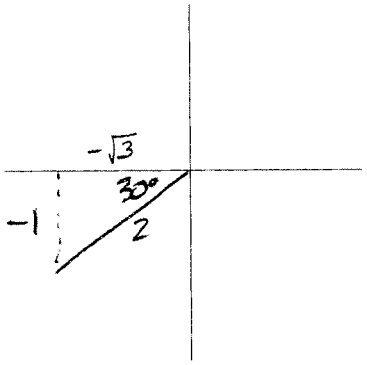
MCR3U – Unit 4 (Trigonometry) Test

Show all related work. **Name:** Answers
Include units if applicable.

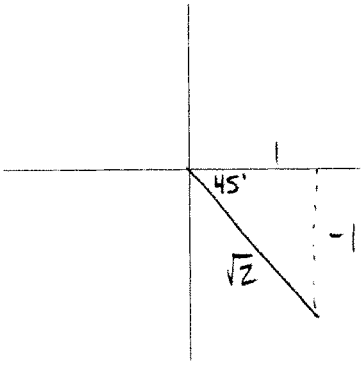
16 K	11 T	5 C	14 A	46 Total

1. Please give the **exact** trigonometric ratios that correspond to the following angles. Include a sketch of the angle!

a) $\tan 210^\circ = \boxed{\frac{-1}{-\sqrt{3}}}$

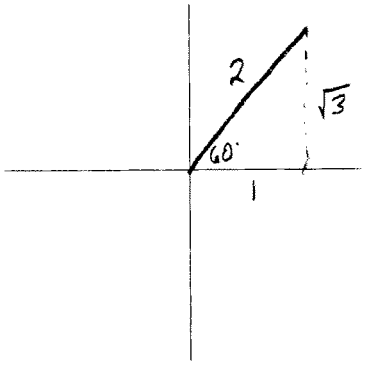


b) $\cos 315^\circ = \boxed{\frac{1}{\sqrt{2}}}$

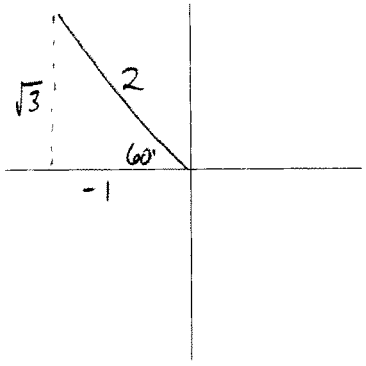


4 K

c) $\sin 60^\circ = \boxed{\frac{\sqrt{3}}{2}}$

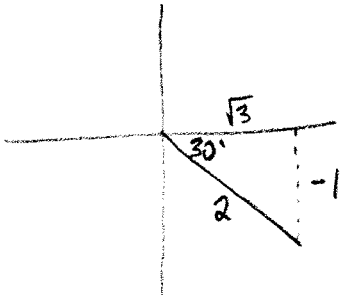


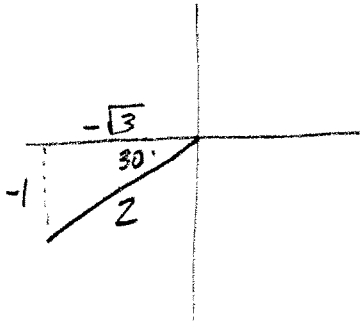
d) $\tan 120^\circ = \boxed{\frac{\sqrt{3}}{-1}}$



4 C

2. Explain how it's possible that $\sin 330^\circ$ and $\sin 210^\circ$ give identical exact trigonometric ratios.





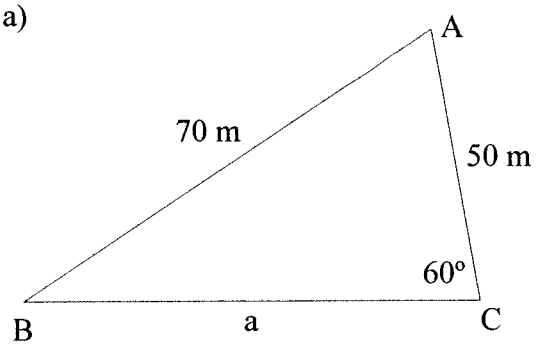
Same opposite
Same hypotenuse

1 C

2. Please solve the following triangles FULLY. That is, give values for each of the following angles and sides. Please show ALL of your work, and **don't forget UNITS**:

a)

5 K



Angle A: 81.79°

Angle B: 38.21°

Side Length a: 80.0 m

$\frac{70}{\sin 60^\circ} = \frac{50}{\sin B}$

$70 \sin B = 50 \sin 60^\circ$

$\sin B = \frac{50 \sin 60^\circ}{70}$

$= 0.6186$

$\angle B = 38.21^\circ$

$\angle A = 180^\circ - 60^\circ - 38.21^\circ = 81.79^\circ$

$\frac{a}{\sin 81.79^\circ} = \frac{70}{\sin 60^\circ}$

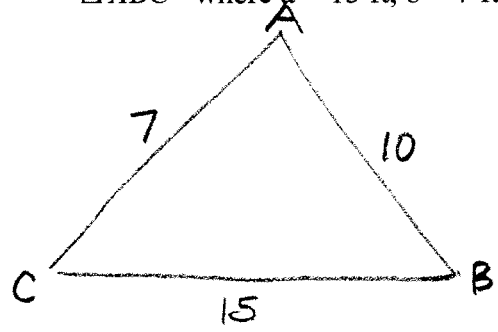
$a \sin 60^\circ = 70 \sin 81.79^\circ$

$a = \frac{70 \sin 81.79^\circ}{\sin 60^\circ}$

$= 80.0 \text{ m}$

b) ΔABC where a = 15 ft, b = 7 ft and c = 10 ft.

5 A



Angle A: 122.88°

Angle B: 23.07°

Angle C: 34.05°

$\cos A = \frac{7^2 + 10^2 - 15^2}{2(7)(10)}$

$= -0.5428$

$\angle A = 122.88^\circ$

$\frac{15}{\sin 122.88^\circ} = \frac{10}{\sin C}$

$15 \sin C = 10 \sin 122.88^\circ$

$\sin C = \frac{10 \sin 122.88^\circ}{15}$

$\sin C = 0.5599$

$\angle C = 34.05^\circ$

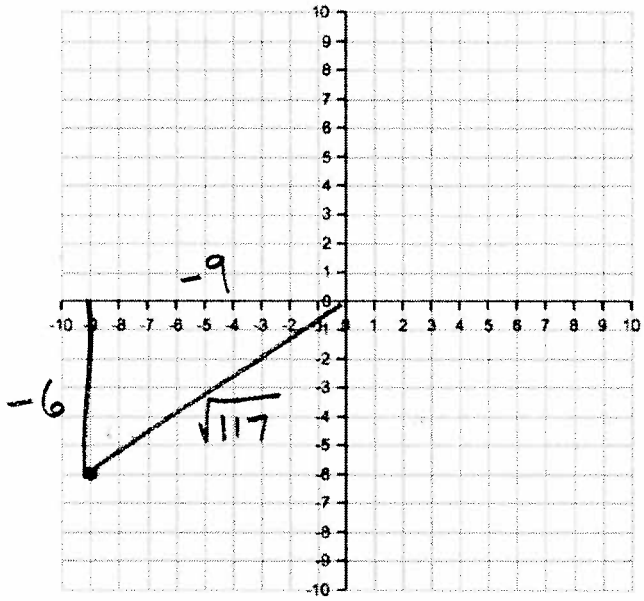
$\angle B = 180^\circ - 122.88^\circ - 34.05^\circ$

23.07°

3. What are the exact trigonometric ratios for the angle (θ) represented by a terminal arm that goes through (-9 , -6)? [Please draw the terminal arm on the grid provided, and label the side lengths. Show any other work in the space below.]

$hyp = \sqrt{(-9)^2 + (-6)^2}$

$= \sqrt{117}$



4 K

sin θ = $\frac{-6}{\sqrt{117}}$ cos θ = $\frac{-9}{\sqrt{117}}$ csc θ = $\frac{\sqrt{117}}{-6}$ sec θ = $\frac{\sqrt{117}}{-9}$

tan θ = $\frac{-6}{-9}$ cot θ = $\frac{-9}{-6}$

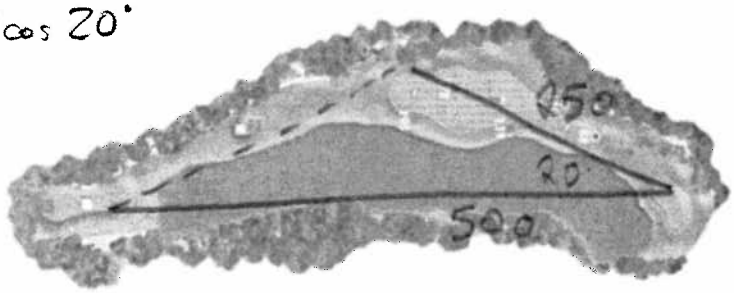
4. The green on a golf hole lies 500 yards directly **west** of the tee, with a water hazard in between the tee and the green. If a golfer's first shot travels 250 yards from the tee at an angle of 20° [to the north of west] and lands on the fairway, how far will the golfer have to hit the second shot from the fairway in order to land on the green? Include a diagram.

$d^2 = 500^2 + 250^2 - 2(500)(250)\cos 20°$

$= 77576.84$

$d = 278.53$ yards

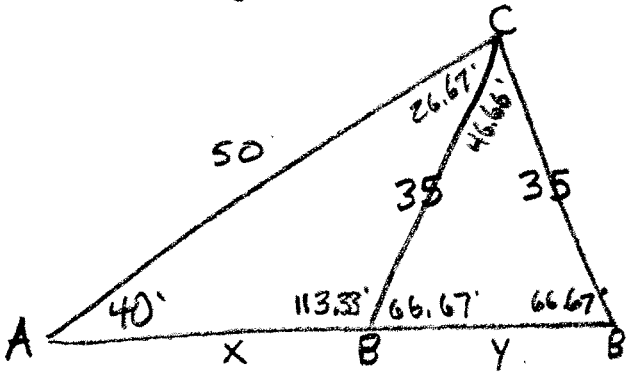
3 K



5. Solve **all** triangles that satisfy the given information. Be sure to show **how many** triangles can be formed.

a) a = 35 m, b = 50 m, and angle A = 40°

$50 \sin 40° = 32.1$ a is longer ⇒ 2 triangles!



$$\frac{35}{\sin 40°} = \frac{50}{\sin B}$$

$$\sin B = \frac{50 \sin 40°}{35}$$

$$= 0.9183$$

$$\angle B = 66.67°$$

$180° - 66.67° = 113.33°$

$180° - 40° - 113.33° = 26.67$

$180° - 66.67° - 66.67° = 46.66°$

$$\frac{x}{\sin 26.67} = \frac{35}{\sin 40°}$$

$$x = \frac{35 \sin 26.67°}{\sin 40°}$$

$= 24.44$ m

$$\frac{35}{\sin 66.67°} = \frac{y}{\sin 46.67}$$

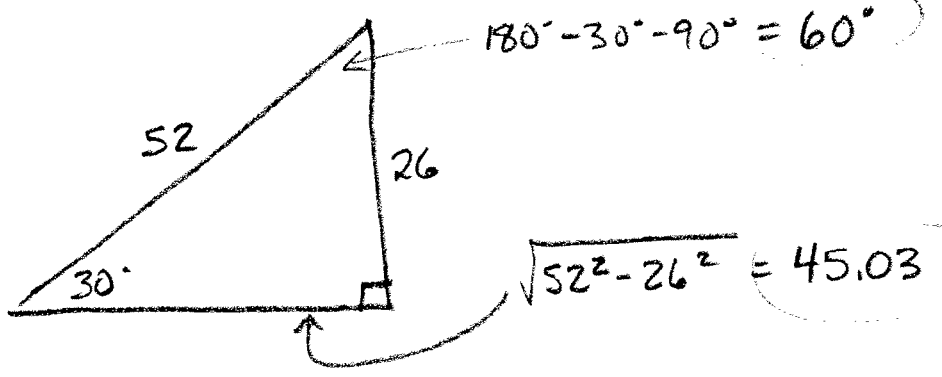
$$y = \frac{35 \sin 46.67°}{\sin 66.67°}$$

$= 27.73$ m

9 A

b) b = 52 m, a = 26 m, and angle A = 30°

$52 \sin 30° = 26$ ∴ one triangle



$180° - 30° - 90° = 60°$

$\sqrt{52^2 - 26^2} = 45.03$ m

c) g = 74 m, f = 80 m, and angle G = 70°

$80 \sin 70° = 75.2$ ∴ No triangles

6. Prove each of the following identities.

a) $\csc x \sec x \cos x \sin x = \sin^2 x + \cos^2 x$

LS: $\left(\frac{1}{\sin x}\right)\left(\frac{1}{\cos x}\right)\cos x \sin x$

$= 1$

3 T $= \sin^2 x + \cos^2 x$

b) $\sin^2 x(\csc^2 x - 1) = \cos^2 x$

LS: $\sin^2 x\left(\frac{1}{\sin^2 x} - 1\right)$

4 T $= \frac{\sin^2 x}{\sin^2 x} - \sin^2 x$

$= 1 - \sin^2 x$

$= \sin^2 x + \cos^2 x - \sin^2 x$

$= \cos^2 x$

c) $\cot x \cos x = \csc x - \sin x$

LS: $\left(\frac{1}{\tan x}\right)(\cos x)$

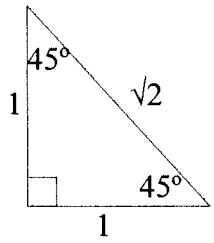
4 T $= \left(\frac{\cos x}{\sin x}\right)\cos x$

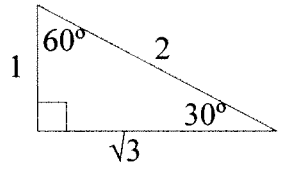
$= \frac{\cos^2 x}{\sin x}$

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

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

Reference Material





$$\tan\theta=\frac{\sin\theta}{\cos\theta}$$

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

$$\csc q=\frac{1}{\sin q}$$

$$\sec q=\frac{1}{\cos q}$$

$$\cot q=\frac{1}{\tan q}$$

$$c^2=a^2+b^2-2ab(\cos C)$$

$$\cos C=\frac{a^2+b^2-c^2}{2ab}$$

$$\frac{a}{\sin A}=\frac{b}{\sin B}=\frac{c}{\sin C}$$

SOH CAH TOA