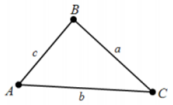
5.5 Law of Sines

Law of Sines

For any $\triangle ABC$, the Law of Sines relates the sine of each angle to the length of the side opposite the angle.



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

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

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$A = \frac{1}{2} \cdot 5 \cdot 11 \cdot \sin 20$

$A = \frac{1 \cdot 13 \cdot 7 \sin 43}{2}$

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Use the Law of Sines to solve the triangle (Find all angles and all sides). Round your answer to 3 decimals

Ex 3) B = 35° C = 105° b = 7

$\frac{\sin 35}{7} = \frac{\sin 105}{c}$ cross multiply

$\frac{7 \cdot \sin 105}{\sin 35} = \frac{c \sin 35}{\sin 35}$

$11.788 = c$

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$A = 40°$ $a = 7.845$

$B = 35°$ $b = 7$

$C = 105°$ $c = 11.788$

$\frac{\sin 35}{7} = \frac{\sin 40}{a}$

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$A = 118°$ $a =$

$B = 40°$ $b = 24$

$C = 22°$ $c =$

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SSA

ASS

angle-side-side

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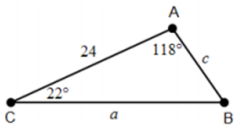
Ex 3)



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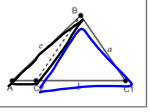
The Ambiguous Case (SSA)

If you are given two angles and one side (ASA or AAS), the Law of Sines will easily provide ONE solution for a missing side. However, the Law of Sines has a problem dealing with SSA. If you are given two sides and one angle, where you must find an angle, the Law of Sines could possibly provide you with one or more solutions or even no solution at all.



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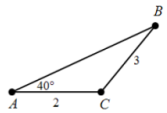
Ex 1) Use the Law of Sines to solve the triangle.



$A=40°$ $a=3$

$B=25.4°$ $b=2$

$C=114.6°$ $c=$

Now check to see if more than one triangle exists with the given information.

TEST
180°
- (the found angle)
Answer
+ (given angle)

If sum > 180° there is only one triangle
If sum < 180° there are two triangles

$\frac{\sin 40}{3} = \frac{\sin B}{2}$

$\frac{2\sin 40}{3} = \frac{3\sin B}{3}$

$\sin^{-1}(\text{ans}) = \sin B$

$B = 25.4°$

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$A_2 = 40°$ $a_2 =$

$180 - 25.4$

$B_2 = 154.6°$ $b_2 =$

$C_2 =$ $C_2 =$

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$A = 35°$ $a = 6$ SSA check for 2 Δ's

$B = 49.9°$ $b = 8$

$C = 95.1°$ $C = 10.41°$

$\frac{\sin 35}{6} = \frac{\sin B}{8}$

$\frac{8\sin 35}{6} = \frac{6\sin B}{6}$

$\sin^{-1}(\text{ans})$

$\frac{\sin 35}{6} = \frac{\sin 95.1}{C}$

$\frac{6\sin 95.1}{\sin 35} = \frac{C\sin 35}{\sin 35}$

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We will work on 5.5 w.s. next class

No Homework

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$A_2 = 35°$ $a = 6$

$B_2 = 180 - 49.9$

$B_2 = 130.1°$ $b_2 = 8$

$C_2 = 14.9°$ $C_2 = 2.690$

$\frac{\sin 35}{6} = \frac{\sin 14.9}{C_2}$

$\frac{6 \sin 14.9}{\sin 35} = C_2 \frac{\sin 35}{\sin 35}$

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Ex 2) Triangle ABC with sides a = 6, b = 8 and m<A = 35°

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