

Copy this triangle in your notes before we get started today.

Notation

- capital letter implies angle
- lower case letter implies side

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

reciprocal form

Oct 21-2:32 PM

Nov 14-5:14 PM

Law of Sines is used to "solve" (aka find all angles & all sides) oblique triangles (no right angles).

In this chapter, most of the time our calculator will be in DEGREE mode.

Example
Solve the triangle given below.

Law of Sines: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

AAS

$$\frac{\sin 30^\circ}{12} = \frac{\sin 45^\circ}{b}$$

$$\frac{b \sin 30^\circ}{\sin 30^\circ} = \frac{12 \sin 45^\circ}{\sin 30^\circ}$$

$$b = 17$$

$$\frac{\sin 30^\circ}{12} = \frac{\sin 105^\circ}{c}$$

$$\frac{c \sin 30^\circ}{\sin 30^\circ} = \frac{12 \sin 105^\circ}{\sin 30^\circ}$$

$$c = 23.2$$

$\angle A = 30^\circ$

$\angle B = 45^\circ$

$\angle C = 105^\circ$

$a = 12$

$b = 17$

$c = 23.2$ (HW)

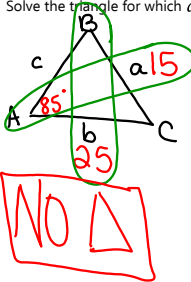
Nov 14-5:24 PM

Nov 11-3:30 PM

Special Case (SSA): No Solution

What we have to remember: the range of the sine function is $[-1, 1]$

Solve the triangle for which $a=15, b=25, A=85^\circ$



$$\frac{\sin 85^\circ}{15} = \frac{\sin B}{25}$$

$$25 \sin 85^\circ = 15 \sin B$$

$$1.7 = \sin B$$

$$\sin^{-1}(1.7) = B$$


ERROR

$\angle A = 85^\circ$
 $\angle B =$
 $\angle C =$
 $a = 15$
 $b = 25$
 $c =$

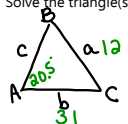
Nov 15-9:12 AM

Special Case (SSA): Two Solutions

What we must remember: Sine is positive in Quadrants I+II. the sum of the interior angles of a triangle is 180° .



Solve the triangle(s) for which $a=12, b=31, A=20.5^\circ$



$$\frac{\sin 20.5^\circ}{12} = \frac{\sin B}{31}$$

$$31 \sin 20.5^\circ = 12 \sin B$$

$$\sin^{-1}\left(\frac{31 \sin 20.5^\circ}{12}\right) = B$$

Check

$$180 - 64.8 + 20.5 = 135.7$$

less $180 = 22.5$

$B = 64.8^\circ$

$\frac{\sin 20.5^\circ}{12} = \frac{\sin 94.7^\circ}{c}$	$\frac{\sin 20.5^\circ}{12} = \frac{\sin 44.3^\circ}{c}$
----------------------------------------------------------	----------------------------------------------------------

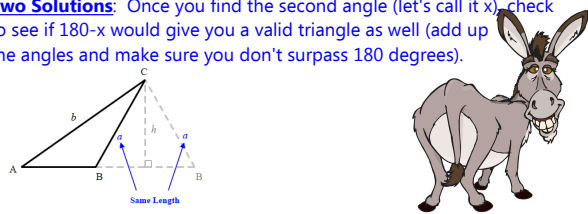
$\Delta 1$	$\Delta 2$
$\angle A = 20.5^\circ$	$\angle A = 20.5^\circ$
$a = 12$	$a = 12$
$\angle B = 64.8^\circ$	$\angle B = 115.2^\circ$
$b = 31$	$b = 31$
$\angle C = 94.7^\circ$	$\angle C = 44.3^\circ$
$c = 31.2$	$c = 23.9$

Nov 15-9:12 AM

When you are given SSA, be sure to check for special cases:

No Solution: Sine of an angle isn't between -1 and 1 .

Two Solutions: Once you find the second angle (let's call it x), check to see if $180-x$ would give you a valid triangle as well (add up the angles and make sure you don't surpass 180 degrees).



Nov 15-2:45 PM

Do you remember how to deal with minutes?

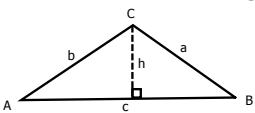
(See #5 on page 414)

$$80^\circ 15' = 80.25^\circ$$

$$25^\circ 30' = 25.5^\circ$$

Nov 15-12:14 PM

Area of an Oblique Triangle



$$a \sin B = \frac{h}{a} \cdot a$$

$$a \sin B = h$$

$$A^{\text{area}} = \frac{1}{2} b h$$

$$A^{\text{area}} = \frac{1}{2} c a \sin B \quad A = \frac{1}{2} a b \sin C \quad A = \frac{1}{2} b c \sin A$$

Ex: $C = 110^\circ$, $a = 6$, $b = 10$

p. 414: #19 (HW)

$$\begin{aligned} \text{Area} &= \frac{1}{2} (6)(10) \sin 110^\circ \\ &= 30 \sin 110^\circ \\ &= 28.2 \text{ units}^2 \end{aligned}$$

Nov 11-4:15 PM

Conclusion


1. What is one way to find angles or sides of an oblique triangle?
2. What do we need to be careful about?
SSA, $\text{O}\Delta\text{s}$, 1Δ , $2\Delta\text{s}$
3. What is the formula for finding the area?
 $A = \frac{1}{2} b c \sin A$

Oct 18-5:35 PM

HOMEWORK

...remember first learning about sine in Geometry? Look at how much you know about it now!

6.1 (p. 414): 1, 5, 9, 13-23 (odd), 33



Nov 15-2:50 PM