Day 40 - Law of Cosines

Solve Right Triangles

1. Pythagorean Theorem
2. SOHCAHTOA

Solve Oblique Triangles – no right angles

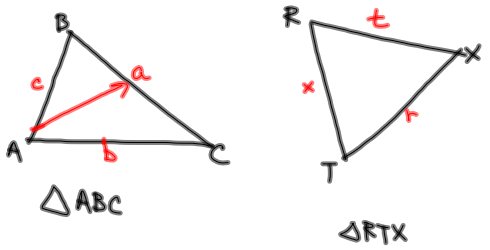
1. Law of cosines
2. Law of sines

Oct 8-8:52 AM

How are Δ's named:

Angles: capital letters

Sides: lowercase letters



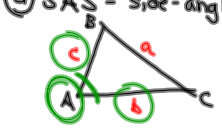
Oct 8-8:59 AM

Law of cosines

① SSS – side-side-side
- All lowercase letters
- Find the largest angle first
  opposite the longest side
- Two smaller sides must add up to be larger than the longest side

  2, 5, 6 2+5 > 6
  7 > 6

② SAS – side-angle-side – all letters will be different



Oct 8-9:04 AM

Law of cosines

① $a^2 = b^2 + c^2 - 2bc \cos A$

② $b^2 = a^2 + c^2 - 2ac \cos B$

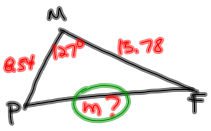
③ $c^2 = a^2 + b^2 - 2ab \cos C$

$(\text{side})^2 = (\text{other side})^2 + (\text{other side})^2 - 2(\text{other side})(\text{other side}) \cos(\text{angle of side we start with})$

side you want to solve for

Oct 8-9:13 AM

Example 1: In ΔPMF, ∠M = 127°, p = 15.78 m, f = 8.54 m. Find the measure of the third side (m).



$m^2 = (8.54)^2 + (15.78)^2 - 2(8.54)(15.78)\cos 127°$

$\sqrt{m^2} = \sqrt{484.14}$

$\boxed{m = 22.003 \text{ meters}}$

Oct 8-9:17 AM

Example 2: In ΔXYZ, x = 3 ft, y = 7 ft, z = 9 ft. Find the largest angle.

$z^2 = x^2 + y^2 - 2xy \cos Z$

3+7 > 9
10 > 9
Yes, we have a triangle

$9^2 = 3^2 + 7^2 - 2(3)(7)\cos Z$

$81 = 9 + 49 - 42 \cos Z$

* $81 = 58 - 42 \cos Z$

$-58 \quad -58$

$\frac{23}{-42} = \frac{-42 \cos Z}{-42}$

$\cos^{-1}(-.5476) = \cos Z$

$\boxed{123.2° = Z}$

Oct 8-9:26 AM

Example 3: In $\triangle XYZ$, $x = 3ft$, $y = 7ft$, $z = 11ft$.
Find the largest angle.

$3 + 7 > 11$
$10 > 11$

No $\triangle$ $\longrightarrow$ No solution

Oct 8-9:35 AM