

Sine Law Worked Questions

Tuesday, June 7, 2022 9:31 PM

Scroll down for solutions - the resolution on them may not be great, but this is what I've got.

Exercises

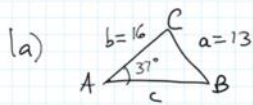
1. Use the Law of Sine to solve $\triangle ABC$ in each case. Round the answers to one decimal place.
 - a) $\angle A = 37^\circ$, $a = 13$, $b = 16$
 - b) $\angle A = 54^\circ$, $a = 13$, $b = 10$
 - c) $\angle B = 120^\circ$, $a = 15$, $b = 31$
 - d) $\angle B = 112^\circ$, $a = 25$, $b = 28$
 - e) $\angle C = 27^\circ$, $a = 17$, $c = 13$
 - f) $\angle A = 72^\circ$, $\angle B = 50^\circ$, $b = 35$
 - g) $\angle B = 105^\circ$, $\angle C = 40^\circ$, $b = 13$
 - h) $\angle A = 22^\circ$, $\angle B = 69^\circ$, $a = 3.7$
 - i) $\angle A = 81^\circ$, $\angle C = 40^\circ$, $a = 10$
 - j) $\angle B = 43^\circ$, $\angle C = 100^\circ$, $c = 24$

2. The roof lines of a building make angles of 28° and 75° with the horizontal. The shorter roof line is 4.1m long. Find the length of the other roof line rounded to one decimal place.
3. Bob observes the angle of elevation of an airplane to be 52° and the angle of elevation for Amy is 36° . Bob and Amy are 325m apart on level ground and on the same vertical plane as the airplane.
 - a) How far to the nearest meter is each person from the airplane?
 - b) How high to the nearest meter is the airplane?
4. Two guy wires 15m and 9m in length are fastened to the top of a radio tower from two points A and B directly opposite one another on level ground. The angle of elevation of the longer wire is 29.3° .
 - a) How far apart are A and B? Round your answer to the nearest meter.
 - b) How tall is the tower? Round your answer to the nearest meter.
5. A bridge MN is to be built across a river. Point P is located 64m from N on the same side of the river and $\angle N = 69^\circ$ while $\angle P = 42^\circ$. How long will the bridge be? Round your answer to the nearest meter.



Law of Sines worked questions

SINE LAW practice



$$\frac{\sin 37^\circ}{13} = \frac{\sin B}{16}$$

$$16 \frac{\sin 37^\circ}{13} = \sin B$$

$$\sin^{-1}\left(\frac{16 \sin 37^\circ}{13}\right) = B$$

$$B = 47.8^\circ$$

$$\Rightarrow C = 95.2^\circ$$

$$\frac{13}{\sin 37^\circ} = \frac{c}{\sin 95.2^\circ}$$

$$\sin 95.2^\circ \left(\frac{13}{\sin 37^\circ}\right) = c$$

$$c = 21.5$$

$$B = 180^\circ - 47.8^\circ$$

$$B = 132.2^\circ$$

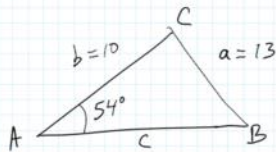
$$\Rightarrow C = 10.8^\circ$$

$$\frac{13}{\sin 37^\circ} = \frac{c}{\sin 10.8^\circ}$$

$$\sin 10.8^\circ \left(\frac{13}{\sin 37^\circ}\right) = c$$

$$c = 4.0$$

b) $\angle A = 54^\circ, a = 13, b = 10$



$$\frac{\sin 54^\circ}{13} = \frac{\sin B}{10}$$

$$\sin^{-1}\left(\frac{10 \sin 54^\circ}{13}\right) = B$$

$$B = 38.48580779^\circ$$

$$B = 38.5^\circ$$

$$C = 87.51419221^\circ$$

$$C = 87.5^\circ$$

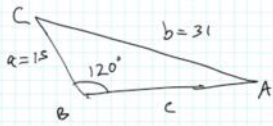
$$\frac{c}{\sin 87.5^\circ} = \frac{13}{\sin 54^\circ}$$

$$c = 16.1$$

OR

~~$A = 54^\circ$
 $B = 141.51...^\circ$
nothing left
for C~~

c) $\angle B = 120^\circ, a = 15, b = 31$



$$\frac{\sin 120^\circ}{31} = \frac{\sin A}{15}$$

$$A = \sin^{-1}\left(\frac{15 \sin 120^\circ}{31}\right)$$

$$A = 24.77428064$$

$$\boxed{A \doteq 24.8^\circ}$$

$$C = 35.22571934$$

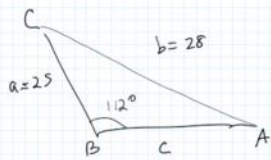
$$\boxed{C \doteq 35.2^\circ}$$

~~OR
A = 155.2°
too much~~

$$\frac{c}{\sin 35.2^\circ} = \frac{31}{\sin 120^\circ}$$

$$\boxed{C \doteq 20.6}$$

d) $\angle B = 112^\circ, a = 25, b = 28$



$$\frac{\sin 112^\circ}{28} = \frac{\sin A}{25}$$

$$A = \sin^{-1}\left(\frac{25 \sin 112^\circ}{28}\right)$$

$$A = 55.87776749$$

$$\boxed{A = 55.9^\circ}$$

$$C = 12.12223251$$

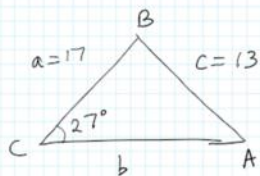
$$\boxed{C \doteq 12.1^\circ}$$

$$\frac{28}{\sin 112^\circ} = \frac{c}{\sin 12.1^\circ}$$

$$\boxed{C \doteq 6.3}$$

~~OR
A = 124.122...°
B = 112°
too much~~

e) $\angle C = 27^\circ, a = 17, c = 13$



$$\frac{\sin A}{17} = \frac{\sin 27^\circ}{13}$$

$$A = \sin^{-1}\left(\frac{17 \sin 27^\circ}{13}\right)$$

$$A = 36.41858115^\circ$$

$$\boxed{A = 36.4^\circ}$$

$$\boxed{B = 116.6^\circ}$$

$$\frac{b}{\sin 116.6^\circ} = \frac{13}{\sin 27^\circ}$$

$$\boxed{b = 25.6}$$

or

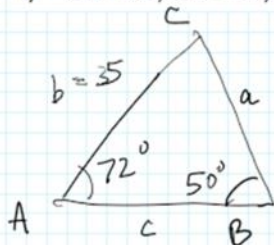
$$\boxed{A = 143.6^\circ}$$

$$\boxed{B = 9.4^\circ}$$

$$\frac{b}{\sin 9.4^\circ} = \frac{13}{\sin 27^\circ}$$

$$\boxed{b = 4.7}$$

f) $\angle A = 72^\circ, \angle B = 50^\circ, b = 35$



$$\boxed{C = 58^\circ}$$

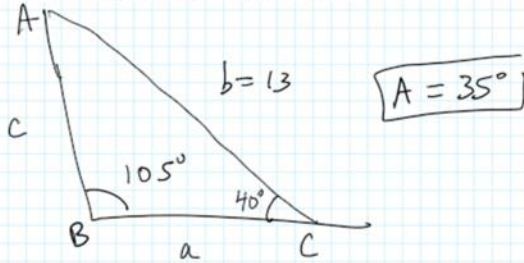
$$\frac{35}{\sin 50^\circ} = \frac{a}{\sin 72^\circ}$$

$$\boxed{a = 43.5}$$

$$\frac{35}{\sin 50^\circ} = \frac{c}{\sin 58^\circ}$$

$$\boxed{c = 38.7}$$

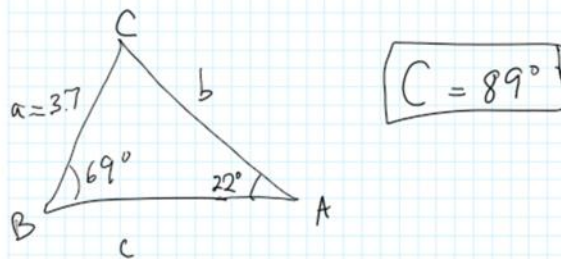
g) $\angle B = 105^\circ$, $\angle C = 40^\circ$, $b = 13$



$$\frac{13}{\sin 105^\circ} = \frac{a}{\sin 35^\circ}, \quad \boxed{a = 7.7}$$

$$\frac{13}{\sin 105^\circ} = \frac{c}{\sin 40^\circ}, \quad \boxed{c = 8.7}$$

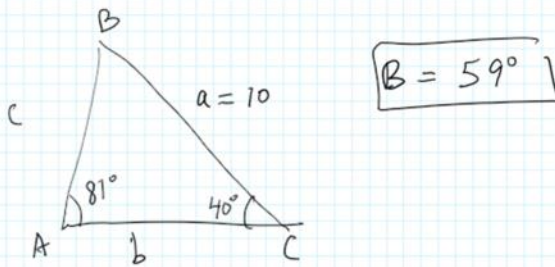
h) $\angle A = 22^\circ$, $\angle B = 69^\circ$, $a = 3.7$



$$\frac{b}{\sin 69^\circ} = \frac{3.7}{\sin 22^\circ}, \quad \boxed{b = 9.2}$$

$$\frac{c}{\sin 89^\circ} = \frac{3.7}{\sin 22^\circ}, \quad \boxed{c = 9.9}$$

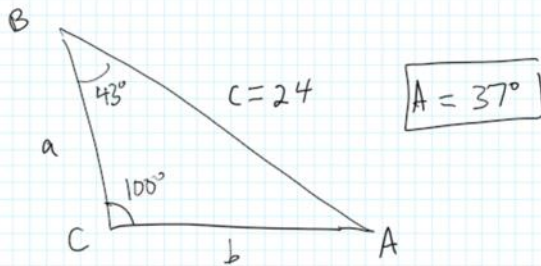
i) $\angle A = 81^\circ, \angle C = 40^\circ, a = 10$



$$\frac{10}{\sin 81^\circ} = \frac{b}{\sin 59^\circ}, \quad \boxed{b = 8.7}$$

$$\frac{10}{\sin 81^\circ} = \frac{c}{\sin 40^\circ}, \quad \boxed{c = 6.5}$$

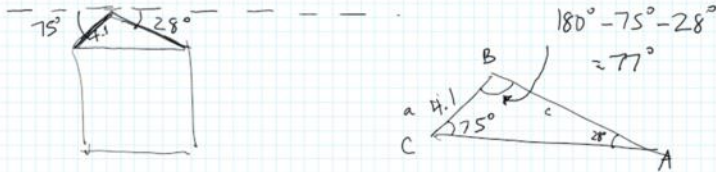
ii) $\angle B = 43^\circ, \angle C = 100^\circ, c = 24$



$$\frac{24}{\sin 100^\circ} = \frac{b}{\sin 43^\circ}, \quad \boxed{b = 16.6}$$

$$\frac{24}{\sin 100^\circ} = \frac{a}{\sin 37^\circ}, \quad \boxed{a = 14.7}$$

2. The roof lines of a building make angles of 28° and 75° with the horizontal. The shorter roof line is 4.1m long. Find the length of the other roof line rounded to one decimal place.

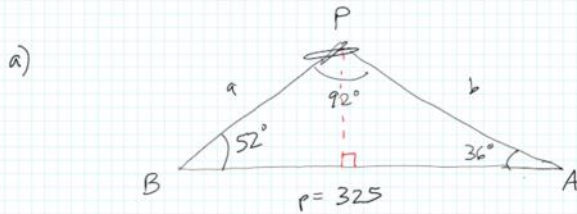


$$\frac{c}{\sin 75^\circ} = \frac{4.1}{\sin 28^\circ}$$

$$c = \sin 75^\circ \left(\frac{4.1}{\sin 28^\circ} \right)$$

$$\boxed{c \approx 8.4 \text{ m}}$$

3. Bob observes the angle of elevation of an airplane to be 52° and the angle of elevation for Amy is 36° . Bob and Amy are 325m apart on level ground and on the same vertical plane as the airplane.
- How far to the nearest meter is each person from the airplane?
 - How high to the nearest meter is the airplane?



$$\frac{b}{\sin 52^\circ} = \frac{325}{\sin 92^\circ} \quad \frac{a}{\sin 36^\circ} = \frac{325}{\sin 92^\circ}$$

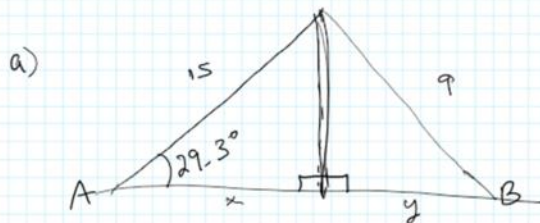
$$b \approx 256 \text{ m} \quad a \approx 191 \text{ m}$$

Bob is 191 m from the plane.
Amy is 256 m from the plane

$$\sin 52^\circ = \frac{h}{191} \quad , \quad h \approx 150.625 \dots$$

$$\boxed{\text{Plane is 151 m above ground}}$$

4. Two guy wires 15m and 9m in length are fastened to the top of a radio tower from two points A and B directly opposite one another on level ground. The angle of elevation of the longer wire is 29.3° .
- How far apart are A and B? Round your answer to the nearest meter.
 - How tall is the tower? Round your answer to the nearest meter.



$$\frac{\sin B}{15} = \frac{\sin 29.3^\circ}{9}$$

$$B = \sin^{-1}\left(\frac{15 \sin 29.3^\circ}{9}\right)$$

$$B = 54.65^\circ$$

$$\cos 29.3^\circ = \frac{x}{15}, \quad x = 13.08103909$$

$$\cos 54.65^\circ = \frac{y}{9}, \quad y = 5.207070537$$

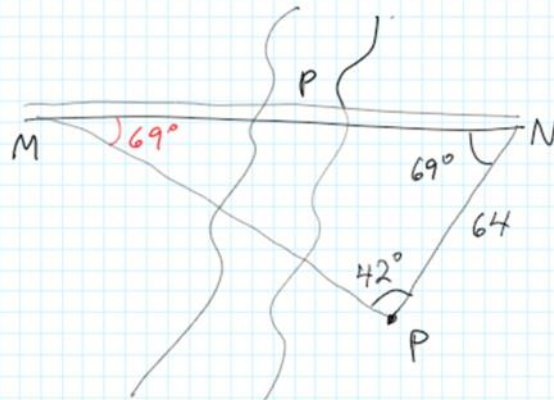
$$\text{Distance} = x + y = 18 \text{ m}$$

b)

$$\sin 29.3^\circ = \frac{h}{15}, \quad h = 7.3407 \dots$$

$$\text{height} = 7 \text{ m}$$

5. A bridge MN is to be built across a river. Point P is located 64m from N on the same side of the river and $\angle N = 69^\circ$ while $\angle P = 42^\circ$. How long will the bridge be? Round your answer to the nearest meter.



$$\frac{p}{\sin 42^\circ} = \frac{64}{\sin 69^\circ}$$

$$p = 45.9 \approx \boxed{46 \text{ m}}$$