Warm up

1. **To approximate the length of a marsh, a surveyor walks 250m from point A to point B, then turns and walks 220m to point C. If ngle B is 105°, find the length of AC.**

$(2350)^2 = (2323)^2$...

2. **The distance on a map from the airport in Miami, FL to the one in Nassau, Bahamas is 295 kilometers due east. Bangor, Maine is northeast of both cities; its airport is 2350 kilometers from Miami and 2323 kilometers from Nassau. What bearing would a <u>plane</u> need to take to fly from Nassau to Bangor?**

91.5°

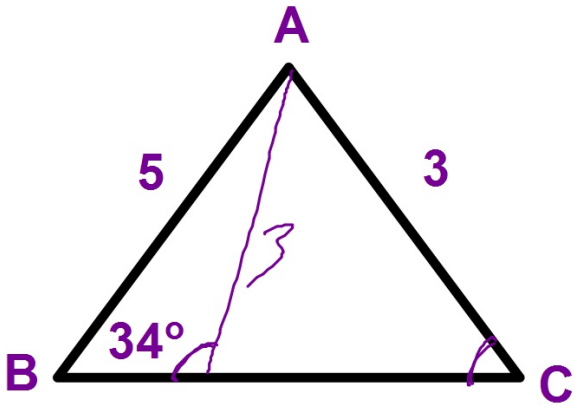
Homework:

7) 4585.8 feet
8) 171.5 meters

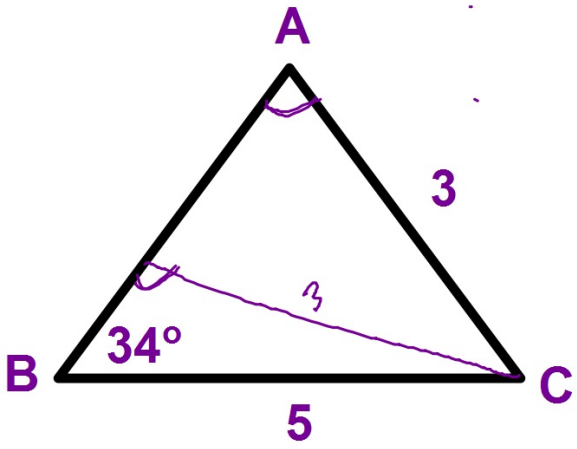
3) 5.18 meters
4) 120 meters; 105.5 meters
5) 157.7 meters
7) 8.4 km

Correction...

1) B = 34° b = 3 c = 5



2) B = 34° b = 3 a = 5



5.1 Fundamental Identities

Objective: Simplify expressions using trigonometric identities.

Fundamental Identities

Recipricoal Identities

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sin\theta = \frac{1}{\csc\theta}$$

$$\sec\theta = \frac{1}{\cos\theta} \qquad \cos\theta = \frac{1}{\sec\theta}$$

$$\cot\theta = \frac{1}{\tan\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

Quotient Identities

$$\tan u = \frac{\sin u}{\cos u} \qquad \cot u = \frac{\cos u}{\sin u}$$

Pythogrean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

CoFunction Identities

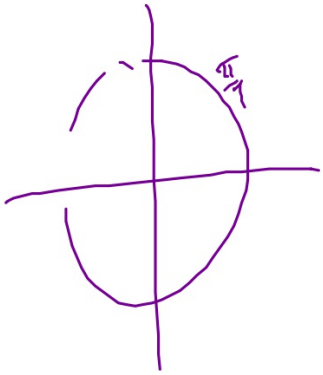
$$\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta \qquad \cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$$

$$\csc\left(\frac{\pi}{2} - \theta\right) = \sec\theta \qquad \sec\left(\frac{\pi}{2} - \theta\right) = \csc\theta$$

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta \qquad \cot\left(\frac{\pi}{2} - \theta\right) = \tan\theta$$

Even odd Identities

$$\sin(-\theta) = -\sin\theta \qquad \csc(-\theta) = -\csc\theta$$
$$\cos(-\theta) = \cos\theta \qquad \sec(-\theta) = \sec\theta$$
$$\tan(-\theta) = -\tan\theta \qquad \cot(-\theta) = -\cot\theta$$



Simplify: $\sec x \tan^2 x + \sec x$

$\sec x(\tan^2 x + 1)$

$\sec x(\sec^2 x)$

$\sec^3 x$

Factor each expression.

a. $\sec^2\theta - 1$

$(\sec\theta + 1)(\sec\theta - 1)$

b. $4\tan^2\theta + \tan\theta - 3$

$u = \tan\theta$

$4u^2 + u - 3$

$(4u - 3)(u + 1)$

$(4\tan\theta - 3)(\tan\theta + 1)$

Factor $\csc^2 x - \cot x - 3$.

$(1 + \cot^2 x) - \cot x - 3$

$\cot^2 x - \cot x - 2$

$(\cot x - 2)(\cot x + 1)$

Simplify $\sin t + \cot t \cos t$.

$$\sin t + \frac{\cos t}{\sin t} \cdot \frac{\cos t}{1}$$

$$\frac{\sin t}{\sin t} \cdot \frac{\sin t}{1} + \frac{\cos^2 t}{\sin t}$$

$$\frac{\sin^2 t}{\sin t} + \frac{\cos^2 t}{\sin t}$$

$$\frac{1}{\sin t} \boxed{\csc t}$$

Perform the addition and simplify.

$$\frac{\sin\theta}{1+\cos\theta}+\frac{\cos\theta}{\sin\theta}$$

$$\frac{\sin\theta-\cos\theta\sin\theta}{1-\cos^2\theta}+\frac{\cos\theta}{\sin\theta}\cdot\frac{\sin\theta}{\sin\theta}$$

$$\sin^2\theta$$

$$\frac{\sin\theta-\cos\theta\sin\theta+\cos\theta\sin\theta}{\sin^2\theta}=\frac{1}{\sin\theta}=\csc\theta$$

Rewrite $\dfrac{1}{1 + \sin x}$ so that it is *not* in fractional form.

$\dfrac{1-\sin x}{1-\sin^2 x}$ $\dfrac{1-\sin x}{\cos^2 x}$ $\dfrac{\sin x}{\cos x} \cdot \dfrac{1}{\cos x}$

$\dfrac{1}{\cos^2 x} - \dfrac{\sin x}{\cos^2 x}$

$\sec^2 x - \tan x \cdot \sec x$

Simplify the following expressions.

1) $\sin x \cot x$

2) $\frac{\sec x}{\csc x}$

3) $\frac{1-\sin^2 x}{\cos x}$

4) $\sin t - \sin t \cos^2 t$

5) $\cos x + \tan x \sin x$

6) $\sin^3 x + \sin x \cos^2 x$

7) $\frac{\csc x - \sin x}{\csc x}$

8) $\frac{\sin x}{\cos x} + \frac{\cos x}{1+\sin x}$

1) $\sin x \cot x = \sin x \cdot \frac{\cos x}{\sin x} = \cos x$

2) $\frac{\sec x}{\csc x} = \frac{\frac{1}{\cos x}}{\frac{1}{\sin x}} = \frac{1}{\cos x} \cdot \frac{\sin x}{1} = \frac{\sin x}{\cos x} = \tan x$

3) $\frac{1-\sin^2 x}{\cos x} = \frac{\cos^2 x}{\cos x} = \cos x$

4) $\sin t - \sin t \cos^2 t = \sin t \cdot (1 - \cos^2 t) = \sin t \cdot \sin^2 t = \sin^3 t$

5) $\cos x + \tan x \sin x = \cos x + \frac{\sin x}{\cos x} \cdot \sin x = \frac{\cos^2 x + \sin^2 x}{\cos x} = \frac{1}{\cos x} = \sec x$

6) $\sin^3 x + \sin x \cos^2 x = \sin x \cdot (\sin^2 x + \cos^2 x) = \sin x$

7) $\frac{\csc x - \sin x}{\csc x} = \frac{\csc x}{\csc x} - \frac{\sin x}{\csc x} = 1 - \sin^2 x = \cos^2 x$

8) $\frac{\sin x}{\cos x} + \frac{\cos x}{1+\sin x} = \frac{\sin x \cdot (1+\sin x) + \cos x \cdot \cos x}{\cos x \cdot (1+\sin x)} = \frac{\sin x + \sin^2 x + \cos^2 x}{\cos x \cdot (1+\sin x)} = \frac{\sin x + 1}{\cos x \cdot (1+\sin x)} = \frac{1}{\cos x} = \sec x$

Exit Ticket:

1. A plane flies at a bearing of N35°E for 250 km, it then changes bearings and flies directly east for 450 km. How far is the plane from where it started?

2. Solve the triangle for all possible solutions
$A = 32^{o}$ $a = 6$ $c = 4$

3) Simplify: