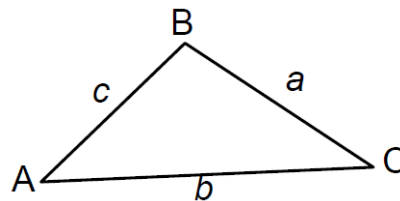


3.1 Law of Sines

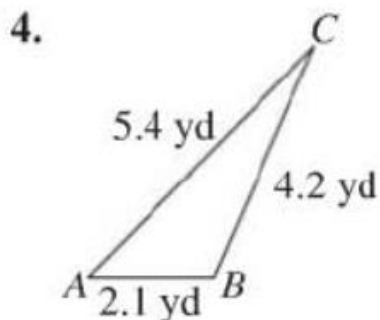
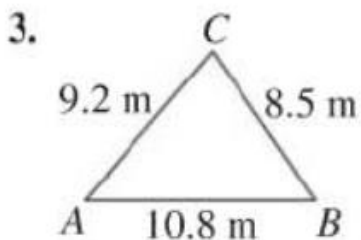
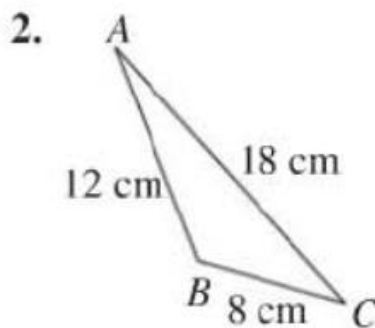
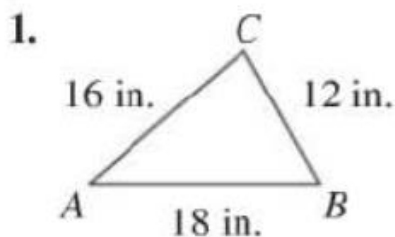
For the following problems, use the triangle shown to the right and the three measures given to find the three missing measures. The triangle is not drawn to scale.

1. $A = 35^\circ, B = 55^\circ, a = 18 \text{ mm}$, find C , b , and c .
2. $B = 40^\circ, C = 110^\circ, c = 30 \text{ ft}$, find A , a , and b .
3. $A = 24.3^\circ, C = 54.6^\circ, c = 26.8$, find B , a , and b .
4. $B = 50^\circ, C = 105^\circ, c = 25$, find A , a , and b .
5. $B = 50^\circ, C = 98^\circ, a = 16$, find A , b , and c .
6. $A = 80^\circ, B = 25^\circ, b = 2.8$, find C , a , and c .



3.2 Law of Cosines

Use the Law of Cosines to solve the triangle. Round answers to the nearest hundredth.



5. $A = 50^\circ, b = 3, c = 11$
6. $C = 108^\circ, a = 10, b = 7$
7. $a = 9, b = 12, c = 15$
8. $B = 20^\circ, c = 15, a = 10$

3.3 The Ambiguous Case

State the number of possible triangles that can be formed using the given measurements.

1. $C = 63^\circ, b = 9, c = 12$

2. $A = 29^\circ, c = 18, a = 17$

3. $B = 33^\circ, a = 27, c = 22$

4. $B = 35^\circ, a = 24, b = 6$

Solve $\triangle ABC$. Round answers to the nearest hundredth. If two solutions exist, find both.

5. $A = 50^\circ, B = 68^\circ, c = 230$

6. $a = 3, b = 4, C = 53^\circ$

7. $A = 60^\circ, a = 9, c = 10$

8. $c = 30, b = 9.5, C = 107^\circ$

9. $A = 70^\circ, c = 26, a = 25$

10. $C = 29^\circ, b = 25, c = 21$

3.4 Applications of the Law of Sines and Law of Cosines

1. Two ranger stations located 10 km apart on the southwest and southeast corners of a national park. They receive a distress call from a camper. Electronic equipment allows SW ranger to determine that the camper is at a location that makes an angle of 61° with the southern boundary. Another beacon allows the SE ranger see that the camper is 9.2 km to the northwest of his position. (a) Which station is closer to the camper? (b) What is the difference in the distances?

2. Ships A and B leave port at the same time and sail on straight paths making an angle of 60° with each other. How far apart are the ships at the end of 1 hour if the speed of ship A is 25km/h and that of ship B is 15 km/h?

3. A plane flies 500 miles on a straight path. The plane then turns left 12 degrees on a new heading and goes another 300 miles. How far is the plane from its original location?

4. A boat leaves a pier heading due north for 50 miles. The captain then turns 20° toward the west and goes another 10 miles. At this point the boat breaks down. What angle (from north) does the harbor need to send a tug boat to retrieve the boat and the captain?

5. The angles of elevation of a balloon from the two points A and B on level ground are 24° and 47° respectively. If points A and B are 8.4 miles apart and the balloon is between the points, in the same vertical plane, approximate, to the nearest tenth of a mile, the height of the balloon above the ground.

6. After a storm, a tree is leaning 3° from vertical toward the front of a house. A person standing on the front porch notices that the angle of elevation to the top of the tree is 40° . If the house is 60 feet from the base of the tree, how tall is the tree?

7. A ship in the bay is 18 miles from one lighthouse and 30 miles from another. What is the distance between lighthouses if the measure of the angle formed by the line of sight to the lighthouse is 130° ?

8. A vertical flagpole is mounted on a hill that makes a 10° angle with the horizontal. If the sun, shining at an angle of elevation of 70° , makes a 13 foot shadow down the hill, how tall is the flagpole?

9. A tree is leaning 5° from vertical up a hill that makes an angle of 15° with the horizontal. The sun, shining at an angle of elevation of 60° , makes a shadow up the hill. If the tree is 45 feet tall, how long is the shadow?

3.5 Oblique Triangles Review

1. Solve the triangle ABC with $a = 3$ cm, $b = 2$ cm and $\angle A = 40^\circ$
2. A new homeowner has a triangular-shaped back yard. Two of the three sides measure 65' and 80'. The angle measure opposite the 65' side is 25° . To the nearest angle, what is the measure of the largest angle?
3. Solve the triangle with $\angle C = 50^\circ$, $\angle A = 45^\circ$, $b = 4$
4. To the nearest square foot, what is the area of a triangular parcel of land if two adjacent sides measure 204' and 246' and the angle between them is 66° ?
5. The directors of a yacht club want to lay out a triangular racing course. The three legs of the race are 8, 11.25 and 8.67 nautical miles long. What is the sharpest angle (smallest angle) the yachts must take in this race?
6. Jacob wants to throw water balloons at Will from the top of the school. The distance from Will to the building is 25 feet and the angle of elevation from Will is 65° . What is the distance Jacob would have to throw the balloon to hit Will?
7. A clown fish and an angel fish separated by a distance of 4 feet were swimming happily in the ocean until they each saw a shark. The angel fish quickly determines that he is 20 feet away from the shark. Then the angel fish looks from the shark pivoting his head 36° towards the clownfish in a panic. Both fish know the shark will eat whichever fish is closer. Who is doomed?
8. Points A and B are on opposite sides of the Grand Canyon. Point C is 200 yards from A. Angle B measures 87° and angle C measures 67° . What is the distance between A and B?
9. 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.
10. A person at A looks due east and sees a UFO with an angle of elevation of 40° . At the same instant, another person, 1.0 miles due west of A looks due east and sights the same UFO with an angle of elevation of 25° . Find the distance between A and the UFO. How far is the UFO above the ground?

Cumulative Review:

11. Given $\sin x = \frac{4}{7}$ and $\cos x = \frac{-\sqrt{33}}{7}$, find $\cot x$.
12. Verify the identity: $\frac{\sec^2 x}{\cot x} - \tan^3 x = \tan x$.
13. Find all the solutions: $2 \cos x - \sqrt{3} = 0$
14. Find all the solutions: $\cos^2 x - \cos 2x = 0$.
15. Evaluate: $\sin 255^\circ$. Use the fact that $255^\circ = 210^\circ + 45^\circ$.
16. Simplify: $\frac{\tan 97^\circ - \tan 37^\circ}{1 + (\tan 97^\circ)(\tan 37^\circ)}$
17. Given $\cos \theta = \frac{3}{4}$, and $\sin \theta < 0$, find $\tan(2\theta)$
18. Evaluate:
 - a. $\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$
 - b. $\tan^{-1} 0$
 - c. $\arccos\left(\sin\left(\frac{\pi}{3}\right)\right)$
19. Graph. Label key points, amplitude, and period.
 - a. $y = 2 \sin x$
 - b. $y = \tan x - 3$