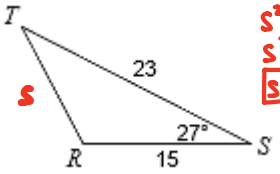
Precalculus Law of Cosines/Law of Sines Review Name: Key Block: ___

Find the indicated measure.

1. Find RT

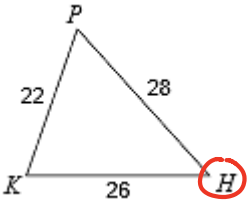



$s^2 = 23^2 + 15^2 - 2(23)(15)\cos 27°$

$s^2 = 139$

$s = 11.8$

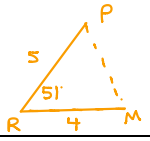
2. Find H




$H = \cos^{-1}\left(\frac{22^2 - 28^2 - 26^2}{-2(28)(26)}\right)$

$H = 48°$

3. Find side r in $\triangle RPM$.



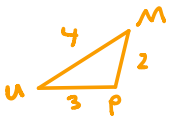

$p = 4, m = 5, R = 51^o$

$r^2 = 5^2 + 4^2 - 2(5)(4)\cos 51°$

$r^2 = 15.8$

$r = 3.98$

4. Find angle $U$ in $\triangle UMP$.



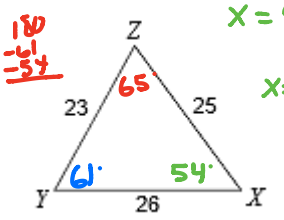

$u = 2, m = 3, p = 4$

$U = \cos^{-1}\left(\frac{2^2 - 3^2 - 4^2}{-2(3)(4)}\right)$

$U = 29°$

Solve each triangle

5.




$180 - 61 - 54$

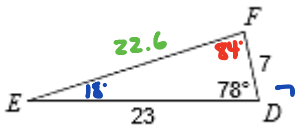
$X = \cos^{-1}\left(\frac{23^2 - 25^2 - 26^2}{-2(25)(26)}\right)$

$X = 54°$

$Y = \cos^{-1}\left(\frac{25^2 - 23^2 - 26^2}{-2(23)(26)}\right)$

$Y = 61°$

6.




$d^2 = 7^2 + 23^2 - 2(7)(23)\cos 78°$

$d = 22.6$

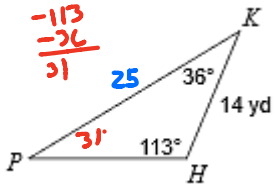
$\frac{\sin 78°}{22.6} = \frac{\sin E}{7}$

$180 - 18 - 78 = 84°$

$\sin E = .30$

$E = 18°$

7.

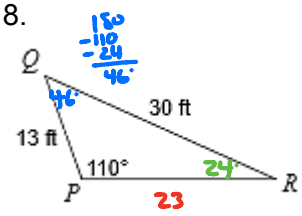



$180 - 113 - 36 = 31$

$\frac{14}{\sin 31} = \frac{h}{\sin 113}$

$\frac{14}{\sin 31} = \frac{k}{\sin 36}$

8.




$180 - 110 - 24 = 46°$

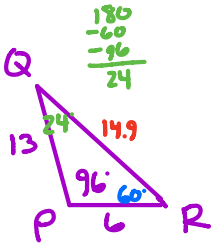
$\frac{\sin R}{13} = \frac{\sin 110}{30}$

$R = 24°$

$\frac{q}{\sin 46} = \frac{30}{\sin 110°}$

$q = 23$

9. $In\ \triangle PQR, r = 13, q = 6, \angle P = 96^o$




$180 - 60 - 96 = 24$

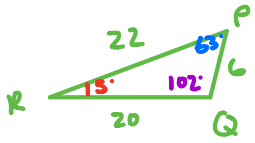
$p^2 = 13^2 + 6^2 - 2(13)(6)\cos 96°$

$p = 14.9$

$\frac{\sin 96}{14.9} = \frac{\sin R}{13}$

$R = 60°$

10. $In\ \triangle PQR, q = 22, r = 6, p = 20$




$R = \cos^{-1}\left(\frac{6^2 - 22^2 - 20^2}{-2(22)(20)}\right)$

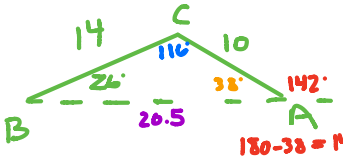
$R = 15°$

$P = \cos^{-1}\left(\frac{20^2 - 22^2 - 6^2}{-2(22)(6)}\right)$

$P = 63°$

$180 - 15 - 63$

11. $In\ \triangle BCA, b = 10, a = 14, \angle B = 26^o$



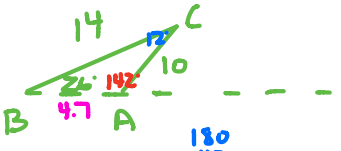

$180 - 26 - 38 = 142$

$\frac{\sin 26}{10} = \frac{\sin A}{14}$

$A = 38°$

$\frac{c}{\sin 116} = \frac{10}{\sin 26}$

$c = 20.5$

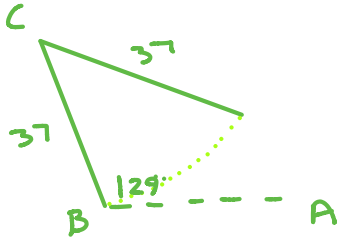



$180 - 142 - 26$

$\frac{c}{\sin 12} = \frac{10}{\sin 26}$

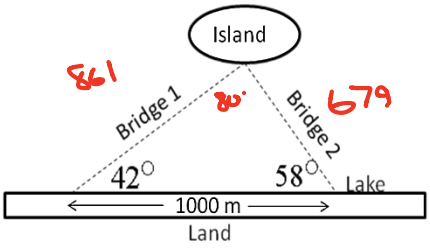
$c = 4.7$

12. $In\ \triangle BCA, a = 37, b = 37, \angle B = 129^o$




No Δ

13. Suppose that you work for a construction company that is planning to build a bridge from the land to a point on an island in a lake. The only two places on the land to start the bridge are point $X$ and point $Y$, 1000 m apart. Point $X$ has better access to the lake but is farther from the island than point $Y$. To help decide between $X$ and $Y$, you need the precise lengths of the two possible bridges. From point $X$ you measure a $42^\circ$ angle to the point on the island, and from point $Y$ you measure $58^\circ$.




A. How long would the bridges be?

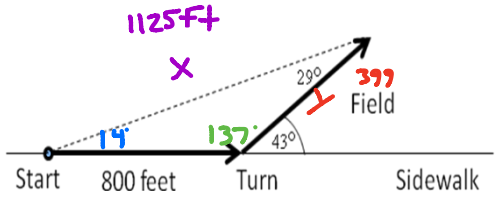
$B_1 = 861$ m  $B_2 = 679$ m

B. If constructing the bridge costs \$370 per meter, how much could be saved by constructing the shorter bridge?

$861 - 679 = 182$

$182(370) =$ \$67,340

14. Ivy walks 800 feet along the sidewalk next to a field. she turns at an angle of $43^\circ$ to the sidewalk and heads across the field. When she stops, she looks back at the starting point, finding a $29^\circ$ angle between her path across the field and the direct route back to the starting point.




$\frac{x}{\sin 137} = \frac{800}{\sin 29}$

$x = 1125$ ft

$\frac{y}{\sin 14} = \frac{800}{\sin 29}$

$y = 399$

A. How far across the field did Ivy walk?

399 ft

B. How far does she have to walk to go directly back to the starting point?

1125 ft

C. Ivy walks 5ft/s on the sidewalk but only 3ft/s across the field. Which way is quicker for her to return to the starting point –by going directly across the field or by retracing the original route?

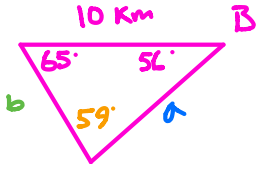
$\frac{800}{5} + \frac{399}{3} = 293$ s  $\frac{1125}{3} = 375$ s

The original route is faster

15. Two rangers, one at Station A and one at Station B, observe a fire in the forest. The angle at Station A formed by the lines of sight to Station B and to the fire is $65.23°$. The angle at Station B formed by the lines of sight to Station A and to the fire is $56.47°$. The stations are 10 km apart.

a. How far from Station A is the fire?

b. How far from Station B is the fire?




$\frac{b}{\sin 56} = \frac{10}{\sin 59}$

$b = 9.7$

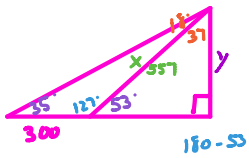
$\frac{a}{\sin 65} = \frac{10}{\sin 59}$

$a = 10.6$

16. To estimate the height of a building, two students find the angle of elevation from a point down the street from the building to the top of the building is $35^o$. From a point that is 300 feet closer to the building, the angle of elevation to the top of the building is $53^o$. IF we assume that the street is level, use this information to estimate the height of the building.

$\frac{x}{\sin 35} = \frac{300}{\sin 18}$

$x = 557$



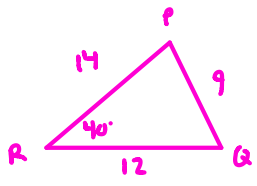

$180 - 53 = 127$

$\frac{y}{\sin 53} = \frac{557}{\sin 90}$

$y = 445$ ft

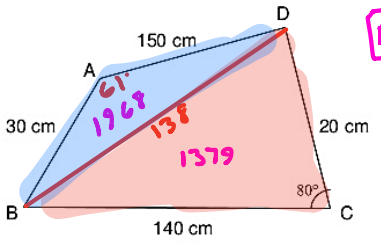
Find the area of the triangle.

17. In $\Delta RPQ$, $q = 14$, $p = 12$, $r = 9$




$A = 54$

18.




$A = 3348$

Extra Practice

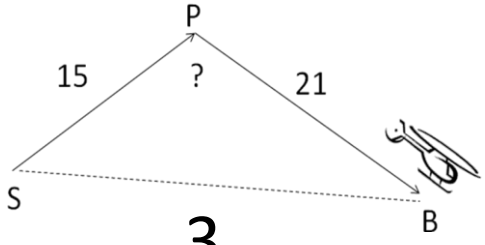
Find the indicated measure

| | |
|---|---|
| 19. Angle $G$ in $\triangle MEG$ if $m = 5cm,\ e = 6cm,\ and\ \ g = 8cm$ | 20. Side $k$ in $\triangle HJK$ if $h = 8m,\ \ j = 6m,\ and\ \ K = 172^{\circ}$ |

Solve each triangle

| | |
|---|---|
| 21. $a = 27, b = 35,\ \angle C = 71^{o}$ | 22. $a = 5, b = 4, c = 7$ |
| 23. $\angle B = 30^{o}, b = 5.2, c = 10.1$ | 24. $\angle A = 73^{o}, b = 12.8, a = 12.5$ |
| 25. $\angle A =, b = 10, a = 64$ | 26. $\angle A = 27.3^{o}, b = 32.9, a = 27.4$ |

27. Miguel flies a helicopter to drop supplies to stranded flood victims. He will fly from the supply depot, S, to the drop point P. Then he will return to the helicopter's base at B, shown in figure. The drop point is 15 miles from the supply depot. The base is 21 miles from the drop point. It is 33 miles between the supply depot and the base. Because the return flight to the base will be made after dark, Miguel wants to know in what direction to fly. What is the angel between the two paths at the drop point?

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28. Juan and Romelia are standing at the seashore 10 miles apart. The coastline is a straight line between them. Both can see the same ship in the water. The angle between the coastline and the line between the ship and Juan is 35 degrees. The angle between the coastline and the line between the ship and Romelia is 45 degrees. How far is the ship from Juan?

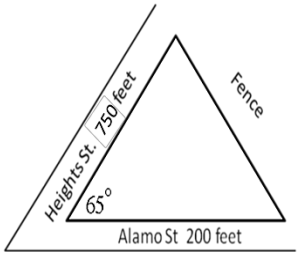
29. Jack is on one side of a 200-foot-wide canyon and Jill is on the other. Jack and Jill can both see the trail guide at an angle of depression of 60 degrees. How far are they from the trail guide?

30. Fred, Barney and Wilma are camping in their tents. If the distance between Fred and Barney is 153 feet, the distance between Fred and Wilma is 201 feet, and the distance between Barney and Wilma is 175 feet, what is the angle between Barney, Wilma and Fred?

31. A triangular parcel of ground has sides of lengths 725 feet, 650 feet, 575 feet. Find the measure of the largest angle.

32. A baseball player in center field is standing approximately 330 feet from the television camera that is directly behind home plate. A batter hits a fly ball that goes to the wall 420 feet from the camera. Approximate how far the center fielder has to run to make the catch if the camera turn $8°$ to follow the play.

36. Gus works for a fence company. He has the job of pricing a fence to go across a triangular lot at the corner of Alamo and Heights Streets, as shown. The streets intersect at a $65^{\circ}$ angle. The lot extends $200\,ft$ from the intersection along Alamo and $750\,ft$ from the intersection along Heights.



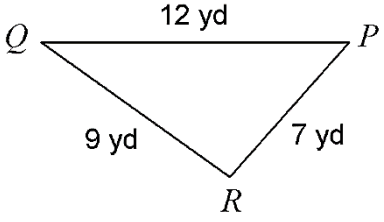

A. How long will the fence be?

B. How much will it cost his company to build it if fencing costs $3.75 / ft?

C. What price should he quote if they want to make 35% profit?

Find the area of the triangle.

33.

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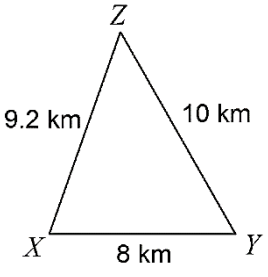


35. In $\triangle TRS$, $s = 8$, $r = 17$, $m\angle T = 82°$