Section 4.3 – The Ambiguous Case of the Sine Law

Learning Targets (Day 1):

Given SSA where the angle is acute:

a. sketch a diagram to illustrate the situation
b. determine the number of possible triangles that could be solved.

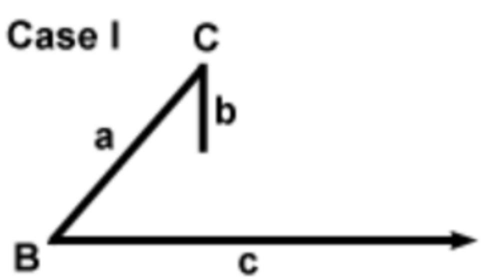
What does "ambiguous" mean?

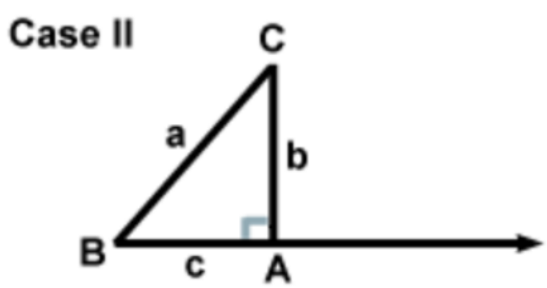
When we are provided with three pieces of information about a triangle, and if the information is **SSA**, then we cannot always be certain about what the triangle looks like, or what all the missing measures will be.

- sometimes you get a **right triangle**
- sometimes you get an **isosceles triangle**
- sometimes you get an **oblique triangle**
- **sometimes you can't even form a triangle!**
- **sometimes you can form 2 different triangles!!**

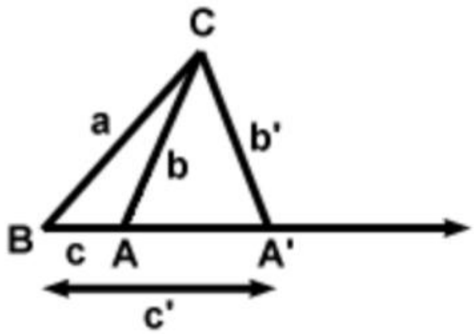
In the following 5 diagrams:
$\angle B$ *is acute*, b *is the* $\boldsymbol{opposite}$ *side*, a *is the* $\boldsymbol{adjacent}$ *side* $(length\ of\ c\ is\ unknown)$

In each diagram, the height of the triangle can be calculated: $\boldsymbol{h = a \sin B}$
but you only need to determine the height when $\boldsymbol{b < a}$ **(this is the first 3 possibilities only)**

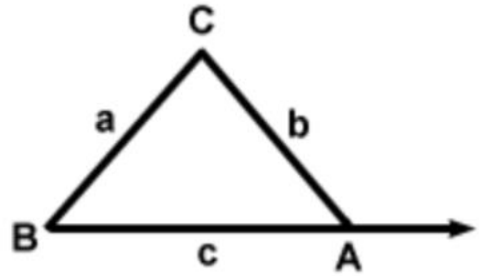




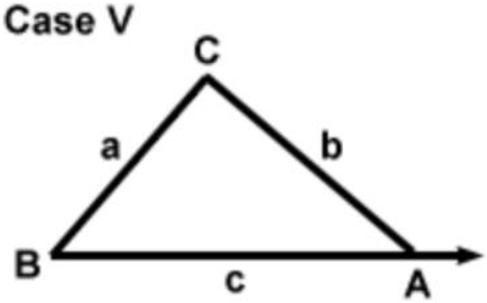
Case III



Case IV



Case V



Summary:

Given SSA with an <u>acute</u> angle,

There is no triangle possible if

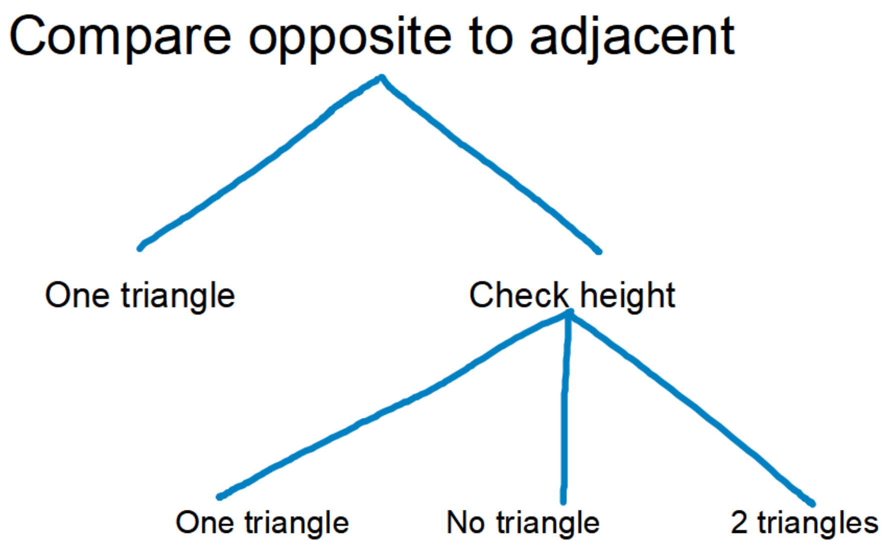
There is one right triangle possible if

There is one isosceles triangle possible if

There is one oblique triangle possible if

There are two different oblique triangles possible if

SSA Decision Tree for Acute Angle Case



Examples:

For each set of information below

- Does the information involve the SSA situation?
- If it does, determine the number of triangles (zero, one or two) possible.
- Draw the triangle(s) to support your answer.

$\angle B = 46°$, a = 14 cm, b = 18 cm

$\angle Q = 80°$, p = 10 cm, r = 23 cm

$\angle M = 81°$, n = 34 mm, m = 27 mm

$\angle P = 47°$, p = 29 cm, r = 36 cm