Honors PreCalculus Name_____

Law of Sines Review Problems

Use the Law of Sines to solve the following triangles. If two triangles exist, solve both of them.

1. ΔABC; A = 40°, B = 30°, b = 10

$\frac{10}{\sin 30^\circ} = \frac{a}{\sin 40^\circ}$

$a \approx 12.86$

$\frac{c}{\sin 110^\circ} = \frac{10 \sin 110^\circ}{\sin 30^\circ}$ $c \approx 18.79$

$C = 110^\circ$
$a \approx 12.86$
$c \approx 18.79$

2. ΔBCD; B = 16°, C = 103°, c = 12

$\frac{b}{\sin 61^\circ} = \frac{12 \sin 16^\circ}{\sin 103^\circ}$

$b \approx 3.39$

$\frac{a}{\sin 61^\circ} = \frac{12 \sin 103^\circ}{\sin 103^\circ}$

$a \approx 10.77$

$A = 61^\circ$
$b \approx 3.39$
$a \approx 10.77$

3. ΔABC; A = 32°, a = 17, b = 11 ONE Δ

$\frac{\sin B}{11} = \frac{\sin 32^\circ}{17}$

$B = \sin^{-1}\left(\frac{11 \sin 32^\circ}{17}\right) \approx 20^\circ$

$\frac{c}{\sin 128^\circ} = \frac{17 \sin 128^\circ}{\sin 32^\circ}$

$B = 20^\circ$
$C = 128^\circ$
$c \approx 25.28$

4. ΔEFG; F = 73°, f = 24, g = 28

$\frac{\sin G}{28} = \frac{\sin 73^\circ}{24}$

$G = \sin^{-1}\left(\frac{28 \sin 73^\circ}{24}\right)$

$G \approx$ UNDEF

NO Δ

5. ΔPQR; P = 30°, q = 18, p = 9

$\frac{\sin Q}{18} = \frac{\sin 30^\circ}{9}$

$Q = 90^\circ$

$18^2 - 9^2 = r^2$

$r \approx 15.59$

$Q = 90^\circ$
$R = 60^\circ$
$r = 15.59$

6. ΔJKL; J = 64°, j = 16, k = 17 2 Δs

$\frac{\sin K}{17} = \frac{\sin 64^\circ}{16}$

$K \approx 72.74^\circ$

107.26

$\frac{l_1}{\sin 43.26} = \frac{16 \sin 43.26}{\sin 64}$

$\frac{l_2}{\sin 107.26} = \frac{16 \sin 8.74}{\sin 64}$

$K_1 \approx 72.74^\circ$
$K_2 \approx 107.26^\circ$
$L_1 \approx 43.26^\circ$
$L_2 \approx 8.74^\circ$
$l_1 \approx 12.2$
$l_2 \approx 2.8$

7. ΔABC; A = 136°, a = 15, b = 28

$\frac{\sin B}{28} = \frac{28 \sin 136^\circ}{15}$

$B \approx$ UNDEF

NO Δ

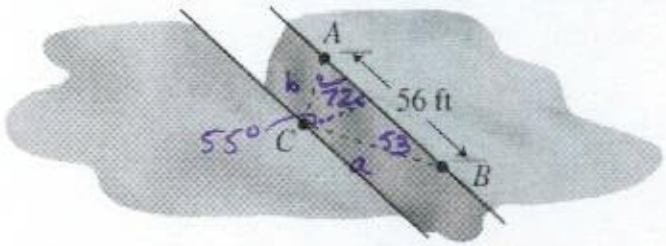
8. ΔUSA; U = 19°, s = 22, S = 47°

$\frac{u}{\sin 114^\circ} = \frac{22 \sin 19^\circ}{\sin 47^\circ}$

$\frac{a}{\sin 114^\circ} = \frac{22 \sin 114^\circ}{\sin 47^\circ}$

$A = 114^\circ$
$u \approx 9.79$
$a \approx 27.48$

9. Two markers A and B on the same side of a canyon rim are 56 feet apart. A third marker C, located across the rim, is positioned so that angle $BAC = 72°$ and angle $ABC = 53°$.



a. Find the distance between C and A. (b)

$$\frac{b}{\sin 53^\circ} = \frac{56 \sin 53^\circ}{\sin 55}$$

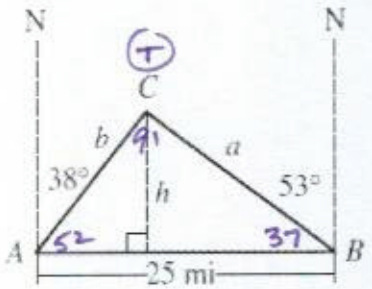
$b \approx 54.6$ ft

b. Find the distance between the two canyon rims (Assume they are parallel).

$$\sin 72^\circ = \frac{d}{b}$$

$d = b \sin 72^\circ \approx 51.9$ ft

10. Two meteorologists are 25 miles apart, located on an East-West road. The meteorologist at point A sights a tornado 38° East of North. The meteorologist at point B sights the same tornado at 53° West of North. Find the distance from each meteorologist to the tornado. Also find the distance between the tornado and the road.



$$\frac{a}{\sin 53^\circ} = \frac{25 \sin 52^\circ}{\sin 91^\circ} \qquad \frac{b}{\sin 37^\circ} = \frac{25 \sin 37^\circ}{\sin 91^\circ}$$

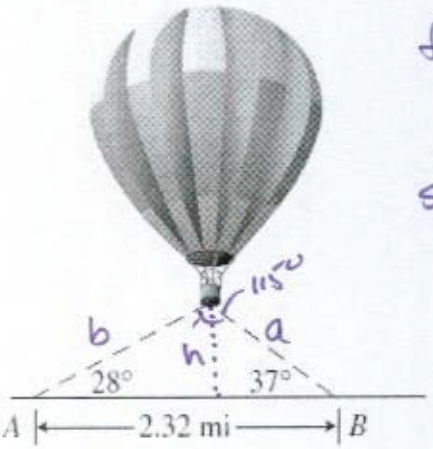
$a \approx 19.7$ mi $\qquad b \approx 15.1$ mi

$$\sin 37^\circ = \frac{h}{a}$$

$h = a \sin 37^\circ$ or $h = b \sin 52^\circ$

$h \approx 11.9$ mi

11. Observers 2.32 miles apart see a hot-air balloon directly between them, but at the angles of elevation shown in the figure. Find the altitude of the balloon.



find either a or b ...

$$\frac{a}{\sin 28^\circ} = \frac{2.32}{\sin 115} \qquad \frac{b}{\sin 37^\circ} = \frac{2.32}{\sin 115}$$

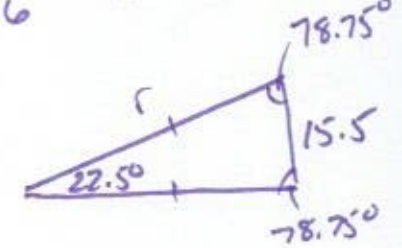
$a \approx 1.2$ mi $\qquad b \approx 1.5$ mi

$h = a \sin 37^\circ$ or $b \sin 28^\circ$

$h \approx 0.72$ mi (≈ 3819 ft)

12. A Ferris wheel has 16 evenly spaced cars. The distance between adjacent chairs is 15.5 feet. Find the radius of the wheel (to the nearest 0.1 feet).

$\frac{360}{16} = 22.5°$



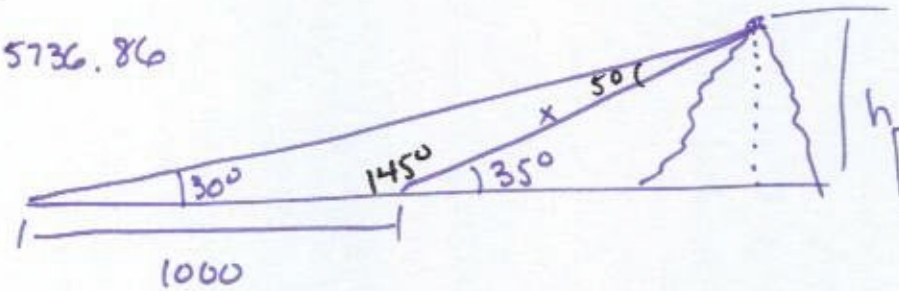
$\frac{r}{\sin 78.75°} = \frac{15.5}{\sin 22.5°}$

$r \approx 39.7 \text{ ft}$

13. While hiking on a level path toward Colorado's front range, Otis Evans determines that the angle of elevation to the top of Long's Peak is 30°. Moving 1000 feet closer to the mountain, Otis determines the angle of elevation to be 35°. How much higher is the top of Long's Peak than Otis's elevation?

$\frac{x}{\sin 30°} = \frac{1000 \sin 30°}{\sin 5°}$

$x = \frac{500}{\sin 5°} \approx 5736.86$

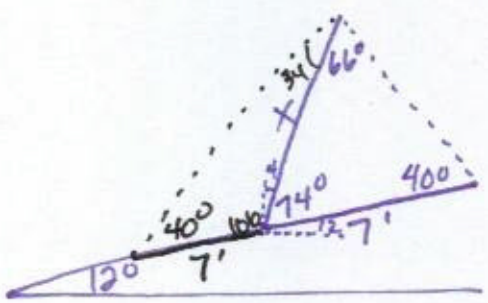


$\sin 35° = \frac{h}{x}$

$h = x \sin 35°$

$h \approx 3290.53 \text{ ft}$

14. A street sign that is on a hill with a 12° incline is leaning at a 4° angle from the vertical. It casts a shadow that is 7 feet long when the sun's angle of elevation is 40º. What is the length of the street sign's post? (How would your answer change if the sun is on the other side of the sign?)



$\frac{x}{\sin 40°} = \frac{7 \sin 40°}{\sin 66°}$

$x = \frac{7 \sin 40°}{\sin 66°} \approx 5.2 \text{ ft}$

$\frac{x}{\sin 40°} = \frac{7}{\sin 34°}$

$x = \frac{7 \sin 40°}{\sin 340} \approx 8.1 \text{ ft}$