Notes

Thursday, February 1, 2018 1:55 PM

Geometry

8.5 Day 2 Notes

LAW OF COSINES

Learning Target: I can use the Law of Cosines to find an angle or side in a triangle.

***What happens when you can't use the Law of Sines? We use the Law of Cosines!*

Let's Practice some Algebra before we get into the Geometry!

1. Solve for b.

$b^2 = 22^2 + 10^2 - 2(22)(10) * \cos 44°$

$b^2 = 584 - 440 \cdot \cos 44$

$\sqrt{b^2} \approx \sqrt{267.49}$

$b \approx 16.36$

2. Solve for m∠C.

$27^2 = 13^2 + 24^2 - 2(13)(24) * \cos C$

$729 = 745 - 624 \cdot \cos C$

$-745 \quad -745$

$\frac{-16}{-624} = \frac{-624 \cdot \cos C}{-624}$

$\cos C \approx .026$

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

$88.53°$

$\cos^{-1}(?) = m\angle C$

LAW OF COSINES

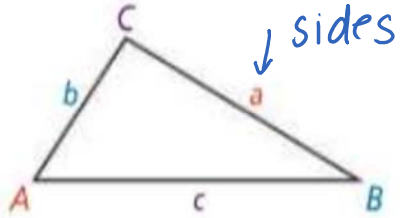
For any △ABC the Law of Cosines relates the cosine of each angle to the side lengths of the triangle.

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

$b^2 = a^2 + c^2 - 2ac \cos B$

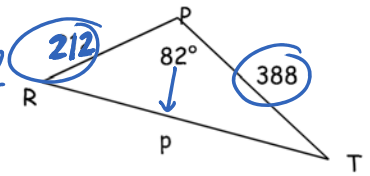
$c^2 = a^2 + b^2 - 2ab \cos C$

*You only use Law of Cosines for SAS and SSS (if you know two side lengths and the included angle OR all three side lengths *



Let's Practice Law of Cosines!

1. Given the diagram, find the length of side p. (SAS)



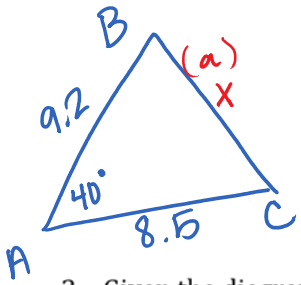
$p^2 = 212^2 + 388^2 - 2 \cdot 212 \cdot 388 \cos 82$

$= 195488 - 164592 \cdot \cos 82$

$\sqrt{p^2} \approx \sqrt{172592.\ldots}$

$p \approx 415.44$

2. In △ABC, m∠A = 40°, c = 9.2, and b = 8.5. Find side a (round to the nearest tenth). (SAS)



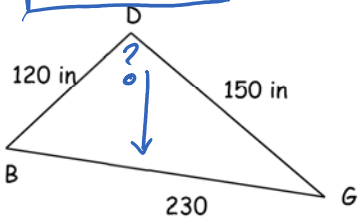
$a^2 = 8.5^2 + 9.2^2 - 2 \cdot 8.5 \cdot 9.2 \cos 40$

$a^2 = 156.89 - 119.81....$

$\sqrt{a^2} \approx \sqrt{37.08....}$

$a \approx 6.1$

3. Given the diagram, find the m∠D. (SSS) inverse



$230^2 = 120^2 + 150^2 - 2 \cdot 120 \cdot 150 \cos D$

$52900 = 36900 - 36000 \cos D$

$-36900 \quad -36900$

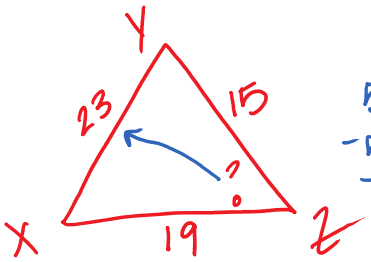
$\frac{16000}{-36000} = \frac{-36000 \cdot \cos D}{-36000}$

$\cos D \approx ....$

$\cos^{-1}(\quad) = D$

$m\angle D \approx 116.4°$

4. In △XYZ, z = 23, x = 15, and y = 19. Find the m∠Z (round to the nearest tenth). (SSS)



$23^2 = 15^2 + 19^2 - 2 \cdot 15 \cdot 19 \cdot \cos Z$

$529 = 586 - 570 \cdot \cos Z$

$-586 \quad -586$

$\frac{-57}{-570} = \frac{-570 \cos Z}{-570}$

$0.1 \approx \cos Z \implies \cos^{-1}(0.1) = Z \approx 84.26°$

Applications!

5. One airplane is 60 miles due north of a control tower. Another airplane is located 70 miles from the tower at a heading of S 80° E (80° east of south). To the nearest tenth of a mile, how far apart are the two airplanes?

$x^2 = 70^2 + 60^2 - 2 \cdot 70 \cdot 60 \cdot \cos 80$

$x^2 = 8500 - 8400 \cdot \cos 80$

$\sqrt{x^2} \approx \sqrt{7041.35....}$

$x \approx 83.91$ miles apart