**PreCalculus - NOTES**

**5.5 The Law of Cosines**

For any triangle (right, acute or obtuse), you may use the following formula to solve for missing sides or angles:

Use the Law of Cosines when… you have 3 dimensions of a triangle and you need to find the other 3 dimensions . They cannot be just ANY 3 dimensions though, or you won’t have enough information to solve the Law of Cosines equations. Use the Law of Cosines if you are given:

**Example 1**

Find all the missing dimensions of triangle ABC, given

that angle B = 98°, side *a* = 13 and side *c* = 20.

**Example 2\***

Find all the missing dimensions of triangle, ABC, given that angle A = 39°, side *b* = 20 and side *c* = 15.

**Example 3\***

Find all the missing dimensions of triangle, ABC,

given that side *a* = 30, side *b* = 20 and side *c* = 15.

**\***Important: The Law of Sines will never produce an obtuse angle. If an angle *might* be obtuse, never use the Law of Sines to find it.

**Area of a Triangle**

You can find the area of any triangle given

at least three pieces of information…

1. **SAS**

Δ Area = $\frac{1}{2}bc\sin(A)=\frac{1}{2}ac\sin(B)=\frac{1}{2}ab\sin(C)$

Ex) Given: B = 75°, a = 20, c = 18… find the area of the Δ

1. **SSS**

Δ Area = $\sqrt{s\left(s-a\right)\left(s-b\right)(s-c)}$

Ex) Given: a = 6, b = 8, c = 12… find the area of the Δ

**Example 4**

The bases on a baseball diamond are 90 feet apart, and the front edge of the pitcher’s rubber is 60.5 feet from the back corner of home plate. Find the distance from the center of the front edge of the pitcher’s rubber to the far corner of firs t base.



**Example 4** : Radio Transmitter Problem

The diagram below represents the centers of three towns, Anston (A), Bakersfield (B) and Chester (C) which are linked by straight roads. Bakersfield is 26 km from Anston and 10 km further north, and Chester is 42 km due south of Bakersfield.



(a) How far east of Anston is Bakersfield?

(b) Find the distance between Anston and Chester?

(c) The range of "Radio Bakersfield", broadcast from point B,

 is such that it can be heard at only one point P on the Anston-Chester road.

1. Find the distance from point A to point D.
2. Find the range of "Radio Bakersfield” (the distance from point B to point P).

(d) A new transmitter is to be set up at E, a point equidistant from the three towns.

 Describe where point E should be and how far is E from each town. B A C