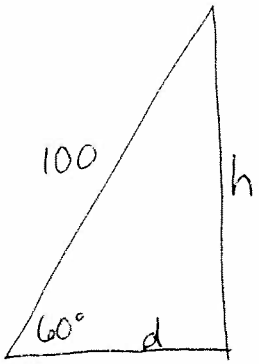
/22K	/9A	/C	/8T	Total	/39

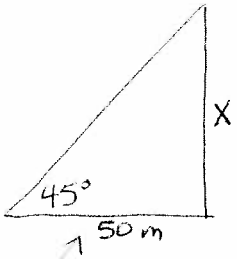
Name: Answers Date: _____

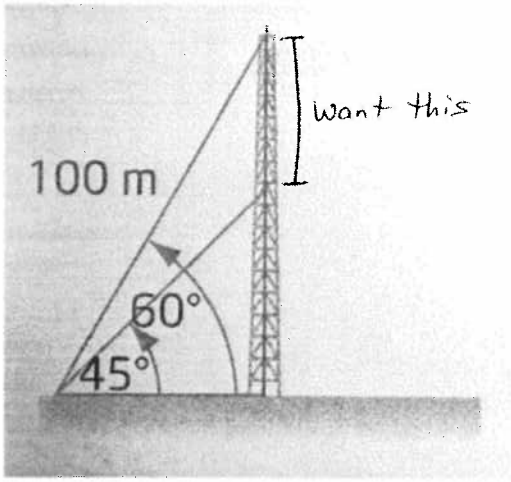
MCR3U Quiz: Trigonometry Cosine law: $c^2 = a^2 + b^2 - 2ab\cos C$

/4 A

1. A radio antenna is supported by guy wires. One guy wire is 100 m long and runs from the top of the antenna to an anchor point on the ground so that it makes an angle of 60 degrees with the ground. A second guy wire is being attached from the same anchor point to the antenna as shown in the diagram. Determine the space between the two points where the guy wires attach to the antenna.







$\sin 60° = \frac{h}{100}$

$h = 100 \sin 60°$

$= 86.60$ m

$\cos 60° = \frac{d}{100}$

$d = 100 \cos 60°$

$d = 50$ m

$\tan 45° = \frac{x}{50}$

$x = 50 \tan 45°$

$= 50$ m

∴ Distance between guy wires is $86.6\text{m} - 50\text{m}$

$= 36.6$ m

/4 T

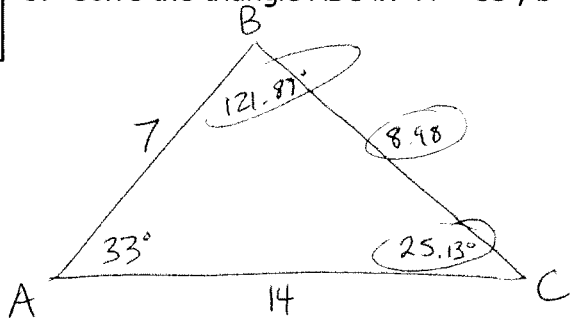
2. Determine another angle that has the same trigonometric ratio as the angle given. Sketch each angle.

a) $\tan 20°$

b) $\cos 140°$

/5 K

3. Solve the triangle ABC if: A = 33°, b = 14 ft, c = 7 ft.



① Cosine Law!

$a^2 = 7^2 + 14^2 - 2(7)(14)\cos 33°$

$a^2 = 80.62$

$a = 8.98$ ft

② Solve for Angle C next. If you solve for angle B, the angles won't add up to 180°. This is because $\angle B$ is OBTUSE.

$$\frac{8.98}{\sin 33°} = \frac{7}{\sin C}$$

$7\sin 33° = 8.98 \sin C$

$\sin C = \frac{7\sin 33°}{8.98}$

$\sin C = 0.4246$

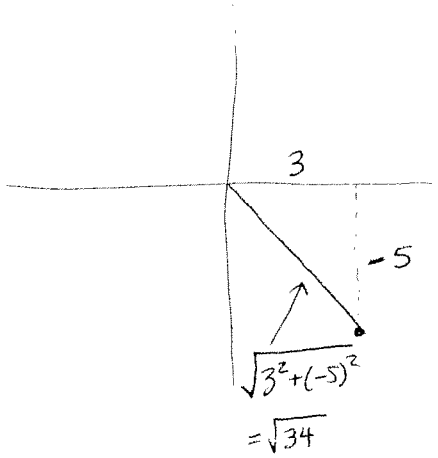
$\angle C = 25.13°$

$\angle B = 180° - 33° - 25.13°$

$\angle B = 121.87°$

/3 K

4. Determine an exact value for $\sin\theta$ if the point $(3, -5)$ lies on the terminal arm of θ.



$\sin\theta = \frac{-5}{\sqrt{34}}$

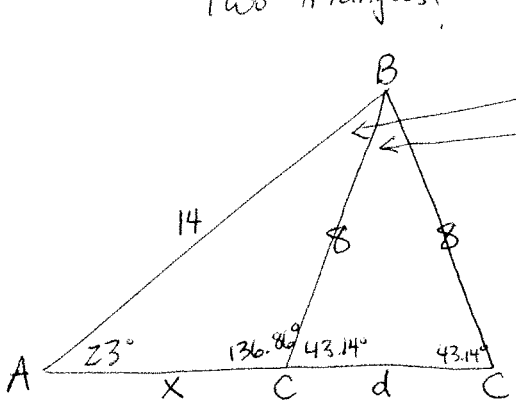
/5
K

5. Determine the missing angles in triangle ABC if: A = 23°, a = 8 m, c = 14 m.

$c \sin A = 14 \sin 23° = 5.47$ m

a is longer than minimum.

Two triangles!



(2) $180° - 23° - 136.86° = 20.14°$

$180° - 43.14° - 43.14° = 93.72°$

(3) $\frac{8}{\sin 23°} = \frac{X}{\sin 20.14°}$

$X = \frac{8 \sin 20.14°}{\sin 23°}$

$X = 7.05$ m

(1) $\frac{14}{\sin C} = \frac{8}{\sin 23°}$

$14 \sin 23° = 8 \sin C$

$\sin C = \frac{14 \sin 23°}{8}$

$\sin C = 0.6838$

$\angle C = 43.14°$

This is clearly the ACUTE angle.

The obtuse one is $180° - 43.14° = 136.86°$

$\frac{8}{\sin 43.14°} = \frac{d}{\sin 93.72°}$

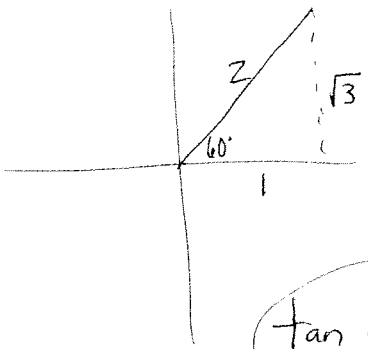
$d = \frac{8 \sin 93.72°}{\sin 43.14°}$

$d = 11.67$ m

/5
K

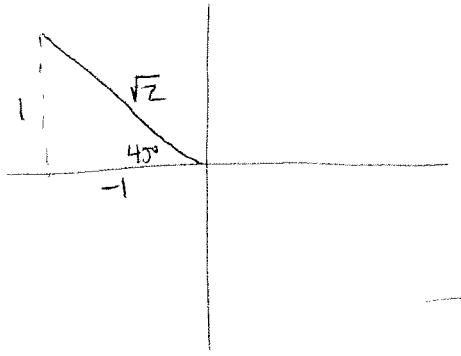
6. Determine the exact value of each trigonometric ratio. Show your work.

a) $\tan 60°$



$\tan 60° = \frac{\sqrt{3}}{1}$

b) $\cos 135°$



$\cos 135° = \frac{-1}{\sqrt{2}}$

Quotient Identity	Pythagorean Identity	Reciprocal Identities		
$\tan\theta = \frac{\sin\theta}{\cos\theta}$	$\sin^2\theta + \cos^2\theta = 1$	$\csc\theta = \frac{1}{\sin\theta}$	$\sec\theta = \frac{1}{\cos\theta}$	$\cot\theta = \frac{1}{\tan\theta}$

/4 K

/4 T

8. Use the basic identities provided above to prove the following identities.

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

$LS = \frac{1}{\cos^2\theta}$

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

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

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

$= \frac{1}{\cos^2\theta}$ ✓

b) $\tan^2\theta - \sin^2\theta = \tan^2\theta\sin^2\theta$

$LS: \frac{\sin^2\theta}{\cos^2\theta} - \sin^2\theta$

$RS: \frac{\sin^2\theta}{\cos^2\theta}\sin^2\theta$

$= \frac{\sin^2\theta}{\cos^2\theta}(1 - \cos^2\theta)$

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

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

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

✓