Sine and Cosine 20.2

Law of Sines and Law of Cosines **Name:** _____

Sum of Angles: $180n - 360$ Interior Angle: $\frac{180n-360}{n}$

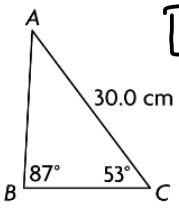
$c^2 = a^2 + b^2$ $a^2 = c^2 - b^2$

$\sin\theta = \frac{\text{Opposite}}{\text{Hypotenuse}}$ $\tan\theta = \frac{\text{Opposite}}{\text{Adjacent}}$ $\cos\theta = \frac{\text{Adjacent}}{\text{Hypotenuse}}$

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

$a^2 = b^2 + c^2 - 2bc\cos A$ $\cos A = \frac{b^2 + c^2 - a^2}{2cb}$

1. Determine the length of c to the nearest tenth.

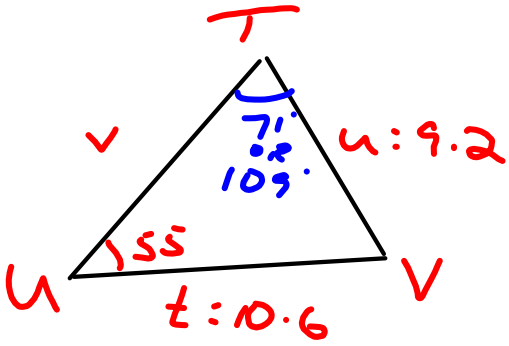


A: a:
B: 87 b: 30
C: 53 c: x

$\frac{30}{\sin 87} = \frac{x}{\sin 53}$

$x = \frac{30(\sin 53)}{\sin 87} = 24.0$

2. Given: $\Delta TUV, t = 10.6\ cm, u = 9.2\ cm$, and $\angle U = 55°$. Determine the measure of $\angle T$, to the nearest degree.



T: t: 10.6
U: 55 u: 9.2
V: V:

$\frac{t}{\sin T} = \frac{u}{\sin U}$

$\frac{10.6}{\sin T} = \frac{9.2}{\sin 55}$

$\sin T = \frac{10.6(\sin 55)}{9.2}$

$\sin T = 0.9438$

$T = \sin^{-1}(0.9438)$

$T = 71°$

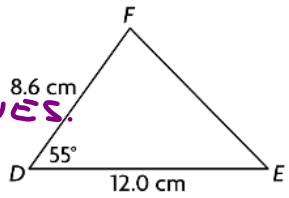
$V = 180 - 55 - 71$

3. The length of d to the nearest tenth of a centimeter is _____ cm.

$D = 55$ $d = x$
$E:$ $e = 8.6$
$F:$ $f = 12.0$

No $\frac{a}{\sin A}$ etc, LAW of COSINES.

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

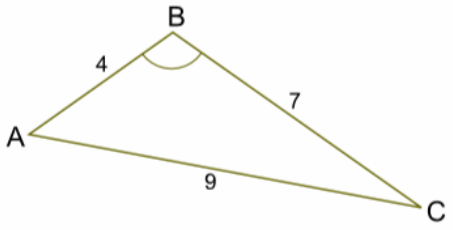


$d^2 = e^2 + f^2 - 2ef\cos D$

$d^2 = 8.6^2 + 12.0^2 - 2(8.6)(12.0)\cos 55 = 99.57$

$d = 10.0$

4. Determine the measure of $\angle B$, to the nearest degree.



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

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

$a = 7$
$b = 9$
$c = 4$

$\cos B = \frac{7^2 + 4^2 - 9^2}{2(7)(4)} = \frac{-16}{56}$

$B = \cos^{-1}\left(\frac{-16}{56}\right) = 106.602$

$= 107$

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$\frac{t}{\sin 71} = \frac{8.7}{\sin 60}$ $\quad t = \frac{8.7(\sin 71)}{\sin 60}$

5. In $\Delta TUV, u = 8.7\ m, v = 7.6\ m$, and $\angle U = 60°$. Solve the triangle; round angles to the nearest degree and sides to the nearest tenth.

II. III.

$T = 71° \quad t = 9.5$

$U = 60° \quad u = 8.7$

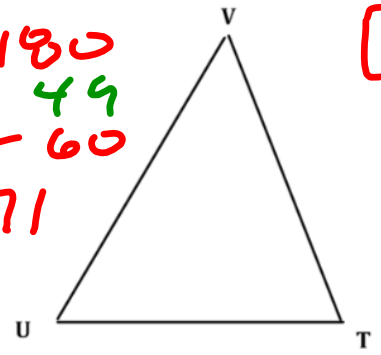
$V = 49° \quad v = 7.6$

I.

LAW SINE

$T = 180 - 49 - 60$

$T = 71$

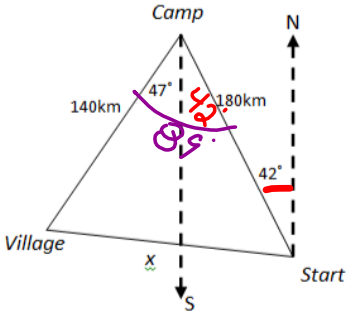


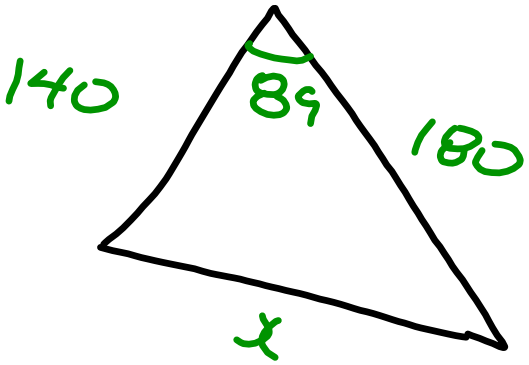
$\frac{8.7}{\sin 60} = \frac{7.6}{\sin V}$

$\sin V = \frac{7.6(\sin 60)}{8.7}$

$V = \sin^{-1}(.7565) = 49$

6. A bush pilot delivers supplies to a remote camp by flying 180 km in the direction N42°W. While at the camp, the pilot receives a radio message to pick up a passenger at a village. The village is 140 km S47°W from the camp. The pilot collects the passenger and flies back to his starting point. How far is the final leg of his trip?





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

$x^2 = 140^2 + 180^2 - 2(140)(180)\cos 89$

$x^2 = 51120$

$x = 226\ km$