

NOTES: Solving Right Triangles

Date: Dec. 6

To **solve** a triangle means to find all the missing sides and angles.

We have the following “tools” in our “toolkit” when working with right triangles:

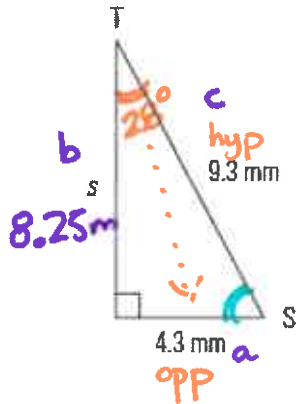
To find:	Use	Need to know
<ul style="list-style-type: none"> a side length 	Pythagorean Theorem $a^2 + b^2 = c^2$	<ul style="list-style-type: none"> two side lengths
	Trigonometric Ratios SOH CAH TOA $\sin A = \frac{opp}{hyp}$ $\cos A = \frac{adj}{hyp}$ $\tan A = \frac{opp}{adj}$	<ul style="list-style-type: none"> one side one non-right angle
<ul style="list-style-type: none"> an angle 	Inverse Trig. Functions SOH CAH TOA $A = \sin^{-1}\left(\frac{opp}{hyp}\right)$ $A = \cos^{-1}\left(\frac{adj}{hyp}\right)$ $A = \tan^{-1}\left(\frac{opp}{adj}\right)$	<ul style="list-style-type: none"> two side lengths
	Sum of Angles in Δ $A + B + C = 180^\circ$	<ul style="list-style-type: none"> one non-right angle

There is usually more than one way to go about solving a triangle!

Examples

Solve the following triangles. Round all angles to the nearest degree and lengths to the nearest hundredth.

a)



① find $\angle T$
SOH CAH TOA

$$\angle T = \sin^{-1}\left(\frac{4.3}{9.3}\right) = 28^\circ$$

$$s = \underline{8.25 \text{ mm}}$$

$$\angle S = \underline{62^\circ}$$

$$\angle T = \underline{28^\circ}$$

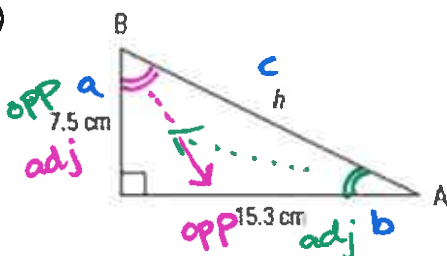
③ find $\angle S$

$$\angle S = 180 - 90 - 28 = 62^\circ$$

② find $s \rightarrow$ Pythagoras

$$\begin{aligned} a^2 + b^2 &= c^2 \\ 4.3^2 + s^2 &= 9.3^2 \\ s^2 &= 9.3^2 - 4.3^2 \\ s &= \sqrt{68} \\ s &= 8.25 \text{ mm} \end{aligned}$$

b)



① find $\angle A$.

SOH CAH TOA

$$\angle A = \tan^{-1}\left(\frac{7.5}{15.3}\right) = 26^\circ$$

② find $\angle B$

SOH CAH TOA

$$\angle B = \tan^{-1}\left(\frac{15.3}{7.5}\right) = 64^\circ$$

③ find $h \rightarrow$ Pythagoras

$$\begin{aligned} 7.5^2 + 15.3^2 &= h^2 \\ \sqrt{290.34} &= h \\ 17.04 \text{ cm} &= h \end{aligned}$$

OR

find $h \rightarrow$ use Trig.



$$\cos 26^\circ = \frac{15.3}{h}$$

* slight difference because we rounded $\angle A$

$$h = \underline{17.02 \text{ cm}}$$