

Name:

Date:

Period: |

Law of Sines

Lesson Objective INBAT solve non-right Δ s using the Law of Sines.

So far, you have used trigonometric ratios to solve right triangles. In this lesson objective, you will learn how to solve ANY triangle. When the triangle is obtuse, you may need to find a trigonometric ratio for an obtuse angle.

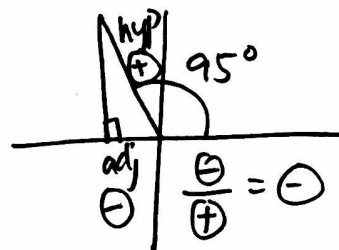
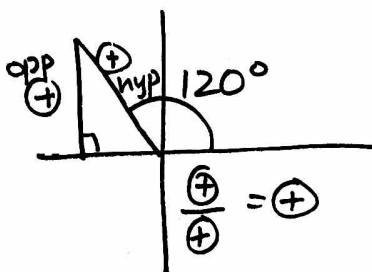
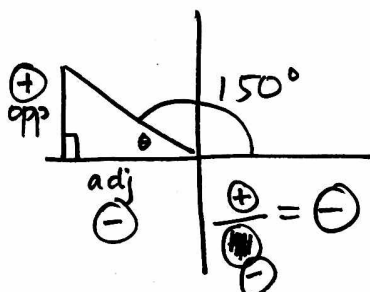
Example

1. Use a calculator to find each trigonometric ratio. Round your answer to three decimal places.

a. $\tan 150^\circ \approx -0.577$

b. $\sin 120^\circ \approx 0.866$

c. $\cos 95^\circ \approx -0.087$



Law of Sines

You can use the Law of Sines to solve triangles when...

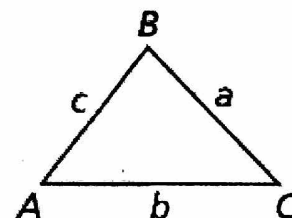
- two angles and the length of any side are known (AAS or ASA cases)
- when the lengths of two sides and an angle opposite one of those sides are known (SSA case) *

Law of Sines (Theorem) (YouTube video of proof of this Theorem is on the classroom website)

The Law of Sines can be written in either of the following forms for ΔABC with side lengths a (opposite $\angle A$), b (opposite $\angle B$) and c (opposite $\angle C$)

$$\frac{\sin A}{a} = \frac{\sin B}{b} = \frac{\sin C}{c}$$

*choose 2!

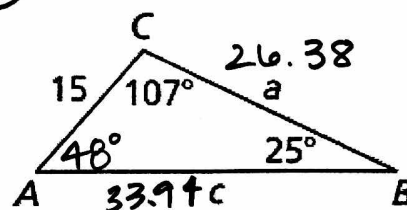


Example:

3. Solve the triangle. Round answers to two decimal places.

AAS case

$$m\angle A = 180 - 107 - 25 = \boxed{48^\circ}$$



$$\frac{\sin 48}{a} = \frac{\sin 25}{15}$$

$$\frac{0.7431}{a} = \frac{0.4226}{15}$$

$$a(0.4226) = 11.1465$$

$$\boxed{a \approx 26.38}$$

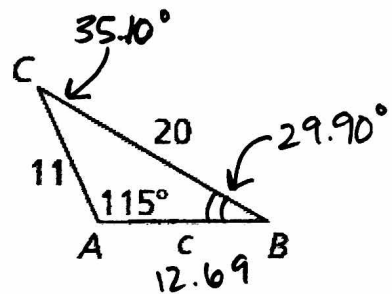
$$\frac{\sin 107}{c} = \frac{\sin 25}{15}$$

$$\frac{0.9563}{c} = \frac{0.4226}{15}$$

$$\boxed{c \approx 33.94}$$

$$\leftarrow c(0.4226) = 14.3445$$

4. Solve the triangle. Round answers to two decimal places. SSA case
 must first solve for unknown $\angle$ opp. given side



$$\textcircled{1} \frac{(\sin B)}{11} = \frac{\sin 115}{20}$$

$$\textcircled{2} m\angle C = 180 - 115 - 29.90$$

$$\frac{(\sin B)}{11} = \frac{0.9063}{20}$$

$$m\angle C \approx 35.10^\circ$$

$$20(\sin B) = 9.9693$$

$$\sin B = 0.4985$$

$$m\angle B = \sin^{-1}(0.4985) \approx 29.90^\circ$$

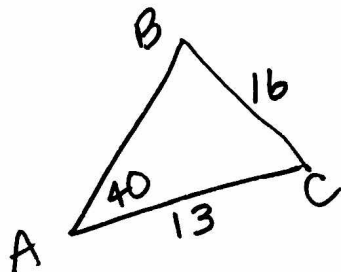
$$\textcircled{3} \frac{\sin 35.10}{C} = \frac{\sin 115}{20}$$

$$\frac{0.5750}{C} = \frac{0.9063}{20}$$

$$C(0.9063) = 11.5$$

$$C \approx 12.69$$

5. Solve $\triangle ABC$ when $m\angle A = 40^\circ$, $b = 13$ and $a = 16$. Draw a diagram.



$$\textcircled{1} \frac{\sin B}{13} = \frac{\sin 40}{16}$$

$$\sin B = 0.5223$$

$$m\angle B \approx 31.49^\circ$$

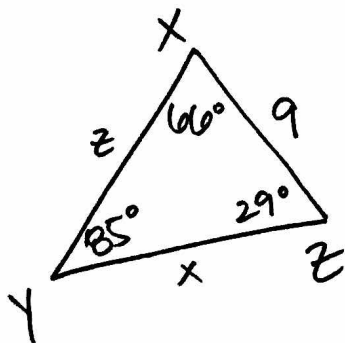
$$\textcircled{2} m\angle C \approx 108.51^\circ$$

by Δ sum thm

$$\textcircled{3} \frac{\sin 108.51}{C} = \frac{\sin 40}{16}$$

$$C \approx 23.60$$

6. Solve $\triangle XYZ$ when $m\angle Y = 85^\circ$, $m\angle Z = 29^\circ$ and $y = 9$. Draw a diagram.



$$m\angle X = 66^\circ \text{ by } \Delta \text{ sum thm}$$

$$\frac{\sin 66}{x} = \frac{\sin 85}{9}$$

$$x \approx 8.25$$

$$\frac{\sin 66}{8.25} = \frac{\sin 29}{z}$$

$$z \approx 4.38$$