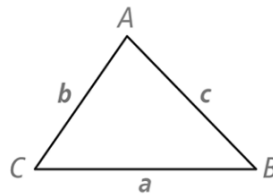


Law of Sines

For any $\triangle ABC$ with side lengths a , b , and c opposite angles A , B , and C , respectively, the **Law of Sines** relates the sine of each angle to the length of the opposite side.

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

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



For $\triangle XYZ$, what is YZ to the nearest tenth?

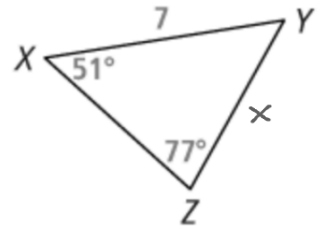
SOLUTION

$$\frac{7}{\sin 77^\circ} = \frac{x}{\sin 51^\circ}$$

$$7 \sin 51^\circ = x \sin 77^\circ$$

$$x = \frac{7 \sin 51^\circ}{\sin 77^\circ}$$

$$= 5.58$$



What is XZ to the nearest tenth?

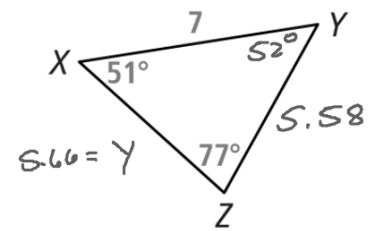
$$180 - 77 - 51$$
$$52$$

Enter your answer.

$$\frac{Y}{\sin 52} = \frac{7}{\sin 77}$$

$$Y \sin 77 = 7 \sin 52$$

$$Y = \frac{7 \sin 52}{\sin 77}$$
$$= 5.66$$



What are $m\angle R$ and $m\angle S$ in $\triangle RST$?

SOLUTION

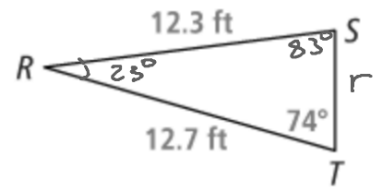
$$\frac{12.3}{\sin 74} = \frac{12.7}{\sin S}$$

$$12.3 \sin S = 12.7 \sin 74$$

$$\sin S = \frac{12.7 \sin 74}{12.3}$$

$$\sin^{-1} \left(\frac{12.7 \sin 74}{12.3} \right) = m\angle S$$

$$83^\circ = m\angle S$$



$$m\angle R = 180 - 74 - 83 = 23^\circ$$

3. a. What is $m\angle N$?

Enter your answer. $\frac{4}{\sin 70} = \frac{2}{\sin N}$

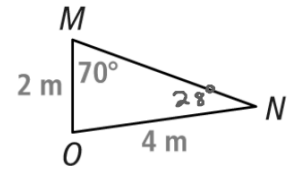
$$4 \sin N = 2 \sin 70$$

$$\sin N = \frac{2 \sin 70}{4}$$

$$\sin^{-1} \left(\frac{2 \sin 70}{4} \right)$$

$$m\angle N = 28^\circ$$

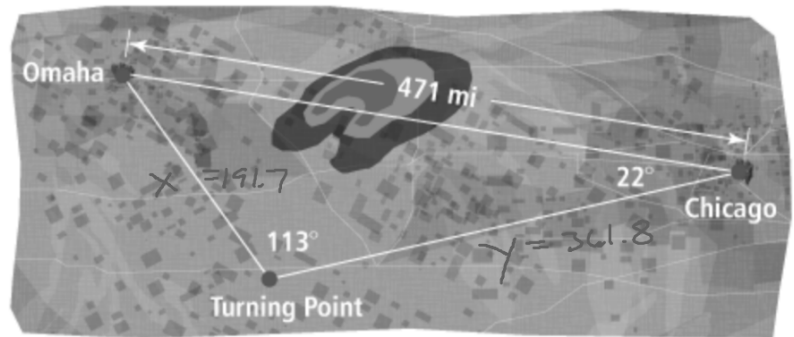
b. What is $m\angle O$?



$$180 - 70 - 28$$

$$m\angle O = 82^\circ$$

The map shows the path a pilot flew between Omaha and Chicago in order to avoid a thunderstorm. How much longer is this route than the direct route to Chicago?



$$\frac{471}{\sin 113} = \frac{x}{\sin 22}$$

$$x \sin 113 = 471 \sin 22$$

$$x = \frac{471 \sin 22}{\sin 113}$$

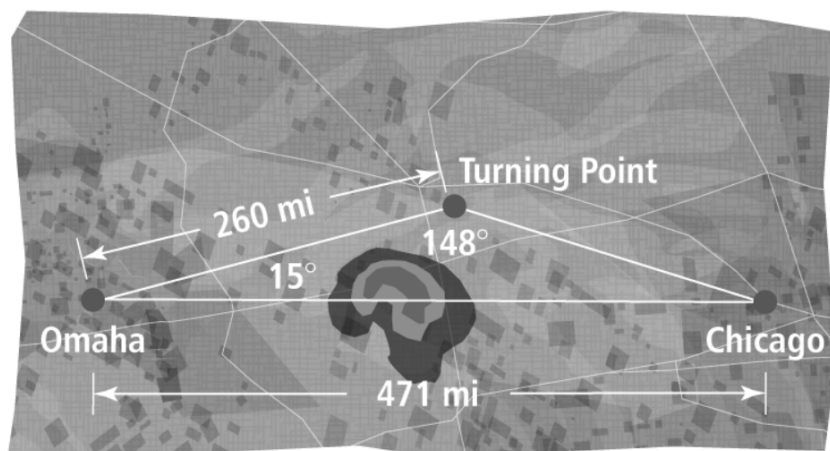
$$553.5 - 471 \\ 82.5 \text{ mi}$$

$$\frac{471}{\sin 113} = \frac{y}{\sin 45}$$

$$y = \frac{471 \sin 45}{\sin 113}$$

$$x + y = 191.7 + 361.8 \\ = 553.5 \text{ mi}$$

4. Suppose the pilot chose to fly north of the storm. How much farther is that route than the direct route?



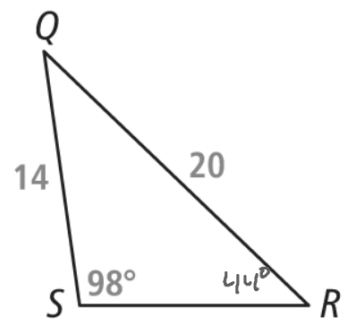
7. What are $m\angle Q$ and $m\angle R$?

Enter your answer.

$$\frac{14}{\sin R} = \frac{20}{\sin 98}$$

$$\sin R = \frac{14 \sin 98}{20}$$

$$\sin^{-1}\left(\frac{14 \sin 98}{20}\right) = 44^\circ$$



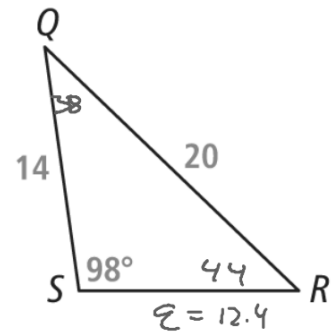
8. What is the perimeter of $\triangle QRS$?

Enter your answer

$$\frac{q}{\sin 38} = \frac{20}{\sin 98}$$

$$q = \frac{20 \sin 38}{\sin 98}$$

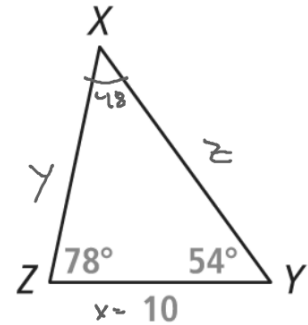
$$= 12.4$$



$$P = 14 + 20 + 12.4$$
$$= 46.4$$

What is XY?

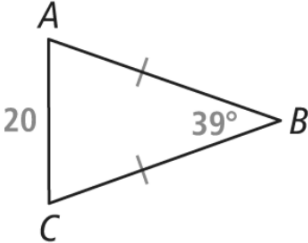
$$\frac{10}{\sin 48} = \frac{z}{\sin 78}$$
$$z \sin 48 = 10 \sin 78$$
$$z = \frac{10 \sin 78}{\sin 48}$$
$$= 13.2$$
$$\frac{10}{\sin 48} = \frac{y}{\sin 54}$$
$$y \sin 48 = 10 \sin 54$$
$$y = \frac{10 \sin 54}{\sin 48}$$
$$= 10.9$$



What is XZ?

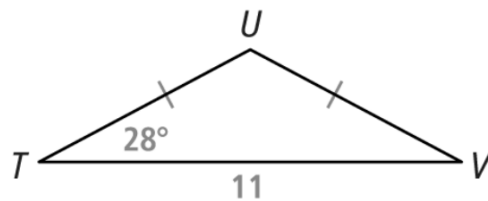
What are AB and BC ?

Enter your answer.

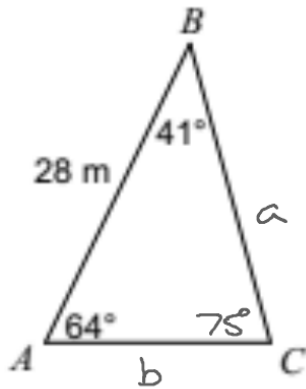


What is the perimeter of $\triangle TUV$?

Enter your answer.



Solve the Triangle



$$m\angle C = 75^\circ \quad a = \quad b =$$

$$\frac{28}{\sin 75} = \frac{a}{\sin 64}$$

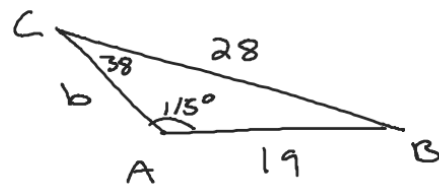
$$a \sin 75 = 28 \sin 64$$

$$a = \frac{28 \sin 64}{\sin 75} \\ = 26.05$$

$$\frac{28}{\sin 75} = \frac{b}{\sin 41}$$

$$b = \frac{28 \sin 41}{\sin 75} \\ = 19.01$$

$$m\angle A = 115^\circ, c = 19 \text{ mi}, a = 28 \text{ mi}$$



$$m\angle C = 38^\circ \quad m\angle B = 27^\circ \quad b = 14.02$$

$$\frac{28}{\sin 115} = \frac{19}{\sin C}$$

$$28 \sin C = 19 \sin 115$$

$$\sin C = \frac{19 \sin 115}{28}$$

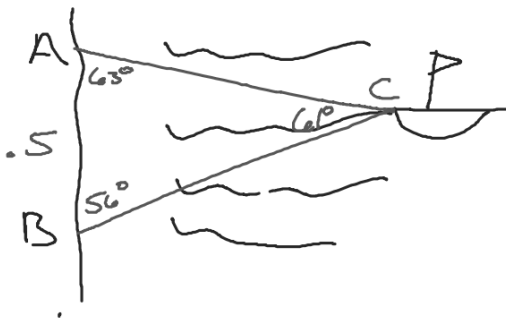
$$\sin^{-1}\left(\frac{19 \sin 115}{28}\right)$$

$$m\angle C = 38^\circ$$

$$\frac{b}{\sin 27} = \frac{28}{\sin 115}$$

$$b = \frac{28 \sin 27}{\sin 115}$$

Two observers are standing on shore $\frac{1}{2}$ mile apart at points A and B and measure the angle to a sailboat at a point C at the same time. Angle A is 63° and angle B is 56° . Find the distance from each observer to the sailboat.



$$\frac{.5}{\sin 61} = \frac{AC}{\sin 56}$$

$$\frac{.5}{\sin 61} = \frac{BC}{\sin 63}$$

A vertical flagpole is attached to the top edge of a building. A man stands 400 feet from the base of the building. From his viewpoint, the angle of elevation to the bottom of the flagpole is 60° ; to the top is 62.5° . Determine the height of the flagpole.