Solve each triangle. Round your answers to the nearest tenth.

19) In ΔABC, $a = 14$ cm, $b = 9$ cm, $c = 6$ cm

$m\angle A = 137°$, $m\angle B = 26°$, $m\angle C = 17°$

21) In ΔQRP, $q = 12$ in, $p = 28$ in, $r = 18$ in

$m\angle Q = 17°$, $m\angle R = 26°$, $m\angle P = 137°$

20) In ΔXYZ, $m\angle X = 138°$, $y = 15$ in, $z = 25$ in

$m\angle Y = 15.5°$, $m\angle Z = 26.5°$, $x = 37.5$ in

22) In ΔQRP, $p = 28$ km, $q = 17$ km, $r = 15$ km

$m\angle Q = 31°$, $m\angle R = 27°$, $m\angle P = 122°$

Homework Answers

2. Given: $C = 42°$, $b = 12$, $a = 14$ — an SAS case.

$$c = \sqrt{a^2 + b^2 - 2ab\cos C} \approx \sqrt{90.303} \approx 9.5;$$
$$A = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right) \approx \cos^{-1}(0.167) \approx 80.3°;$$
$$B = 180° - (A + C) \approx 57.7°.$$

4. Given: $a = 28$, $b = 35$, $c = 17$ — an SSS case.

$$A = \cos^{-1}\left(\frac{b^2 + c^2 - a^2}{2bc}\right) \approx \cos^{-1}(0.613) \approx 52.2°;$$
$$B = \cos^{-1}\left(\frac{a^2 + c^2 - b^2}{2ac}\right) \approx \cos^{-1}(-0.159) \approx 99.2°,$$
$$C = 180° - (A + B) \approx 28.6°.$$

8. Given: $b = 22$, $c = 31$, $A = 82°$ — an SAS case.

$$a = \sqrt{b^2 + c^2 - 2bc\cos A} \approx \sqrt{1255.167} \approx 35.4;$$
$$B = \cos^{-1}\left(\frac{a^2 + c^2 - b^2}{2ac}\right) \approx \cos^{-1}(0.788) \approx 37.9°;$$
$$C = 180° - (A + B) \approx 60.1°.$$

9. No triangles possible $(a + c = b)$

10. No triangles possible $(a + b < c)$

18. Given: $A = 52°$, $b = 14$, $c = 21$ — an SAS case. $a = \sqrt{b^2 + c^2 - 2bc\cos A} \approx \sqrt{274.991} \approx 16.583$, so Area $\approx \sqrt{13418.345} \approx 115.84$ m^2 (using Heron's formula). Or, use $A = \frac{1}{2}bc\sin A$.

22. $s = \frac{21}{2}$; Area $= \sqrt{303.1875} \approx 17.41$

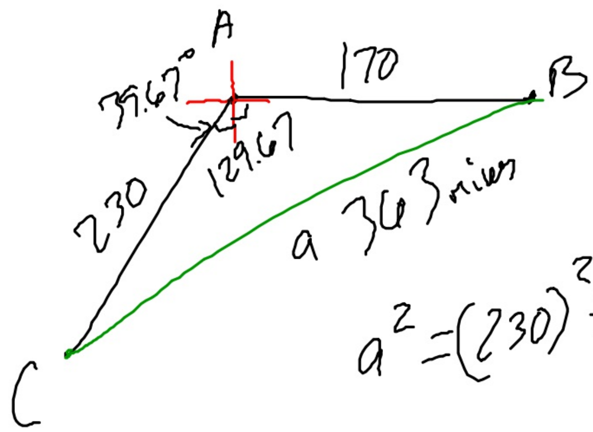
30. The shorter diagonal splits the parallelogram into two (congruent) triangles with $a = 26$, $B = 39°$, and $c = 18$.

The diagonal has length $b = \sqrt{a^2 + c^2 - 2ac\cos B}$ $\approx \sqrt{272.591} \approx 16.5$ ft.

31. Following the method of Example 3, divide the hexagon into 6 triangles. Each has two 12-inch sides that form a 60° angle.

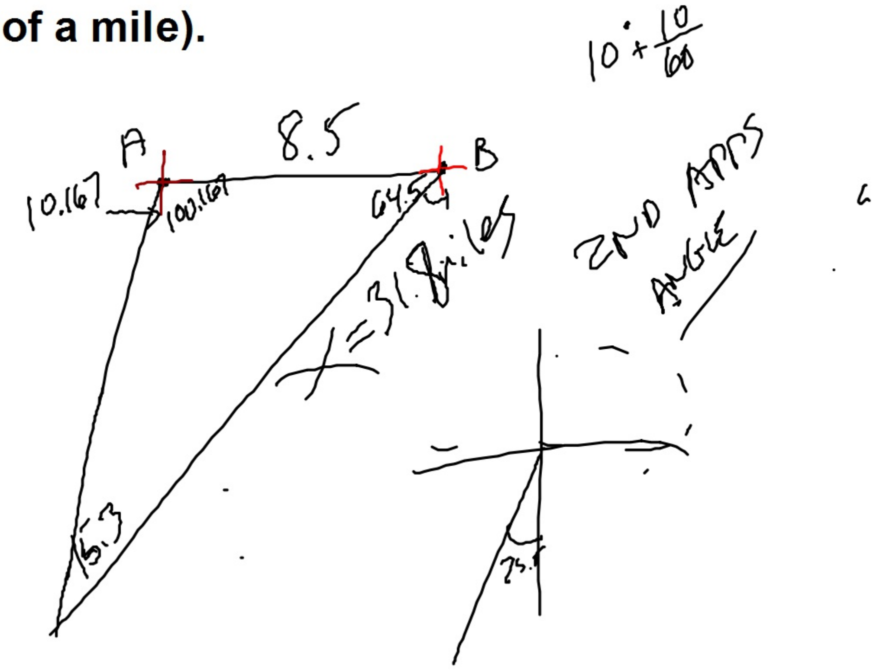
$$6 \times \frac{1}{2}(12)(12)\sin 60° = 216\sqrt{3} \approx 374.1 \text{ square inches}$$

1. **An airplane leaves an airport and flies due west 170 miles and then 230 miles in the direction S 39.67° W. How far is the plane from the airport at this time?**

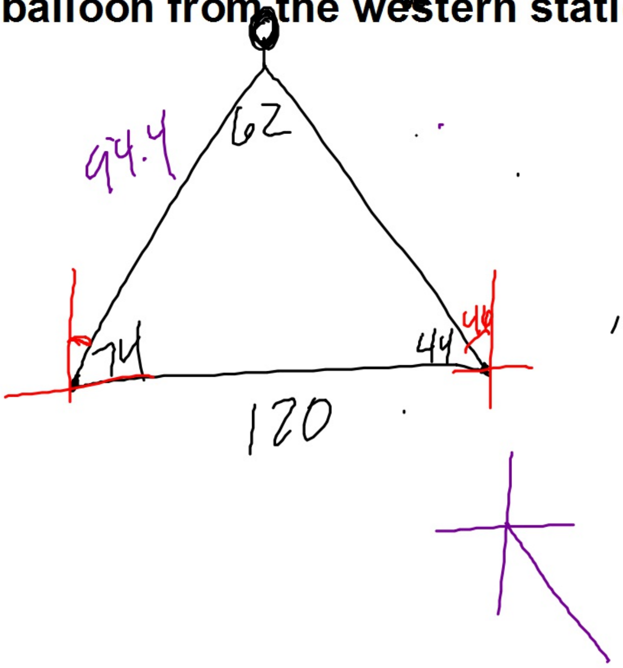


$$a^2 = (230)^2 + (170)^2 - 2(230)(170)\cos 129.67$$

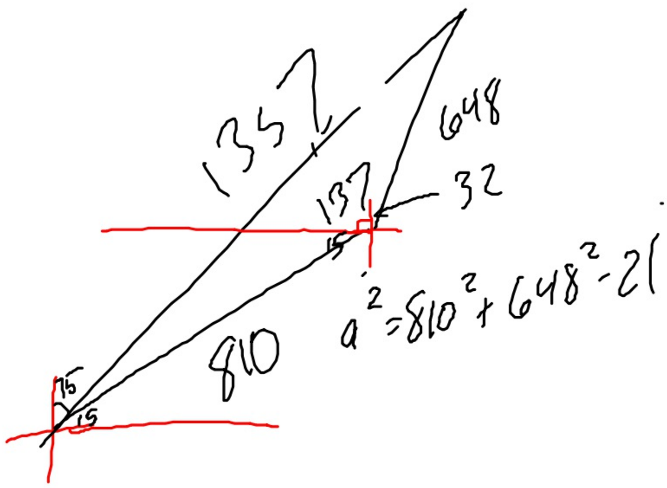
2. **Lookout station B is located 8.5 mi due east of station A. The bearing of a fire from A is S10°10'W and the bearing from B is S25°30'W Determine the distance from the fire to B (to the nearest tenth of a mile).**



3. Two tracking stations are on the equator 120 miles apart. A weather balloon is located on a bearing of N 16°E from the western station and on a bearing of N 46° ~~E~~ W from the eastern station. How far is the balloon from the western station?



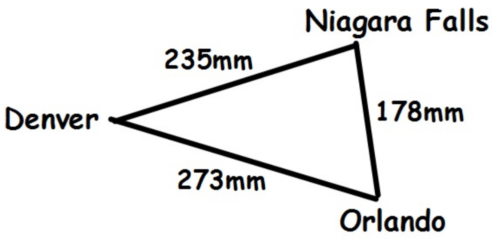
Example 6: A plane flies 810 miles from A to B with a bearing of N 75° E. Then it flies 648 miles from B to C with a bearing of N 32° E. Draw a diagram to represent the problem and find the straight line distance from C to A.



The distance on a map from the airport in Miami, FL to the one in Nassau, Bahamas is 295 kilometers due east. Bangor, Maine is northeast of both cities; its airport is 2350 kilometers from Miami and 2323 kilometers from Nassau. What bearing would a <u>plane</u> need to take to fly from Nassau to Bangor?

Example 7: On a map, Orlando is 178mm due south of Niagara Falls, Denver is 273mm from Orlando, and Denver is 235mm from Niagara Falls.

(a) Find the bearing of Denver from Orlando
(b) Find the bearing of Denver from Niagara Falls



A plane flies 500 km with a bearing of N 44° W from B to C. The plane then flies southwest 840 km from C to A and is due west of location B. Find the bearing of the flight from C to A.

Example 5: To approximate the length of a marsh, a surveyor walks 250m from point A to point B, then turns and walks 220m to point C. The m<B = 105°. Find the length of AC.

Example 7: Two ships leave a port at 9 A.M. One travels at a bearing of N 53° W at 12 miles per hour and the other travels at a bearing of S 67° W at 16 miles per hour. Approximate how far apart they are at noon that day.

Exit Ticket:

1. **A plane flies at a bearing of N35°E for 250 km, it then changes bearings and flies directly east for 450 km. How far is the plane from where it started?**

2. **Solve the triangle for all possible solutions**
A=32°   a= 4   c=6

Fundamental Identities

Recipricoal Identities

$$\csc\theta = \frac{1}{\sin\theta} \qquad \sin\theta = \frac{1}{\csc\theta}$$

$$\sec\theta = \frac{1}{\cos\theta} \qquad \cos\theta = \frac{1}{\sec\theta}$$

$$\cot\theta = \frac{1}{\tan\theta} \qquad \tan\theta = \frac{1}{\cot\theta}$$

Quotient Identities

$$\tan u = \frac{\sin u}{\cos u} \qquad \cot u = \frac{\cos u}{\sin u}$$

Pythogrean Identities

$$\sin^2\theta + \cos^2\theta = 1$$

$$\tan^2\theta + 1 = \sec^2\theta$$

$$1 + \cot^2\theta = \csc^2\theta$$

CoFunction Identities

$$\sin\left(\frac{\pi}{2} - \theta\right) = \cos\theta \qquad \cos\left(\frac{\pi}{2} - \theta\right) = \sin\theta$$

$$\csc\left(\frac{\pi}{2} - \theta\right) = \sec\theta \qquad \sec\left(\frac{\pi}{2} - \theta\right) = \csc\theta$$

$$\tan\left(\frac{\pi}{2} - \theta\right) = \cot\theta \qquad \cot\left(\frac{\pi}{2} - \theta\right) = \tan\theta$$

Even odd Identities

$$\sin(-\theta) = -\sin\theta \qquad \csc(-\theta) = -\csc\theta$$
$$\cos(-\theta) = \cos\theta \qquad \sec(-\theta) = \sec\theta$$
$$\tan(-\theta) = -\tan\theta \qquad \cot(-\theta) = -\cot\theta$$