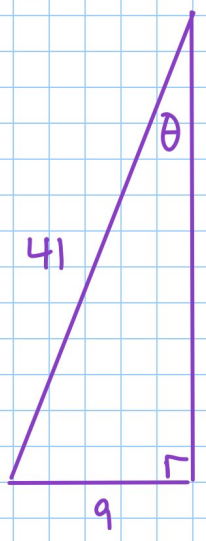
Precalc Ch 7 PPP

1) Find the exact value of the six trig functions of θ.

$\sin\theta = \frac{9}{41}$ $\quad \csc\theta = \frac{41}{9}$

$\cos\theta = \frac{40}{41}$ $\quad \sec\theta = \frac{41}{40}$

$\tan\theta = \frac{9}{40}$ $\quad \cot\theta = \frac{40}{9}$



$b^2 + 9^2 = 41^2$

$b^2 + 81 = 1681$

$b^2 = 1600$

$b = 40$

Formulas:

$\sin\theta = \frac{opp}{hyp}$ $\quad \csc\theta = \frac{hyp}{opp}$

$\cos\theta = \frac{adj}{hyp}$ $\quad \sec\theta = \frac{hyp}{adj}$

$\tan\theta = \frac{opp}{adj}$ $\quad \cot\theta = \frac{adj}{opp}$

2) Solve the triangle with $a = 16$, $\beta = 34^\circ$, and $\alpha = 71^\circ$

Find its area

$\gamma = 180 - 34 - 71 = 75^\circ$ $\qquad \gamma = \underline{75^\circ}$

$\frac{\sin 71^\circ}{16} = \frac{\sin 34^\circ}{b}$ $\qquad \frac{\sin 71^\circ}{16} = \frac{\sin 75^\circ}{c}$ $\qquad b = \underline{9.46}$

$\frac{b\sin 71^\circ}{\sin 71^\circ} = \frac{16\sin 34^\circ}{\sin 71^\circ}$ $\qquad \frac{c\sin 71^\circ}{\sin 71^\circ} = \frac{16\sin 75^\circ}{\sin 71^\circ}$ $\qquad c = \underline{16.35}$

$b = 9.46$ $\qquad C = 16.35$ $\qquad \text{Area} = \underline{73.10}$

$A = \frac{1}{2}ab\sin\gamma = \frac{1}{2}\cdot 16 \cdot 9.46 \cdot \sin 75^\circ = 73.10$

Formulas: Law of Sines

$\frac{\sin\alpha}{a} = \frac{\sin\beta}{b} = \frac{\sin\gamma}{c}$

$\alpha + \beta + \gamma = 180^\circ$

$A = \frac{1}{2}ab\sin\gamma$

3) Solve the triangle with $a = 9.3,\ b = 40.1,\ c = 43.2$

Find its area.

$$\cos\gamma = \frac{(9.3^2 + 40.1^2 - 43.2^2)}{(2 \cdot 9.3 \cdot 40.1)} = -0.2303$$

$$\gamma = \cos^{-1}(-.2303) = 103.3^\circ$$

$$\cos\beta = \frac{(9.3^2 + 43.2^2 - 40.1^2)}{(2 \cdot 9.3 \cdot 43.2)} = 0.4290$$

$$\beta = \cos^{-1}(.4290) = 64.6^\circ$$

$$\alpha = 180 - 103.3 - 64.6 = 12.1^\circ$$

$$A = \frac{1}{2}ab\sin\gamma = \frac{1}{2} \cdot 9.3 \cdot 40.1 \sin 103.3^\circ = 181.46$$

$\alpha =$ 12.1°

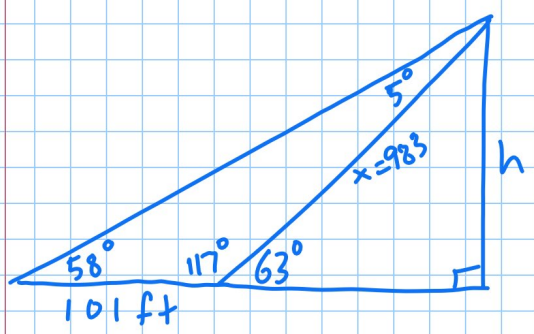
$\beta =$ 64.6°

$\gamma =$ 103.3°

Area = 181.46

Formulas: $\cos\gamma = \frac{a^2 + b^2 - c^2}{2ab}$ $\cos\beta = \frac{a^2 + c^2 - b^2}{2ac}$ $\cos\alpha = \frac{b^2 + c^2 - a^2}{2bc}$

4) A person stands away from a monument, looking up at the top. The angle of elevation to the top of the monument is 63°. The person then walks 101 ft directly away from the monument and measures the angle of elevation as 58°. How tall is the monument?



$$\frac{\sin 5^\circ}{101} = \frac{\sin 58^\circ}{x}$$

$$x = \frac{101 \sin 58^\circ}{\sin 5^\circ}$$

$$x = 983 \text{ ft}$$

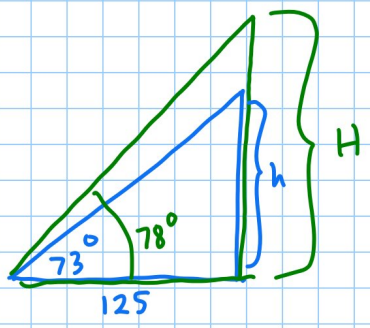
$$\sin 63^\circ = \frac{h}{983}$$

$$h = 983 \sin 63^\circ$$

$$h = 876 \text{ ft}$$

Formulas: $\frac{\sin\alpha}{a} = \frac{\sin\beta}{b}$ and $\sin\theta = \frac{\text{opp}}{\text{hyp}}$

5) An admirer of art is looking at a statue on top of a building. If the admirer is 125 m from the building how tall is the statue if the angle of elevation to the bottom of the statue is 73° and to the top of the statue is 78°?



$\tan 73^\circ = \frac{h}{125}$ $\qquad$ $\tan 78^\circ = \frac{H}{125}$

$h = 125 \tan 73^\circ$ $\qquad$ $H = 125 \tan 78^\circ$

$h = 409\text{ m}$ $\qquad$ $H = 588\text{ m}$

So statue is $588 - 409 =$ **179 m**

Formula: $\tan\theta = \frac{opp}{adj}$

6) Sonny and Cher are carpeting a weird triangular stage for a performance. The dimensions of the stage are 65 ft by 75 ft by 100 ft. If the carpeting costs $11 per square yard, how much will they spend on carpeting? (Have to round up, can't buy a fraction of a yd^2)

$s = \frac{1}{2}(65+75+100) = 120$

$A = \sqrt{120(120-65)(120-75)(120-100)} = \sqrt{120 \cdot 55 \cdot 45 \cdot 20}$

$A = 2437.21\ \cancel{ft^2} \cdot \frac{1\ yd^2}{9\ \cancel{ft^2}} = 270.8\ yd^2$

So need $271\ yd^2 \times \$11/yd^2 =$ **$2981**

Formulas: $A = \sqrt{s(s-a)(s-b)(s-c)}$

$s = \frac{1}{2}(a+b+c)$

$1\ yd^2 = 9\ ft^2$