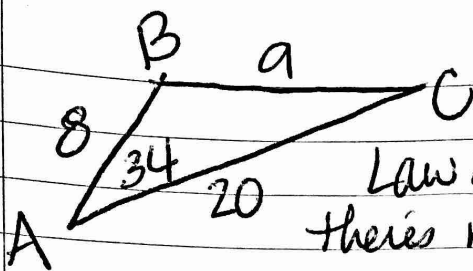


Top Problem is a doozy! (Day 02 Law of Sines & Cosines)



Law of cosines b/c there's no opp. a side!

$$a \approx 14.10$$

$$B = 52^\circ 29' \quad 127^\circ 31'$$

$$C = 18^\circ 30'$$

$$\sqrt{a^2} = \sqrt{8^2 + 20^2 - 2(8)(20)\cos 34} = 14.096$$

$$20^2 > 8^2 + 14.10^2$$

$$400 > 262.81$$

$$\frac{\sin 34}{14.10} = \frac{\sin B}{20} = \frac{\sin C}{8}$$

obtuse A
 $\angle B$ should be obtuse!

$$\sin B = \frac{20 \sin 34}{14.10}$$

$$\sin C = \frac{8 \sin 34}{14.10}$$

$$B = \sin^{-1}\left(\frac{20 \sin 34}{14.10}\right)$$

$$C = \sin^{-1}\left(\frac{8 \sin 34}{14.10}\right)$$

$$B = 52.48 = 52^\circ 29'$$

$$C = 18.498 \approx 18^\circ 30'$$

B should be obtuse

$$180 - 52.48 = 127.52 = 127^\circ 31'$$

This problem is an example of a deeper level problem.

If you use the law of cosines to get B; knowing it is obtuse:

$$20^2 = 8^2 + 14.10^2 - 2(8)(14.10)\cos B$$

$$137.19 = \cos B \quad 127.538 = B$$

$$-225.16 \quad B = 127^\circ 32'$$

$$C = 180^\circ - (127^\circ 32' + 34^\circ)$$

$$180 - 161^\circ 32' = 179^\circ 60'$$

$$- 161^\circ 32'$$

$$18^\circ 28'$$

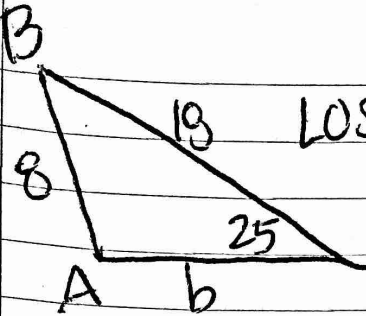
$$a \approx 14.10$$

$$B = 127^\circ 32'$$

$$C = 18^\circ 28'$$

If you use the law of sines, you might have to do deeper thinking for a problem, but if you use the law of cosines to find the obtuse angle first, you'll get it right every time!

This is only a problem if the triangle is obtuse. If it is acute, the method you choose won't matter.

1.  LOS: $\frac{\sin 25}{8} = \frac{\sin B}{b} = \frac{\sin A}{18}$

$A = 71^{\circ}58'$
 $B = 83^{\circ}2'$
 $b = 18.79$

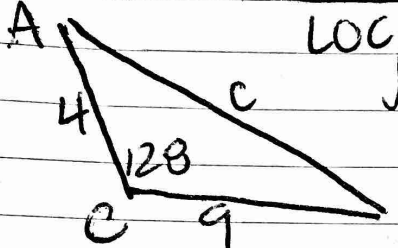
$\sin A = \frac{18 \sin 25}{8}$

$A = 71.969 = 71^{\circ}58'$

$b \sin 25 = 8 \sin 83^{\circ}2'$

$b = \frac{8 \sin 83^{\circ}2'}{\sin 25} = 18.789$

$\begin{array}{r} 179\ 60 \\ - 96\ 58 \\ \hline 83^{\circ}2' \end{array}$

2.  LOC: $\sqrt{c^2} = \sqrt{4^2 + 9^2 - 2(4)(9)\cos 128}$

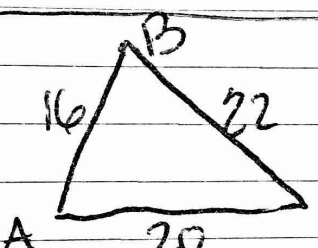
$C = 11.89$
 $A = 36^{\circ}37'$
 $B = 15^{\circ}23'$

$\frac{\sin A}{9} = \frac{\sin 128}{11.89}$

$\sin A = \frac{9 \sin 128}{11.89}$

$A = 36.62^{\circ}$

$\begin{array}{r} 179\ 60 \\ - 104\ 37 \\ \hline \end{array}$

3.  SSS = LOC

$A = 74^{\circ}25'$
 $B = 61^{\circ}17'$
 $C = 44^{\circ}28'$

$22^2 = 16^2 + 20^2 - 2(16)(20)\cos A$

$484 = 656 - 640 \cos A$

$-172 = -640 \cos A$

$\cos A = \frac{172}{640}$

$A = 74.41$

$22^2 = 16^2 + 20^2 - 2(16)(20)\cos B$

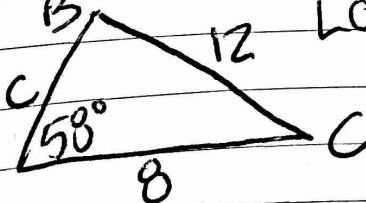
$484 = 656 - 640 \cos B$

$-172 = -640 \cos B$

$\cos B = \frac{172}{640}$

$B = 61.12$

$\begin{array}{r} 179\ 60 \\ - 135\ 32 \\ \hline 44\ 28' \end{array}$

4.  LOS: $\frac{\sin 58}{8} = \frac{\sin B}{12}$

$C = 14.14$
 $B = 34^{\circ}26'$
 $C = 87^{\circ}34'$

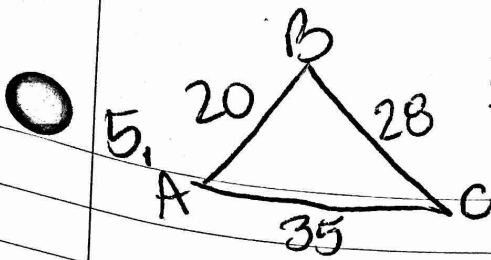
$\sin B = \frac{8 \sin 58}{12}$

$\frac{\sin 87^{\circ}34'}{c} = \frac{\sin 58}{12}$

$c \sin 58 = 12 \sin 87^{\circ}34'$

$c = \frac{12 \sin 87^{\circ}34'}{\sin 58} = 14.137$

$\begin{array}{r} C = 179\ 60 \\ - 92\ 26 \\ \hline 87^{\circ}34' \end{array}$



SSS = LOC
 $35^2 > 20^2 + 28^2$
 obtuse A

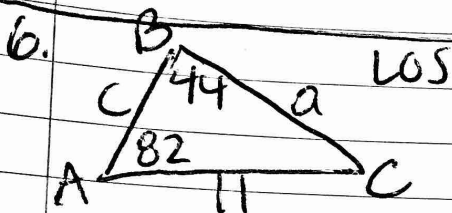
$$A = 53^{\circ} 5'$$

$$B = 92^{\circ} 6'$$

$$C = 34^{\circ} 49'$$

$35^2 = 20^2 + 28^2 - 2(20)(28)\cos B$ $28^2 = 20^2 + 35^2 - 2(20)(35)\cos A$
 $\frac{41}{-1120} = \cos B = 92.097$ $\frac{-841}{-1400} = \cos A = 53.078$

$C = 180 - (A+B) = 179 60$
 $\frac{-145}{34} \frac{11}{49}$



LOS
 $\frac{\sin 44}{11} = \frac{\sin 82}{a} = \frac{\sin 54}{c}$

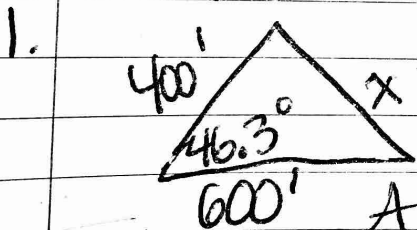
$$a = 15.68$$

$$c = 12.81$$

$$C = 54^{\circ}$$

$a \sin 44 = 11 \sin 82$
 $c \sin 44 = 11 \sin 54$
 $a = \frac{11 \sin 82}{\sin 44} = 15.68$
 $c = \frac{11 \sin 54}{\sin 44} = 12.81$

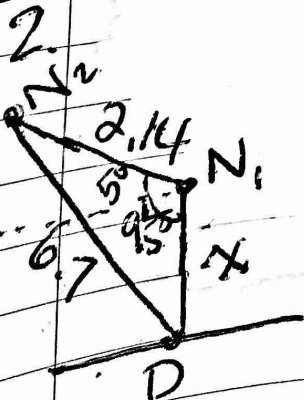
APPLICATIONS:



$x^2 = 400^2 + 600^2 - 2(400)(600)\cos 46.3$
 $x = 434.02$

$P = 400 + 600 + 434.02 = 1434.02 \text{ feet}$
 Area = $\frac{1}{2}(400)(600)\sin 46.3$

$A = 86756.06 \text{ ft}^2$

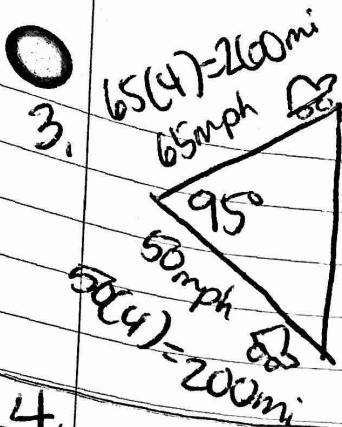


$\frac{\sin 95}{6.7} = \frac{\sin D}{2.14}$
 $2.14 \sin 95 = 6.7 \sin D$

$\frac{\sin 66.45}{x} = \frac{\sin 95}{6.7}$
 $x \sin 95 = 6.7 \sin 66.45$
 $x = \frac{6.7 \sin 66.45}{\sin 95}$

$D = 18.55^{\circ}$
 $N_2 = 180 - 95 - 18.55 = 66.45^{\circ}$

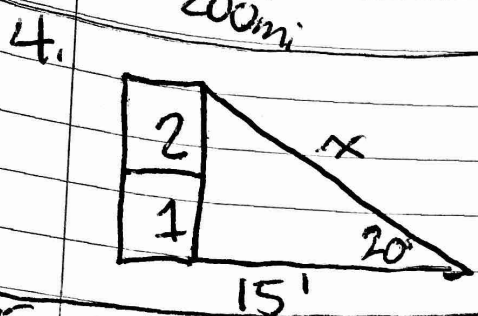
$x = 6.17 \text{ miles}$



$$D = r \cdot t$$

$$\sqrt{x^2} = \sqrt{200^2 + 260^2 - 2(200)(260)\cos 95}$$

$$x = 341.56 \text{ miles apart}$$

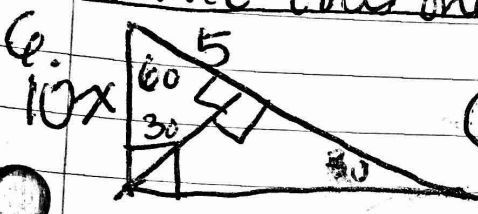


$$\cos 20 = \frac{15}{x}$$

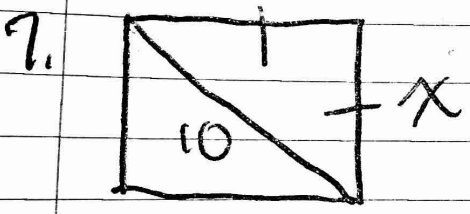
$$x = \frac{15}{\cos 20}$$

$$x = 15.96 \text{ feet}$$

5. Omit this one :)



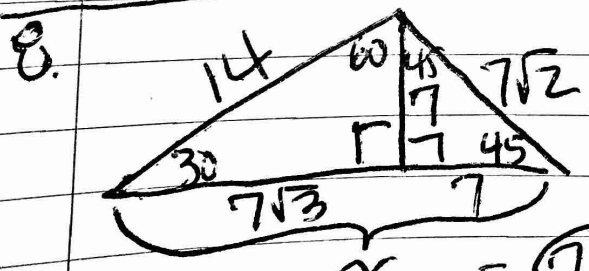
$$x = 10$$



$$x\sqrt{2} = 10$$

$$x = \frac{10\sqrt{2}}{\sqrt{2}\sqrt{2}} = \frac{10\sqrt{2}}{2} = 5\sqrt{2}$$

$$\text{Perimeter} = 5\sqrt{2} \cdot 4 = 20\sqrt{2}$$



$$x = 7\sqrt{3} + 7$$

You could use a calculator & get decimal approximations too.

$$\text{Per} = 14 + 7\sqrt{2} + 7\sqrt{3} + 7 = 21 + 7\sqrt{2} + 7\sqrt{3}$$