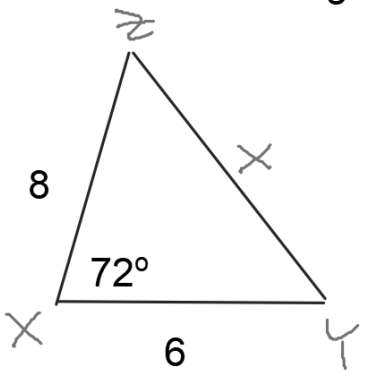
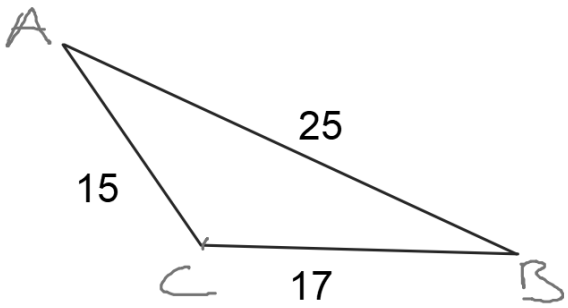
Solve the Triangle





$$\frac{X}{\sin 72} = \frac{6}{\sin B}$$

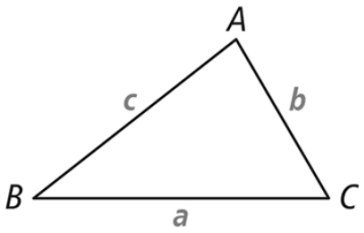
Law of Cosines

For any $\triangle ABC$, the **Law of Cosines** relates the cosine of each angle to the side lengths of the triangle.

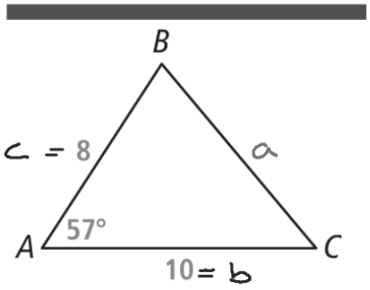
$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$b^2 = a^2 + c^2 - 2ac \cos B$$

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



What is *BC* to the nearest tenth?



SOLUTION

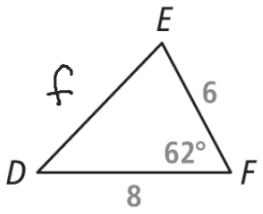
$$a^2 = b^2 + c^2 - 2bc\cos A$$

$$a^2 = 10^2 + 8^2 - 2(10)(8)\cos 57°$$

$$a^2 = 76.8577$$

$$a \approx 8.8$$

a. What is *DE*?



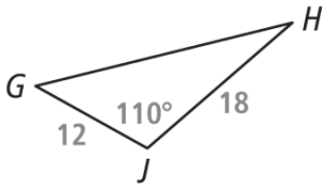
Enter your answer

$f^2 = d^2 + e^2 - 2de\cos F$

$f^2 = 8^2 + 6^2 - 2(8)(6)\cos 62°$

$f = 7.4$

b. What is *GH*?

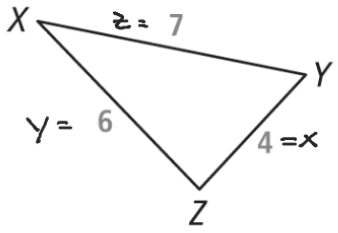


Enter your answer

$$GH^2 = 12^2 + 18^2 - 2(12)(18)\cos 110^\circ$$

$$= 24.8$$

What is $m\angle X$?



$$X^2 = y^2 + z^2 - 2yz\cos X$$

$$4^2 = 6^2 + 7^2 - 2(6)(7)\cos X$$

$$16 = 36 + 49 - 84\cos X$$

$$16 = 85 - 84\cos X$$

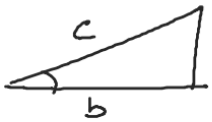
$$-85 \quad -85$$

$$-69 = -84\cos X$$

$$\frac{69}{84} = \cos X$$

$$\cos^{-1}\left(\frac{69}{84}\right) = m\angle X$$

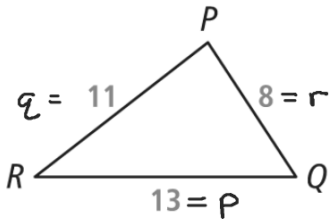
$$m\angle X \approx 34.8^\circ$$



$180^\circ \quad 0^\circ$

$$-1 \le \theta \le 1$$

What is $m\angle P$?



$$p^2 = r^2 + q^2 - 2rq\cos P$$

$$13^2 = 8^2 + 11^2 - 2(8)(11)\cos P$$

$$169 = 64 + 121 - 176\cos P$$

$$169 = 185 - 176\cos P$$

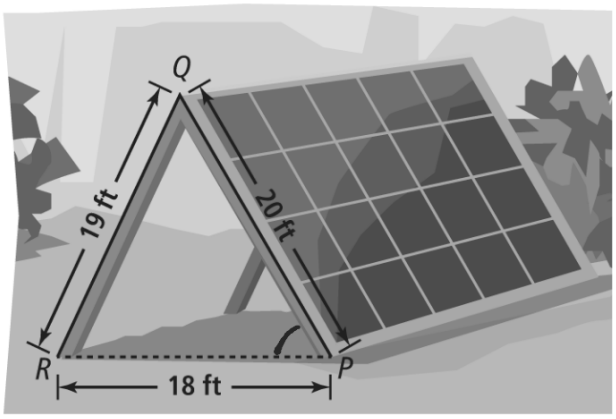
$$-16 = -176\cos P$$

$$\frac{16}{176} = \cos P$$

$$\cos^{-1}\left(\frac{16}{176}\right) = m\angle P$$

$$m\angle P = 84.8^\circ$$

The optimal tilt for Keenan's solar panel is between 58° and 60° to the horizontal. Has Keenan placed his solar panel at an optimal angle?



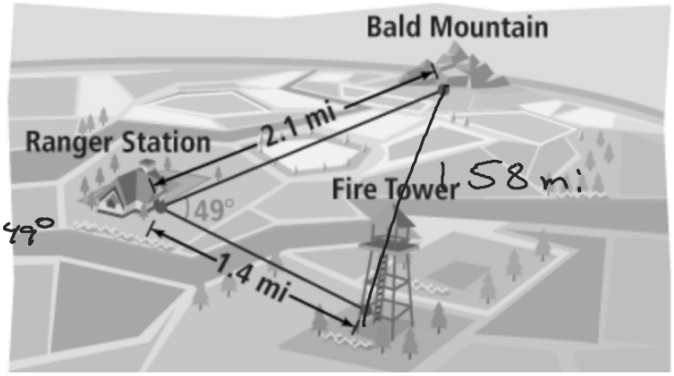
SOLUTION

$19^2 = 18^2 + 20^2 - 2(18)(20)\cos P$

$m\angle P = 59.7°$

Yes optimal tilt.

The district ranger wants to build a new ranger station at the location of the fire tower because it would be closer to Bald Mountain than the old station is. Is the district ranger correct? Explain.

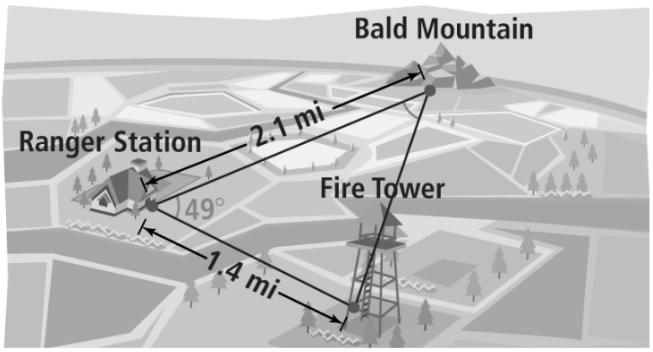


SOLUTION $x^2 = 1.4^2 + 2.1^2 - 2(1.4)(2.1)\cos 49^\circ$

Yes, Fire tower is closer to Bald Mountain

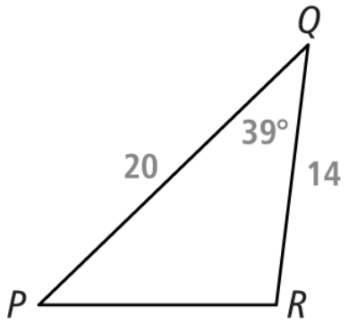
4. Assume a path is drawn from the fire tower to Bald Mountain. What is the angle the new path forms with the old path from Bald Mountain to the ranger station?

Enter your answer.



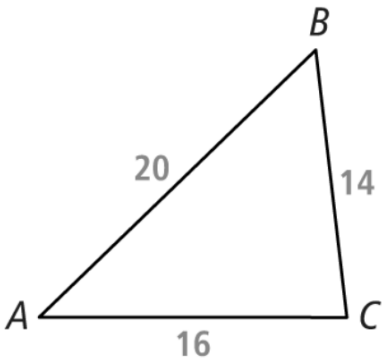
What is *PR* to the nearest tenth?

Enter your answer.

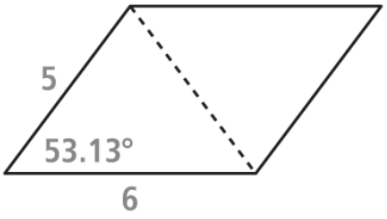


. What is $m\angle B$ to the nearest tenth?

Enter your answer.



12. Use the Law of Cosines to find the diagonal of the parallelogram.

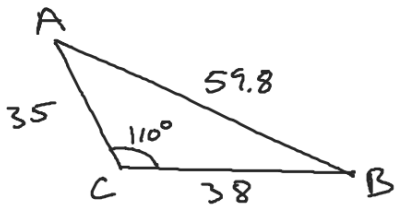


Enter your answer.

Solve the Triangle

$m\angle A = 36.7$ $m\angle B = 33.3$ $C = 59.8$

$m\angle C = 110°,\ b = 35 \text{ mi},\ a = 38 \text{ mi}$



$c^2 = 35^2 + 38^2 - 2(35)(38)\cos 110°$

$\frac{38}{\sin A} = \frac{59.8}{\sin 110°}$

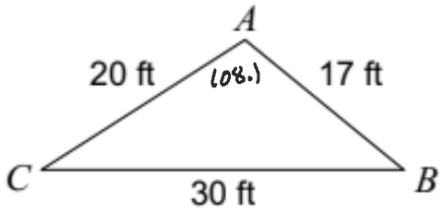
$59.8 \sin A = 38 \sin 110°$

$\sin A = \frac{38 \sin 110°}{59.8}$

$\sin^{-1}\left(\frac{38 \sin 110}{59.8}\right) = m\angle A$

$m\angle A = 36.7$

$m\angle A = 108.1$ $m\angle B =$ $m\angle C =$



$30^2 = 20^2 + 17^2 - 2(20)(17)\cos A$

$900 = 689 - 680\cos A$

$211 = -680\cos A$

$\cos A = \frac{-211}{680}$

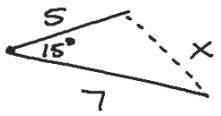
$\frac{20}{\sin B} = \frac{30}{\sin 108.1}$ $\frac{17}{\sin C} = \frac{30}{\sin 108.1}$

$\sin^{-1}\left(\frac{20 \sin 108.1}{30}\right) = m\angle B$ 39.32

$\sin^{-1}\left(\frac{17 \sin 108.1}{30}\right) = m\angle C$

32.6

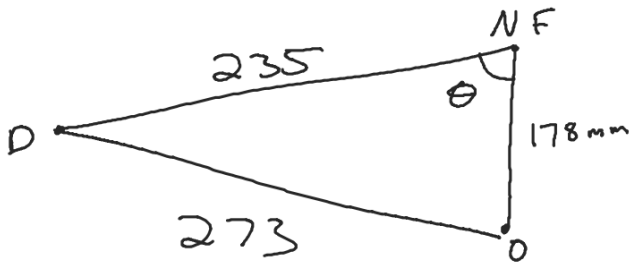
During a figure skating routine, Jackie and Peter skate apart with an angle of 15° between them. Jackie skates for 5 meters and Peter skates for 7 meters. How far apart are the skaters?



$x^2 = 5^2 + 7^2 - 2(5)(7)\cos 15^\circ$

$x = 2.5$ m apart

On a map, Orlando is 178 mm due south of Niagara Falls, Denver is 273 mm from Orlando, and Denver is 235 mm from Niagara Falls. Find the angle at Niagara Falls.



$\theta = 81.49^\circ$

81.5°

A triangular playground has sides of lengths 475 feet, 595 feet, and 401 feet. What are the measures of the angles between the sides, to the nearest tenth of a degree?