

Solving Any Triangle with Sines, Cosines and Area

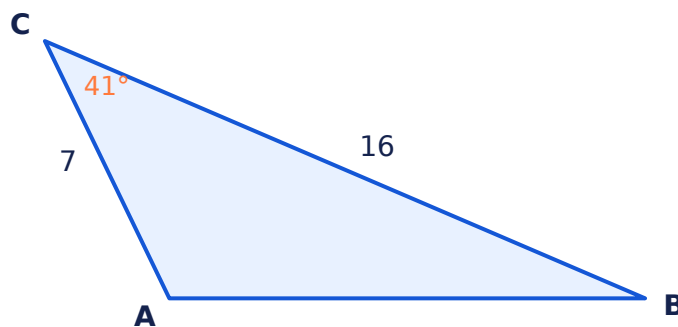
Grade 10 – Geometry math · Worksheet · Standards: G-SRT.D.9, G-SRT.D.10, G-SRT.D.11

Name: _____ Date: _____ Class: _____

These problems cover the area formula $\frac{1}{2}ab \sin C$, the Law of Sines and the Law of Cosines (G-SRT.D.9, D.10 and D.11). Early problems build the habit of choosing a law; later ones solve whole triangles. Surveying lots, lake crossings, drones and bearings supply the contexts.

Standards: G-SRT.D.9, G-SRT.D.10, G-SRT.D.11 · **Level:** Grade 10 Geometry

Problem 1 Area from Two Sides (easy)



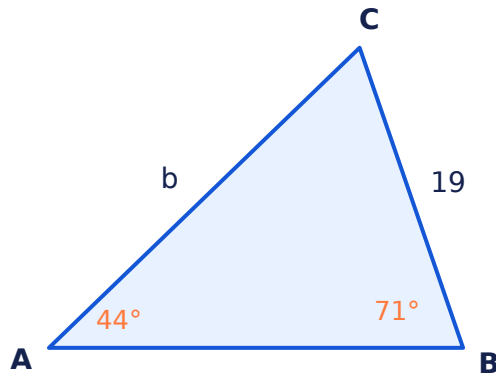
Sides 16 and 7, included angle 41°.

A garden bed is shaped like this triangle, with lengths in feet. Compute its area, rounded to tenths of a square foot.

Problem 2 Area with an Obtuse Angle (easy)

A triangular sail has two edges of 12.5 feet and 8 feet that meet at an angle of 115°. Find the area of the sail to the nearest tenth.

Problem 3 Law of Sines for a Side (easy)



Find b .

Use the figure to determine the length of side b , reported to one decimal place.

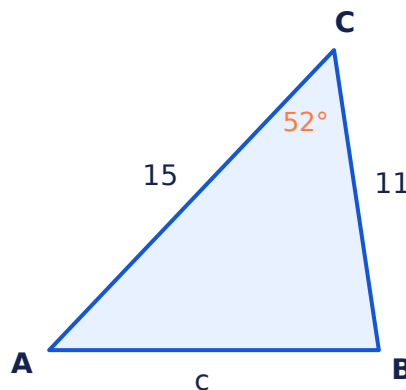
Problem 4 Law of Sines for an Angle (medium)

In triangle ABC, $A = 72^\circ$, $a = 24$ and $b = 19$. Find angle B to the nearest tenth of a degree.

Problem 5 Find the Third Angle First (medium)

In triangle ABC, $A = 53^\circ$, $C = 71^\circ$ and $c = 40$. Find angle B and side a . Round a to the nearest tenth.

Problem 6 Law of Cosines for a Side (medium)



Find c .

Find side c to the nearest tenth.

Problem 7 Obtuse Included Angle (medium)

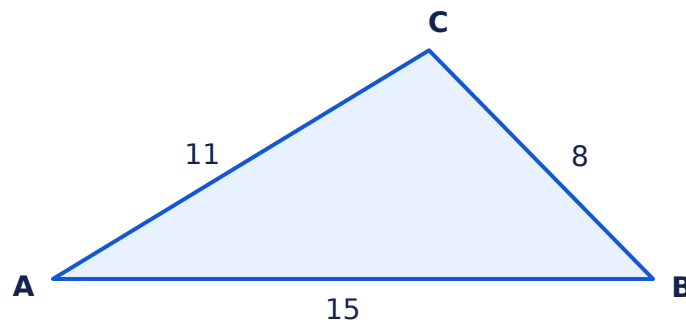
Two sides of a triangle measure 7.5 inches and 10 inches, and the angle between them is 124° . Find the third side to the nearest tenth.

Problem 8 Largest Angle from Three Sides (medium)

Which angle of a triangle with side lengths 7, 11 and 15 is greatest? Calculate its measure, rounded to one decimal place.

Problem 9 Choose the Law (easy)

For each case, state whether to begin with the Law of Sines or the Law of Cosines. (a) $A = 40^\circ$, $B = 65^\circ$, $a = 12$. (b) $a = 7$, $b = 9$, $C = 100^\circ$. (c) $a = 8$, $b = 10$, $c = 13$. (d) $B = 30^\circ$, $C = 80^\circ$, $c = 21$.

Problem 10 Solve from Three Sides (hard)

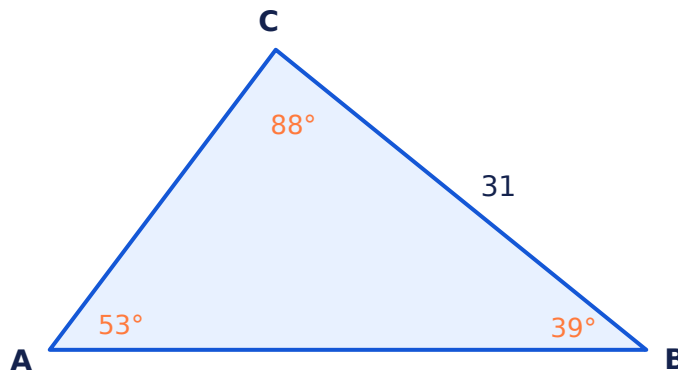
Sides 8, 11 and 15.

Find all three angles of the triangle to the nearest tenth of a degree.

Problem 11 Solve from Two Sides and an Angle (hard)

In triangle ABC, $A = 67^\circ$, $b = 22$ and $c = 17$. Find a , B and C . Round to the nearest tenth.

Problem 12 Solve from Two Angles and a Side (hard)



Side $a = 31$ lies between B and C .

In triangle ABC, $B = 39^\circ$, $C = 88^\circ$ and $a = 31$. Find A , b and c . Round to the nearest tenth.

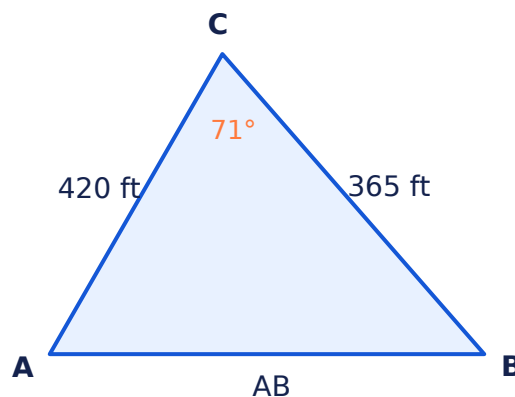
Problem 13 Area from Three Sides (hard)

A triangular plot has sides of 9 yards, 13 yards and 16 yards. Use the Law of Cosines and the area formula to find its area to the nearest tenth.

Problem 14 Area of a Parallelogram (medium)

Two adjacent sides of a parallelogram measure 18 inches and 12.5 inches, with an angle of 64° between them. A diagonal splits it into two congruent triangles. Find the area of the parallelogram to the nearest tenth.

Problem 15 Distance Across a Lake (medium)



Surveyor at P sights points A and B across the lake.

A surveyor stands at point P . Point A across the lake is 420 feet away and point B is 365 feet

away, and the angle APB is 71° . How far apart are A and B , to the nearest foot?

Problem 16 Two Boats Leave a Dock (medium)

Two boats leave the same dock at noon. One travels 12 miles on a bearing of 025° . The other travels 9 miles on a bearing of 112° . How far apart are they to the nearest tenth of a mile?

Problem 17 Observers Tracking a Plane (hard)

Two observers 3.2 miles apart on level ground track a plane that is in the vertical plane through both of them. The interior angles of the sighting triangle at the observers are 41° and 67° . (a) Find the distance from the 41° observer to the plane. (b) Find the altitude of the plane. Round to the nearest hundredth of a mile.

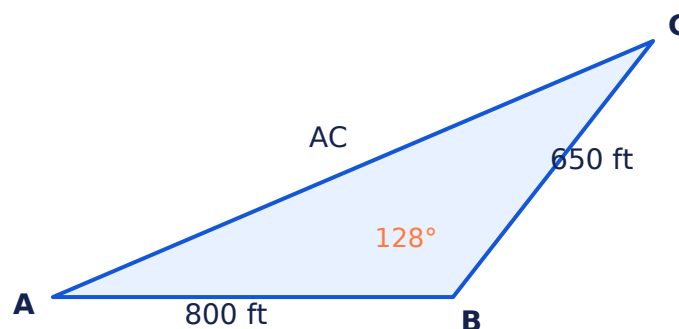
Problem 18 Two Possible Triangles (hard)

In triangle ABC , $A = 30^\circ$, $a = 7$ and $b = 12$. Show that two triangles are possible, and find angle C and side c in each. Round to the nearest tenth.

Problem 19 Area of a Four-Sided Lot (hard)

A lot is split by a diagonal into two triangles. The first triangle has sides 62 feet and 48 feet enclosing a 75° angle. The second has sides 55 feet and 40 feet enclosing a 110° angle. Find the total area to the nearest square foot.

Problem 20 Drone Return Flight (hard)



Drone path $A \rightarrow B \rightarrow C$.

A drone flies 800 feet from A to B , turns, and flies 650 feet to C . The interior angle at B is 128° .

(a) How long is the direct flight from C back to A ? (b) At what angle at A between AB and AC

must it aim? Round to the nearest tenth.