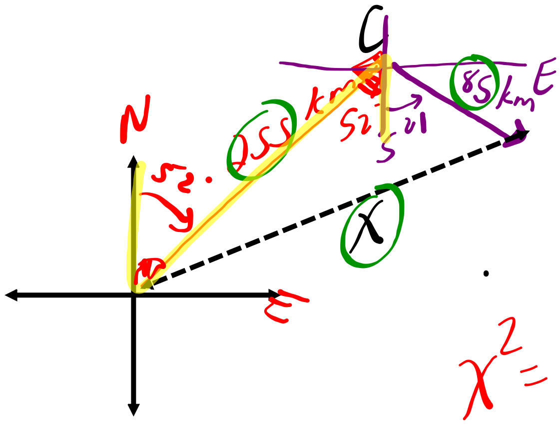
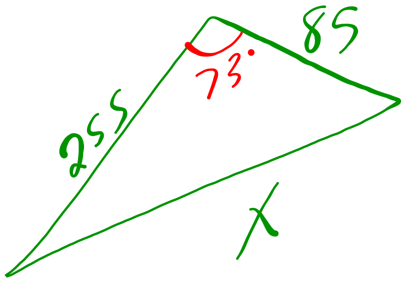
QUESTIONS???

HOMEWORK: More Applications/Word Problems

Page 154 #5, 6, 9, 10, 11 (bearings - see example from Friday)
Page 172 #9, 10, 12, 13, 14

11. A bush pilot delivers supplies to a remote camp by flying 255 km in the direction N52°E. While at the camp, the pilot receives a radio message to pick up a passenger at a village. The village is 85 km S21°E from the camp. What is the total distance, to the nearest kilometre, that the pilot will have flown by the time he returns to his starting point?





$$x^2 = 255^2 + 85^2 - 2(255)(85)\cos 73$$

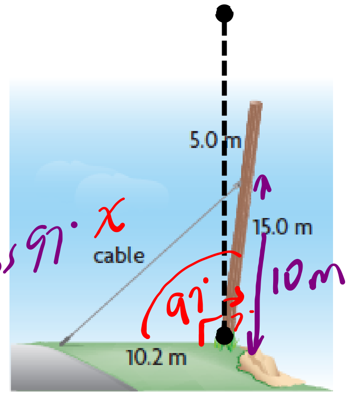
$x^2 =$

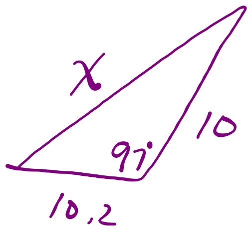
```
255²+85²-2*255*8
5*cos(73)
         59575.6866
√(Ans
        244.0813115
```

$x =$

TOTAL DISTANCE
$= 244 + 85 + 255$
$= 584$ km

12. A 15.0 m telephone pole is beginning to lean as the soil erodes. A cable is attached 5.0 m from the top of the pole to prevent the pole from leaning any farther. The cable is secured 10.2 m from the base of the pole. Determine the length of the cable that is needed if the pole is already leaning 7° from the vertical.





$$x^2 = 10.2^2 + 10^2 - 2(10.2)(10)\cos 97°$$

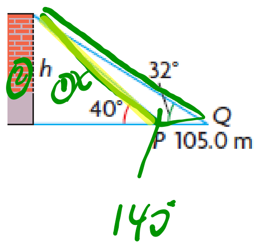
$x^2 =$

```
10.2²+10²-2*10.2
*10*cos(97)
         228.9013461
√(Ans
         15.12948598
```

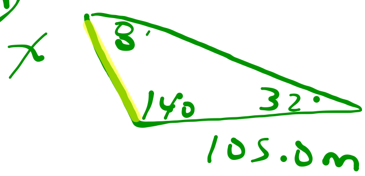
$x =$

$$x = 15.1\ m$$

13. A building is observed from two points, P and Q, that are 105.0 m apart. The angles of elevation at P and Q measure 40° and 32°, as shown. Determine the height, h, of the building to the nearest tenth of a metre.



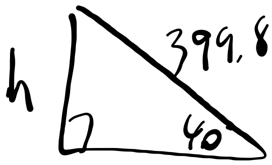
①



$$\cancel{\sin 32°}\,\frac{x}{\cancel{\sin 32°}} = \frac{105}{\sin 8°}\sin 32$$

$X = 399.8\,m$

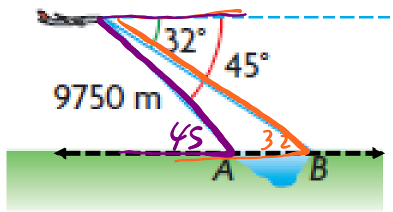
②



$$399.8 \sin 40° = \frac{h}{\cancel{399.8}}(399.8)$$

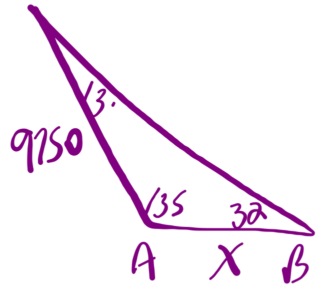
$256.99\,m = h$

14. A surveyor in an airplane observes that the angles of depression to points A and B, on opposite shores of a lake, measure 32° and 45°, as shown. Determine the width of the lake, AB, to the nearest metre.



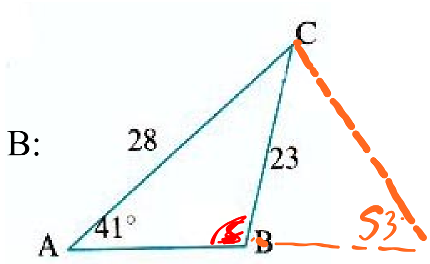
$$\frac{x}{\cancel{\sin 13}}\,\cancel{\sin 13} = \frac{9750 \sin 13}{\sin 32}$$

$$\boxed{x = 4138.9\text{m}}$$



Warm Up

Determine the measure of the obtuse angle B:



$$\frac{\cancel{28}\sin B}{\cancel{28}} = \frac{28\sin 41^\circ}{23}$$

$$\sin^{-1}\cancel{\sin} B = \sin^{-1}(0.7987)$$

$$\angle B = 53^\circ$$

OR $\angle B = 180^\circ - 53^\circ$

$$\angle B = 127^\circ$$

Trigonometry Summary AND 'The AMBIGUOUS Case'...

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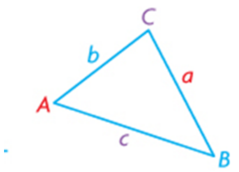


sine law $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

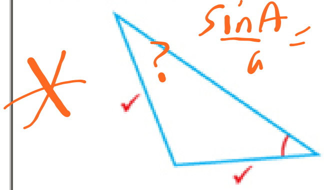
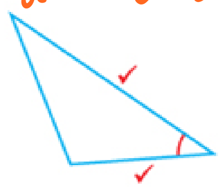
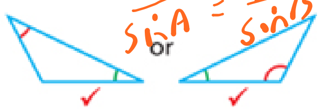
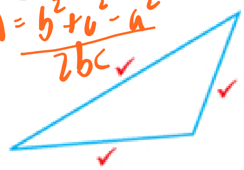
cosine law $a^2 = b^2 + c^2 - 2bc \cos A$

oblique triangle

A triangle that does not contain a 90° angle.

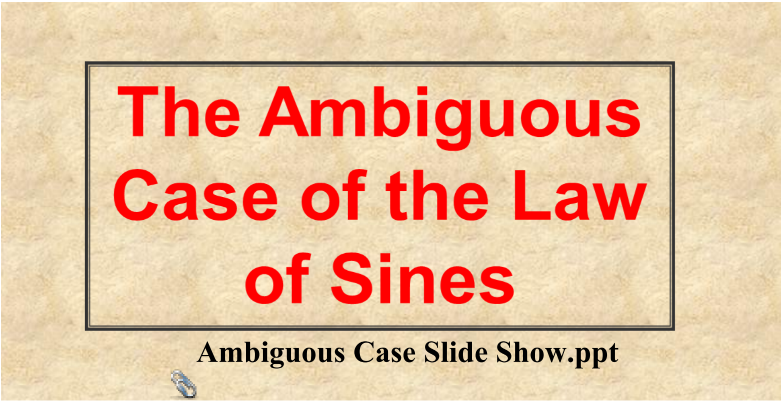
Need to Know

- The sine law and cosine law are used with obtuse triangles in the same way that they are used with acute triangles.

Use the sine law when you know ...	Use the cosine law when you know ...
- the lengths of two sides and the measure of the angle that is opposite a known side $\frac{\sin A}{a} = \frac{\sin B}{b}$ 	- the lengths of two sides and the measure of the contained angle $a^2 = b^2 + c^2 - 2bc \cos A$ 
- the measures of two angles and the length of any side $\frac{a}{\sin A} = \frac{b}{\sin B}$ 	- the lengths of all three sides $\cos A = \frac{b^2 + c^2 - a^2}{2bc}$ 

Ambiguous Case

- Be careful when using the sine law to determine the measure of an angle. The inverse sine of a ratio always gives an acute angle, but the supplementary angle has the same ratio. You must decide whether the acute angle, θ, or the obtuse angle, $180° - \theta$, is the correct angle for your triangle.



am·big·u·ous [am-**big**-yoo-*uh* s] [?] Show IPA

adjective

1. open to or having several possible meanings or interpretations; equivocal: *an ambiguous answer.*
2. *Linguistics* . (of an expression) exhibiting constructional homonymity; having two or more structural descriptions, as the sequence *Flying planes can be dangerous.*
3. of doubtful or uncertain nature; difficult to comprehend, distinguish, or classify: *a rock of ambiguous character.*
4. lacking clearness or definiteness; obscure; indistinct: *an ambiguous shape; an ambiguous future.*

Notes - Ambiguous Case.pdf

In Summary

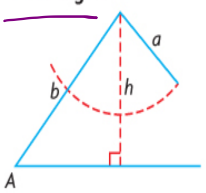
Key Idea

- The ambiguous case of the sine law may occur when you are given two side lengths and the measure of an angle that is opposite one of these sides. Depending on the measure of the given angle and the lengths of the given sides, you may need to construct and solve zero, one, or two triangles.

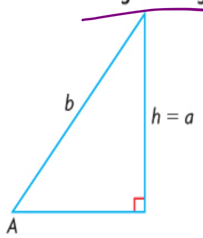
Need to Know

- In $\triangle ABC$ below, where h is the height of the triangle, $\angle A$ and the lengths of sides a and b are given, and $\angle A$ is acute, there are four possibilities to consider:

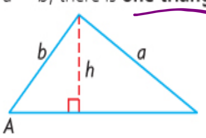
If $\angle A$ is acute and $a < h$, there is **no triangle.**



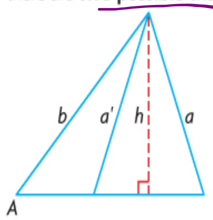
If $\angle A$ is acute and $a = h$, there is **one right triangle.**



If $\angle A$ is acute and $a > b$ or $a = b$, there is **one triangle.**

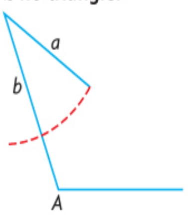


If $\angle A$ is acute and $h < a < b$, there are **two possible triangles.**

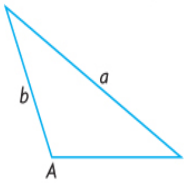


- If $\angle A$, a, and b are given and $\angle A$ is obtuse, there are two possibilities to consider:

If $\angle A$ is obtuse and $a < b$ or $a = b$, there is **no triangle.**



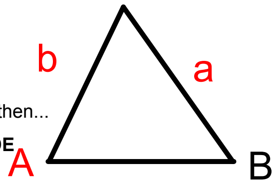
If $\angle A$ is obtuse and $a > b$, there is **one triangle.**



Criteria for the Ambiguous Case...

- Must be given SSA
- Given angle is acute
- a < b

*** If ALL 3 criteria are met, then...



CALCULATE THE ALTITUDE

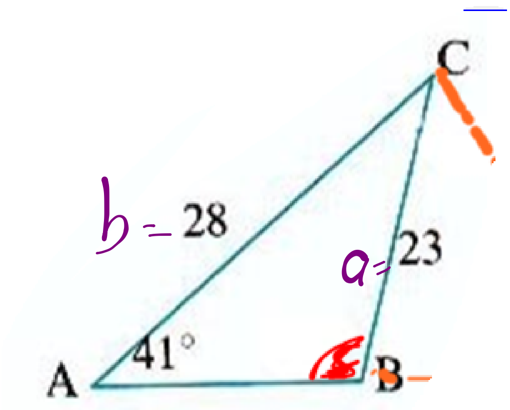
$\boxed{\text{alt} = b \sin A}$

CASE 1: a < altitude; there is NO SOLUTION

CASE 2: a = altitude; there is ONE SOLUTION [Right Triangle]

CASE 3: a >altitude; this is the 'AMBIGUOUS CASE'...TWO SOLUTIONS

1) Acute Triangle (angle, θ, is found with Law of Sines)
2) Obtuse Triangle (angle is 180° - θ)



Criteria (Ambiguous)

✓ SSA

✓ Given angle acute

✓ $a < b$

$$\boxed{h = b \sin A}$$

$h = 28 \sin 41°$

$h = 18.4$

a vs h

$23 > 18.4$

Case 1 $a < h$

Case 2 $a = h$

Case 3 $a > h$

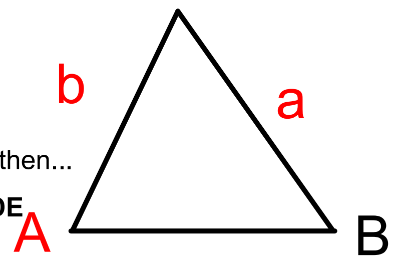
2 solutions (ambiguous)

MUST MEMORIZE THESE NOTES IN ORDER TO KNOW AMBIGUOUS CASE

Criteria for the Ambiguous Case...

- Must be given SSA
- Given angle is acute
- a < b

*** If ALL 3 criteria are met, then...



CALCULATE THE ALTITUDE

$\boxed{\text{alt} = b \sin A}$

CASE 1: a < altitude; there is NO SOLUTION

CASE 2: a = altitude; there is ONE SOLUTION [Right Triangle]

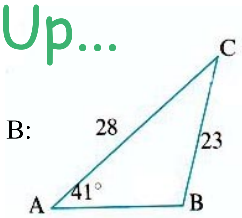
CASE 3: a >altitude; this is the 'AMBIGUOUS CASE'...TWO SOLUTIONS

1) Acute Triangle (angle, θ, is found with Law of Sines)

2) Obtuse Triangle (angle is $180^{\circ} - \theta$)

Back to the Warm-Up...

Determine the measure of the obtuse angle B:



Attachments

Ambiguous Case Slide Show.ppt

Notes - Ambiguous Case.pdf