Law of Cosines p. 66

Use for triangles when you are given:

- SSS - Always find largest angle 1st with law of cosines, then middle angle with law of sines & then the smallest angle
- SAS - Use law of cosines to find the missing side, then use law of sines to find the angles (find smaller angle 1st)

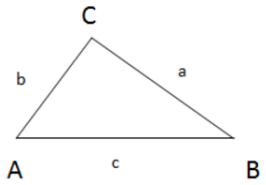
Law of the Cosines

Law of Cosines:

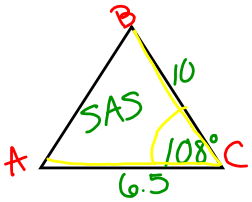
$a^2 = b^2 + c^2 - 2 \cdot b \cdot c \cdot Cos(A)$

$b^2 = a^2 + c^2 - 2 \cdot a \cdot c \cdot Cos(B)$

$c^2 = a^2 + b^2 - 2 \cdot a \cdot b \cdot Cos(C)$



1. Solve the triangle given C= 108°, a=10, b=6.5



a= 10 A= 44.7°
b= 6.5 B = 27.3°
c= 13.5 C= 108°

① Law of Cosines

$c^2 = a^2 + b^2 - 2ab\cos C$

$c^2 = (10)^2 + (6.5)^2 - 2(10)(6.5)\cos 108$

$c = 13.5$

② Law of sines to find ∠B

$\frac{c}{\sin C} = \frac{b}{\sin B}$

$\frac{13.5}{\sin 108} = \frac{6.5}{\sin B}$

$\frac{6.5 \sin 108}{13.5} = \frac{13.5 \sin B}{13.5}$

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

$B = 27.3°$

③ Subtract 2 angles from 180°

$A = 180° - 27.3° - 108°$

$A = 44.7°$

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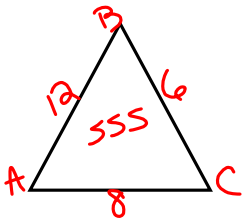
2. Solve the triangle given a = 6, b = 8, c = 12



$a = 6$ $A = 26.4$
$b = 8$ $B = 36.3$ 3rd and 1st
$c = 12$ $C = 117°$

① Find largest angle using ∠OC

$c^2 = a^2 + b^2 - 2ab\cos C$

$12 = 6 + 8 - 2x$
$12 = 14 - 2x$
$-14 \quad -14$
$\frac{-2}{-2} = \frac{-2x}{-2}$

$12^2 = 6^2 + 8^2 - 2(6)(8)\cos C$

$144 = 100 - 96\cdot\cos C$
$-100 \quad -100$

$\frac{44}{-96} = \frac{-96\cdot\cos C}{-96}$

calc

$C = \cos^{-1}(\text{Ans})$

$C = 117.3°$

② LOS to find middle angle

$\frac{c}{\sin C} = \frac{b}{\sin B}$

$\frac{12}{\sin 117.3°} = \frac{8}{\sin B}$

$\sin^{-1}\left(\frac{8\sin 117.3}{12}\right) = B$

$B = 36.3$

③ Subtract 2 angles from 180° to find smallest ∠.

$A = 180° - 117.3 - 36.3$

$A = 26.4°$

3. Solve the triangle given a = 9, b = 3, c = 11

$c^2 = a^2 + b^2 - 2ab\cos C$

$11^2 = 9^2 + 3^2 - 2(9)(3)\cos C$

$121 = 90 - 54\cos C$
$-90 \quad -90$

$\frac{31}{-54} = \frac{-54\cos C}{-54}$

$121 = 90 - 54x$

$C = 125°$

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