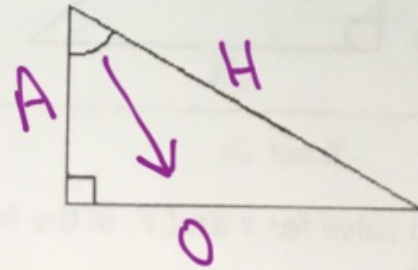
SOH → $\text{Sine } \angle = \frac{\text{opposite}}{\text{hypotenuse}}$	CAH → $\text{Cosine } \angle = \frac{\text{adjacent}}{\text{hypotenuse}}$	TOA → $\text{Tangent } \angle = \frac{\text{opposite}}{\text{adjacent}}$
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Label each of the sides as **opposite leg**, **adjacent leg**, and **hypotenuse**.

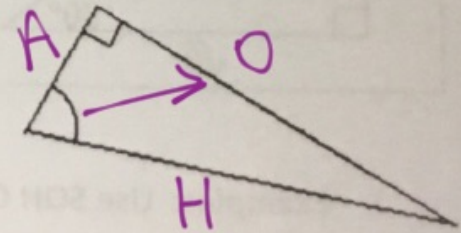
1.



2.

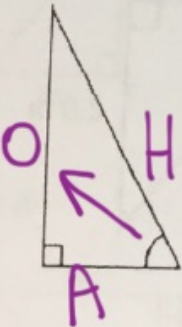


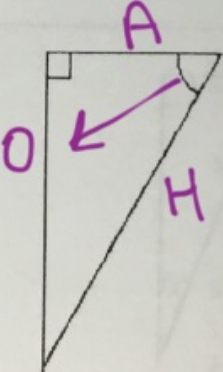
3.

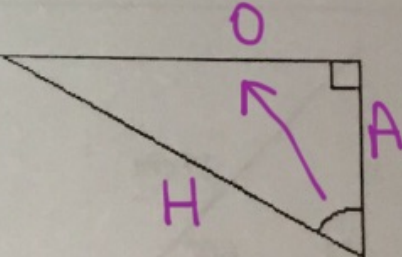



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4. 

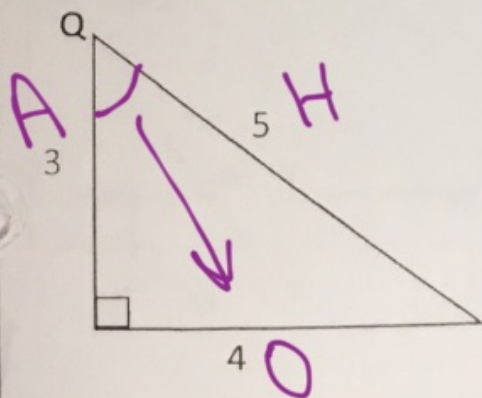
5. 

6. 

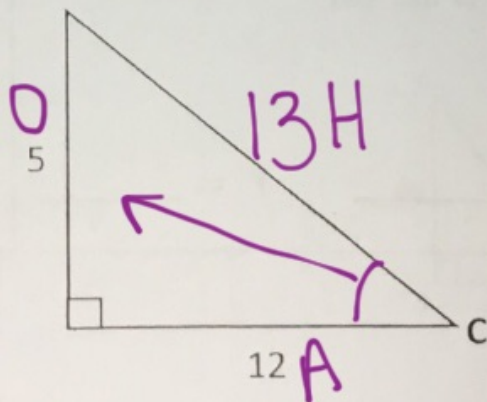
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➤ Use the definitions of the three trig ratios to complete each statement.

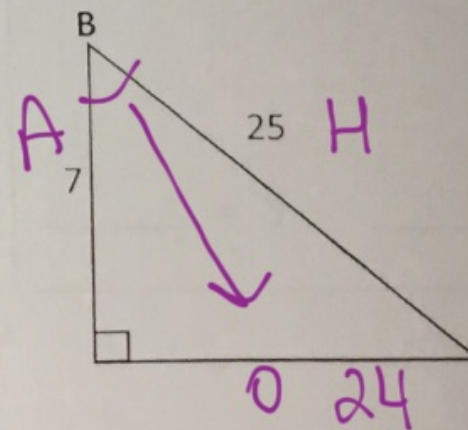
1. $\sin Q = \frac{O}{H} = \frac{4}{5}$
 $\cos Q = \frac{A}{H} = \frac{3}{5}$
 $\tan Q = \frac{O}{A} = \frac{4}{3}$



2. $\sin C = \frac{O}{H} = \frac{5}{13}$
 $\cos C = \frac{A}{H} = \frac{12}{13}$
 $\tan C = \frac{O}{A} = \frac{5}{12}$



3. $\sin B = \frac{O}{H} = \frac{24}{25}$
 $\cos B = \frac{A}{H} = \frac{7}{25}$
 $\tan B = \frac{O}{A} = \frac{24}{7}$



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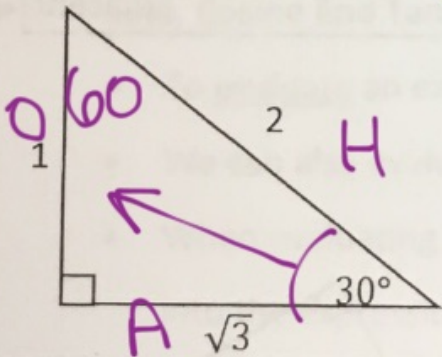
$$7^2 + b^2 = 25^2$$

$$49 + b^2 = 625$$

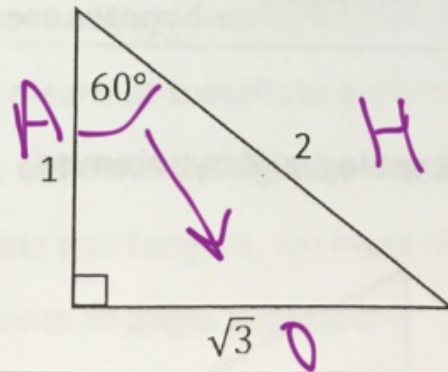
$$b^2 = 576$$

➤ Recall Special Right Triangles: Find the value of each function in simplest radical form.

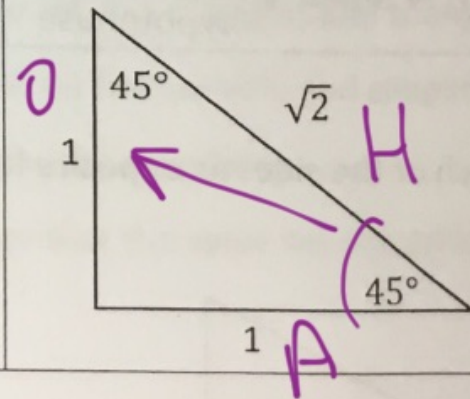
4. $\sin 30^\circ = \frac{1}{2}$
 $\cos 30^\circ = \frac{\sqrt{3}}{2}$
 $\tan 30^\circ = \frac{1/\sqrt{3} \cdot \sqrt{3}}{1} = \frac{\sqrt{3}}{3}$



5. $\sin 60^\circ = \frac{\sqrt{3}}{2}$
 $\cos 60^\circ = \frac{1}{2}$
 $\tan 60^\circ = \frac{\sqrt{3}}{1}$



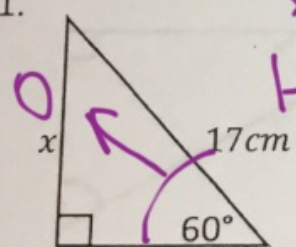
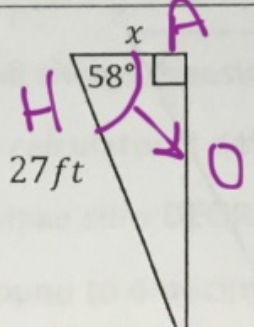
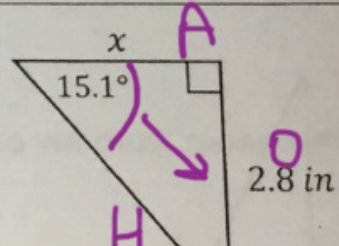
6. $\sin 45^\circ = \frac{1/\sqrt{2} \cdot \sqrt{2}}{2} = \frac{\sqrt{2}}{2}$
 $\cos 45^\circ = \frac{\sqrt{2}}{2}$
 $\tan 45^\circ = 1$



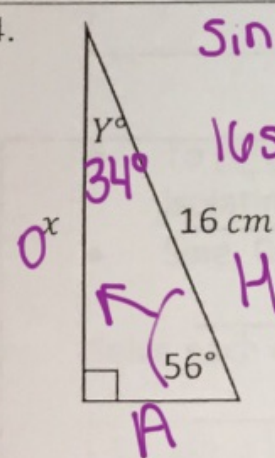
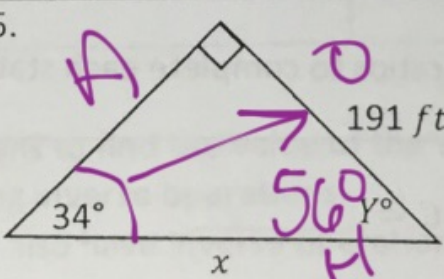
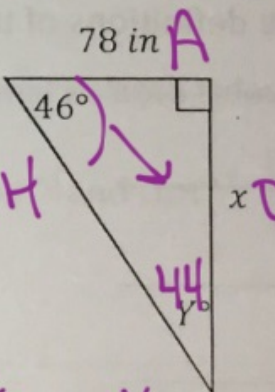
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➤ Examples: Use SOH CAH TOA to solve for x and Y in the following right triangles.

<p>1.</p>  <p>Handwritten notes: $x\sqrt{3}$, $2x$, $2x = \frac{17}{2}$, $x = 8.5$, $8.5\sqrt{3}$</p> $\sin(60) = \frac{x}{17}$ $17\sin(60) = x$ $x \approx 14.7224\text{cm}$	<p>2.</p>  <p>Handwritten notes: $\cos(58) = \frac{x}{27}$, $27\cos(58) = x$</p> $\cos(58) = \frac{x}{27}$ $27\cos(58) = x$ $x \approx 14.3078\text{ft}$	<p>3.</p>  <p>Handwritten notes: $\tan(15.1) = \frac{2.8}{x}$, $x \tan(15.1) = 2.8$</p> $\tan(15.1) = \frac{2.8}{x}$ $x \tan(15.1) = 2.8$ $x = \frac{2.8}{\tan(15.1)}$ $x \approx 10.3773\text{in}$
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$17\sin(60)$

<p>4.</p>  <p> $\sin(56) = \frac{x}{16}$ $16 \sin(56) = x$ </p> <p> $x \approx 13.2646 \text{ cm}$ $y = 34^\circ$ </p>	<p>5.</p>  <p> $\sin(34) = \frac{191}{x}$ $x \cdot \sin(34) = 191$ $\frac{x \cdot \sin(34)}{\sin(34)} = \frac{191}{\sin(34)}$ $x = \frac{191}{\sin(34)}$ </p> <p> $x \approx 341.5637 \text{ ft}$ $y = 56^\circ$ </p>	<p>6.</p>  <p> $\tan(46) = \frac{x}{78}$ $78 \tan(46) = x$ </p> <p> $x = 80.7714 \text{ in}$ $y = 44^\circ$ </p>
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HW: 15-17

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