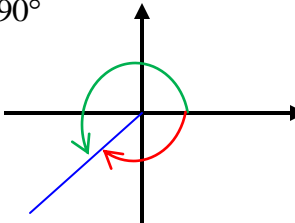


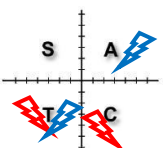
Name: _____ Solution _____

Period: _____

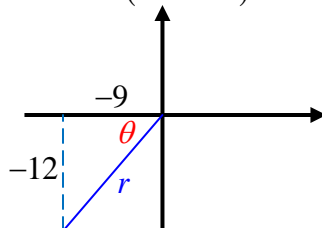
1. Determine two coterminal angles (one positive and one negative) and the reference angle for each given angle.

<p>a. $\theta = 290^\circ$</p> <p style="text-align: center;">$\theta = 650^\circ$ $\theta = -70^\circ$ $\theta_r = 70^\circ$</p>	<p>b. $\theta = -200^\circ$</p> <p style="text-align: center;">$\theta = 160^\circ$ $\theta = -560^\circ$ $\theta_r = 20^\circ$</p>
<p>c. $\theta = 520^\circ$</p> <p style="text-align: center;">$\theta = 160^\circ$ $\theta = -200^\circ$ $\theta_r = 20^\circ$</p>	<p>d. $\theta = -490^\circ$</p> <div style="text-align: center;">  </div> <p style="text-align: right;">$\theta = 230^\circ$ $\theta = -130^\circ$ $\theta_r = 50^\circ$</p>

2. Determine the quadrant in which angle x lies.

<p>a. $\sin x < 0$ and $\tan x > 0$</p> <div style="text-align: center;">  </div> <p style="text-align: center;"><i>Quadrant III</i></p>	<p>b. $\cos x > 0$ and $\tan x < 0$</p> <p style="text-align: center;"><i>Quadrant IV</i></p>
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3. The point $P(-9, -12)$ is on the terminal arm of angle θ . Find $\sin \theta$, $\cos \theta$, and $\tan \theta$.



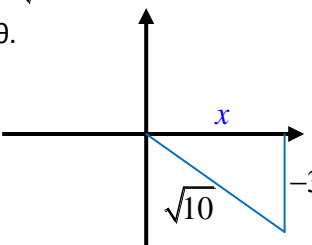
$$\begin{aligned} (-9)^2 + (-12)^2 &= r^2 \\ 81 + 144 &= r^2 \\ 15 &= r \end{aligned}$$

$$\sin \theta = \frac{-12}{15} = \frac{-4}{5} \quad \cos \theta = \frac{-9}{15} = \frac{-3}{5}$$

$$\tan \theta = \frac{12}{9} = \frac{4}{3}$$

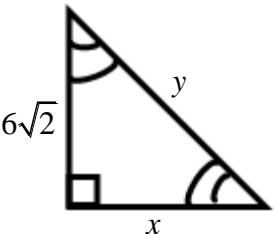
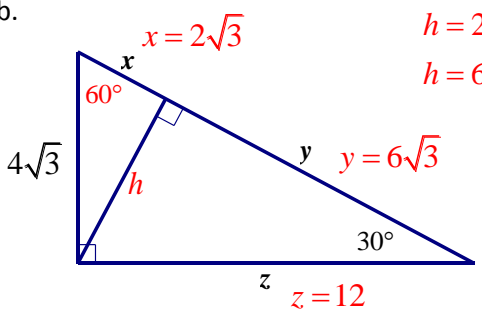
4. If point P is on the terminal arm in standard position making angle θ , which is in the fourth quadrant, and $\sin \theta = -\frac{3}{\sqrt{10}}$. Determine the possible coordinates for P, and Find the other two trigonometric ratio for θ .

$$\begin{aligned} x^2 + (-3)^2 &= (\sqrt{10})^2 \\ x^2 + 9 &= 10 \\ x &= 1 \end{aligned}$$



$$\begin{aligned} \cos \theta &= \frac{1}{\sqrt{10}} \\ \tan \theta &= \frac{-3}{1} \end{aligned}$$

5. Solve for the missing sides of the triangles. Express your answer in exact value.

<p>a.</p>  <div style="margin-left: 200px;"> $x = 6\sqrt{2}$ $y = 12$ </div>	<p>b.</p>  <div style="margin-left: 100px;"> $x = 2\sqrt{3}$ $h = 2\sqrt{3} \times \sqrt{3}$ $h = 6$ $y = 6\sqrt{3}$ $z = 12$ </div>
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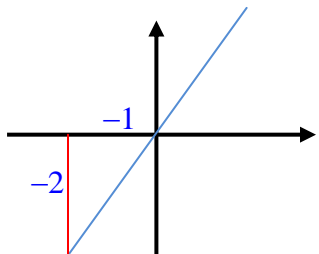
6. Find the values of θ for $0^\circ < \theta \leq 360^\circ$.

<p>a. $\sin \theta = -\frac{1}{\sqrt{2}}$</p> <div style="margin-left: 100px;"> $\theta_r = 45^\circ$ </div> <div style="margin-left: 150px;"> $Quadrant III : \theta = 225^\circ$ $Quadrant IV : \theta = 315^\circ$ </div>	<p>b. $\tan \theta = \sqrt{3}$</p> <div style="margin-left: 100px;"> $\theta_r = 60^\circ$ </div> <div style="margin-left: 150px;"> $Quadrant I : \theta = 60^\circ$ $Quadrant III : \theta = 240^\circ$ </div>
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7. Solve for θ to the nearest degree, if $0^\circ \leq \theta < 360^\circ$.

<p>a. $\cos \theta = -0.7515$</p> <div style="margin-left: 100px;"> $\theta = \cos^{-1}(0.7515)$ $\theta = 41^\circ$ </div> <div style="margin-left: 150px;"> $Quadrant II : \theta = 139^\circ$ $Quadrant III : \theta = 221^\circ$ </div>	<p>b. $\tan \theta = -0.8642$</p> <div style="margin-left: 100px;"> $\theta = \tan^{-1}(0.8642)$ $\theta = 41^\circ$ </div> <div style="margin-left: 150px;"> $Quadrant II : \theta = 139^\circ$ $Quadrant IV : \theta = 319^\circ$ </div>
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8. If the terminal arm of an angle θ , lies on the line $4x - 2y = 0$, for $x \leq 0$, determine the exact value of $\sin \theta + \cos \theta$.

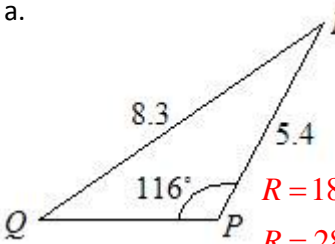
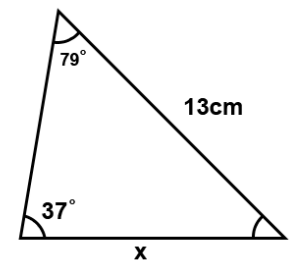


$(1)^2 + (2)^2 = r^2$
 $1 + 4 = r^2$
 $\sqrt{5} = r$

$\cos \theta = \frac{-1}{\sqrt{5}}$
 $\sin \theta = \frac{-2}{\sqrt{5}}$

$\therefore \sin \theta + \cos \theta = \frac{-1}{\sqrt{5}} + \frac{-2}{\sqrt{5}} = \frac{-3}{\sqrt{5}}$

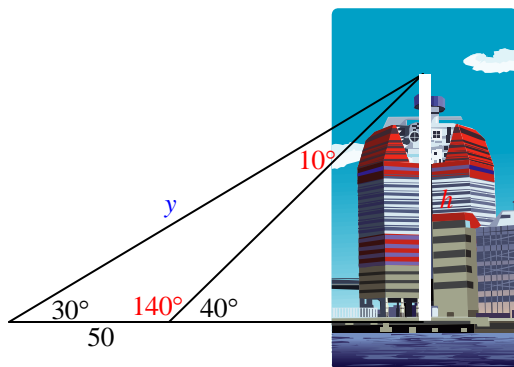
9. Solve the triangle.

<p>a.</p>  <p style="color: red;">$R = 180 - (116 + 35.786^\circ)$ $R = 28.214^\circ$</p> $\frac{\sin 116}{8.3} = \frac{\sin Q}{5.4}$ $\frac{5.4 \sin 116}{8.3} = \sin Q$ $35.786^\circ = Q$ $\frac{8.3}{\sin 116} = \frac{PQ}{\sin 28.214}$ $\frac{8.3 \sin 28.214}{\sin 116} = PQ$ $4.366 = PQ$	<p>b.</p> 
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10. Solve for angle C.

<p>a. $\angle A = 48^\circ$, $a = 4$, and $c = 5$</p> $\frac{\sin C}{5} = \frac{\sin 48}{4}$ $\sin C = \frac{5 \sin 48}{4}$ $\angle C = 68.269^\circ$ <p style="text-align: center;">OR</p> $\angle C = 180 - 68.269$ $\angle C = 111.731^\circ$ <p style="text-align: center;">• Ambiguous Case</p>	<p>b. $\angle A = 39^\circ$, $a = 28$, and $c = 41$</p> $\frac{\sin C}{41} = \frac{\sin 39}{28}$ $\sin C = \frac{41 \sin 39}{28}$ $\angle C = 67.147^\circ$ <p style="text-align: center;">OR</p> $\angle C = 180 - 67.147$ $\angle C = 112.853^\circ$ <p style="text-align: center;">• Ambiguous Case</p>
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11. An observer on the ground looks up to the top of a building at an angle of elevation of 30° . After moving 50 feet closer, the angle of elevation is now 40° . Find the height of the building.



$$\frac{y}{\sin 140} = \frac{50}{\sin 10}$$

$$y = \frac{50 \sin 140}{\sin 10}$$

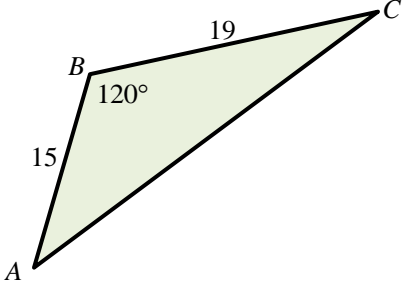
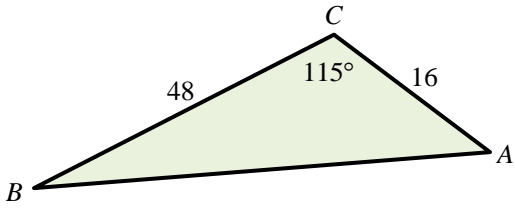
$$y = 185.08$$

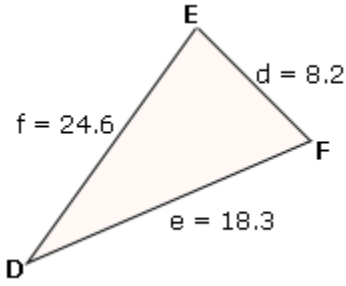
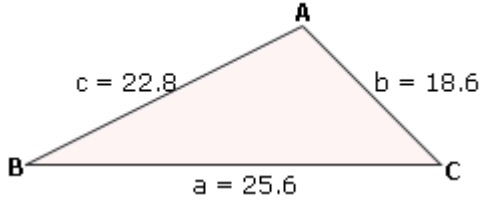
$$\sin 30^\circ = \frac{h}{185.08}$$

$$h = 185.08 \sin 30$$

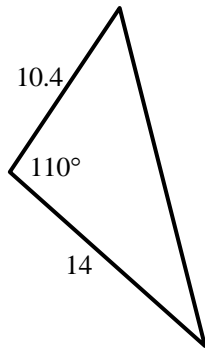
$$h = 92.54 \text{ ft}$$

12. Solve the triangle.

<p>a.</p> 	<p>b.</p>  $c^2 = 48^2 + 16^2 - 2(48)(16)\cos 115^\circ$ $c^2 = 2560 - 1536\cos 115^\circ$ $c = 56.65$ $\frac{\sin 115}{56.65} = \frac{\sin A}{48}$ $\frac{48\sin 115}{56.65} = \sin A$ $50.17^\circ = A$ $\angle C = 180 - (115 + 50.17)$ $\angle C = 14.83^\circ$
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<p>c.</p> 	<p>d.</p>  $25.6^2 = 22.8^2 + 18.6^2 - 2(22.8)(18.6)\cos A$ $655.36 = 865.8 - 848.16\cos A$ $-210.44 = -848.16\cos A$ $0.24811356 = \cos A$ $75.634^\circ = \angle A$ $\frac{\sin 75.634}{25.6} = \frac{\sin B}{18.6}$ $\frac{18.6\sin 75.634}{25.6} = \sin B$ $44.736^\circ = \angle B$ $\angle C = 180 - (75.634 + 44.736)$ $\angle C = 59.63^\circ$
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13. Two people started walking from the same point, at the same time; the walkers diverge at an angle of 110 degree. If one walks at rate 3.5 km/h and the other at 2.6 km/h. Find the distance between them after 4 hours.

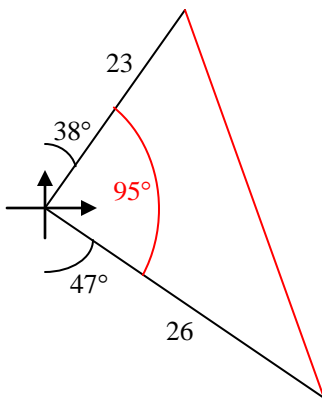


$$c^2 = 14^2 + 10.4^2 - 2(14)(10.4)\cos 110^\circ$$

$$c^2 = 304.16 - 291.2\cos 110^\circ$$

$$c = 20.09 \text{ km}$$

14. Two ships leave port at 4 p.m. One is headed at a bearing of N 38 E and is traveling at 11.5 miles per hour. The other is traveling 13 miles per hour at a bearing of S 47 E. How far apart are they when dinner is served at 6 p.m.?

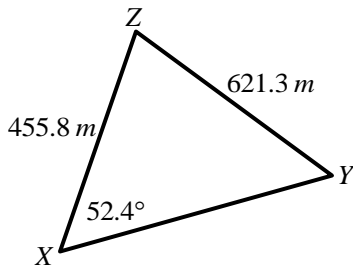


$$c^2 = 23^2 + 26^2 - 2(23)(26)\cos 95^\circ$$

$$c^2 = 1205 - 1196\cos 95^\circ$$

$$c = 36.18 \text{ miles}$$

15. A straight line tunnel is to be constructed through a mountain between points X and Y in the diagram below. Naturally, locations X and Y are not visible from each other, and with the mountain in the way, it is impossible to measure the distance between the two points. However, a third point, Z, is located from which both X and Y are visible, and for which the distances and angles indicated in the diagram are measured. Compute the required length of the tunnel.



$$\frac{\sin 52.4}{621.3} = \frac{\sin Y}{455.8}$$

$$\frac{455.8 \sin 52.4}{621.3} = \sin Y$$

$$35.538^\circ = \angle Y$$

$$\angle Z = 180 - (52.4 + 35.538)$$

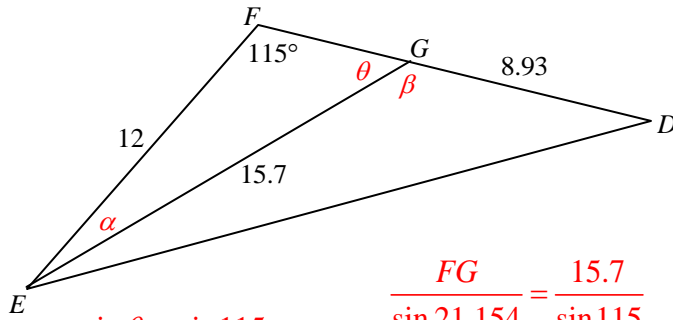
$$\angle Z = 92.062^\circ$$

$$\frac{621.3}{\sin 52.4} = \frac{XY}{\sin 92.062}$$

$$\frac{621.3 \sin 92.062}{\sin 52.4} = XY$$

$$783.675 \text{ m} = XY$$

16. Find the measure of length DE to the nearest unit.



$$\angle\beta = 180 - 43.846$$

$$\angle\beta = 136.1542^\circ$$

$$c^2 = 15.7^2 + 8.93^2 - 2(15.7)(8.93)\cos 136.1542^\circ$$

$$c^2 = 326.2349 - 280.402\cos 136.1542^\circ$$

$$c = 22.99$$

$$\frac{\sin\theta}{12} = \frac{\sin 115}{15.7}$$

$$\sin\theta = \frac{12\sin 115}{15.7}$$

$$43.846^\circ = \angle\theta$$

$$\frac{FG}{\sin 21.154} = \frac{15.7}{\sin 115}$$

$$FG = \frac{15.7\sin 21.154}{\sin 115}$$

$$FG = 6.25$$

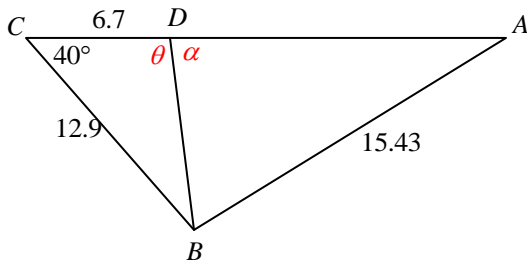
$$FD = 6.25 + 8.93$$

$$FD = 15.18$$

$$\angle\alpha = 180 - (115 + 43.846)$$

$$\angle\alpha = 21.1542^\circ$$

17. Find the measure of angle A to the nearest tenth.



$$BD^2 = 6.7^2 + 12.9^2 - 2(6.7)(12.9)\cos 40^\circ$$

$$BD^2 = 211.3 - 172.86\cos 40^\circ$$

$$BD = 8.88$$

$$\angle\alpha = 180 - 69$$

$$\angle\alpha = 111^\circ$$

$$\frac{\sin\theta}{12.9} = \frac{\sin 40}{8.88}$$

$$\sin\theta = \frac{12.9\sin 40}{8.88}$$

$$\angle\theta = 69^\circ$$

$$\frac{\sin A}{8.88} = \frac{\sin 111}{15.43}$$

$$\sin A = \frac{8.88\sin 111}{15.43}$$

$$\angle A = 32.5^\circ$$