

Geometry · Law of Sines, Law of Cosines and Triangle Area · Worksheet

Common Core G-SRT.D.9, G-SRT.D.10, G-SRT.D.11 · mathovore.fr

Name: _____ Date: ____/____/____ Score: _____

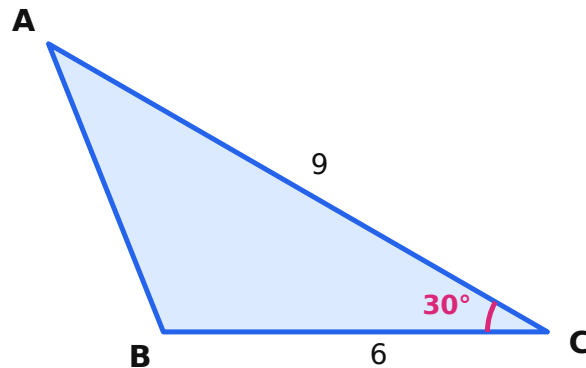
These 22 problems practice Common Core standards G-SRT.D.9, G-SRT.D.10 and G-SRT.D.11. Find triangle areas from two sides and an angle, apply the Law of Sines and the Law of Cosines, complete a short proof, and solve non-right triangles.

The last six problems are surveying and navigation word problems. Work from easiest to hardest, keep extra decimals until the final step, and use degree mode.

GeometryCommon Core: G-SRT.D.9 · G-SRT.D.10 · G-SRT.D.11

Problem 1: Area from two sides and an angle

Find the area of the triangle in square units.



Two sides 6 and 9 with an included angle of 30 degrees.

Problem 2: Area, decimal answer

Two sides of a triangle measure 12 cm and 15 cm, and the angle between them is 50° . Find the area to the nearest tenth of a square centimeter.

Problem 3: Area with an obtuse angle

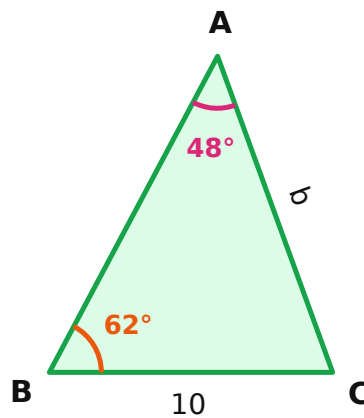
A triangle has sides 7.5 in. and 10 in. with an included angle of 115° . Find its area to the nearest tenth of a square inch.

Problem 4: Angle from the area

A triangle with area 60 square units has sides 10 and 15 on either side of an acute angle C . Find $m\angle C$ to the nearest tenth of a degree.

Problem 5: Law of Sines for a side

Find side b to the nearest tenth.



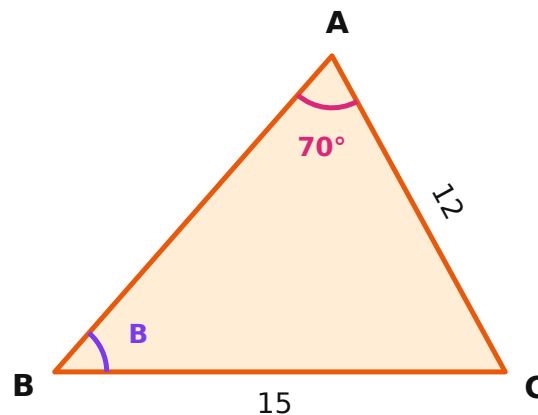
Triangle with A 48 degrees, B 62 degrees and a 10.

Problem 6: Third angle, then two sides

In triangle ABC, $B = 35^\circ$, $C = 80^\circ$ and $c = 24$. Find $m\angle A$, then sides a and b to the nearest tenth.

Problem 7: Law of Sines for an angle

Find $m\angle B$ to the nearest tenth of a degree. Side a is the longer side, so B is acute.



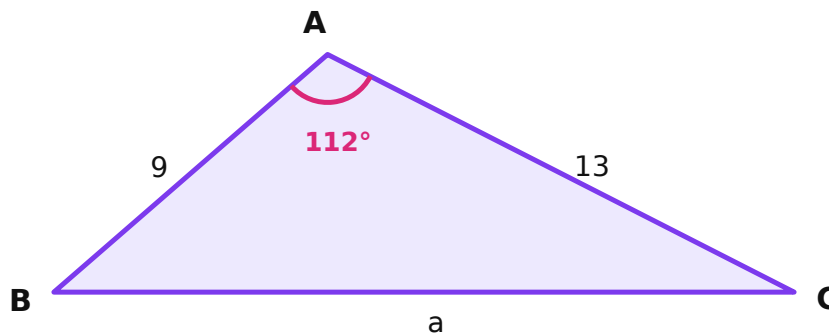
Triangle with a 15, b 12 and A 70 degrees.

Problem 8: Law of Cosines, SAS

In triangle ABC, $a=7$, $b=12$ and $C=60^\circ$. Find c to the nearest tenth.

Problem 9: Law of Cosines, obtuse angle

Find side a to the nearest tenth.



Sides 13 and 9 with an included angle of 112 degrees.

Problem 10: Law of Cosines, SSS

A triangle has sides 7, 9 and 12. Find the largest angle to the nearest tenth of a degree.

Problem 11: All three angles

Find all three angles of the triangle with sides 13, 14 and 15. Round each to the nearest tenth of a degree and check that they add to 180° .

Problem 12: Choose the law

For each triangle, name the law (Sines or Cosines) you would use first to find an unknown side or angle, and explain why.

- a. $a=9$, $b=12$, $C=47^\circ$
- b. $A=52^\circ$, $B=71^\circ$, $a=15$
- c. $a=7$, $b=9$, $c=12$
- d. $A=35^\circ$, $a=7$, $b=10$

Problem 13: Cosines and the Pythagorean theorem

Show that the Law of Cosines becomes the Pythagorean theorem when $C=90^\circ$. Then verify with $a=6$ and $b=8$.

Problem 14: Proof of the area formula

Complete the proof that the area of triangle ABC is $\frac{1}{2}ab\sin C$ by writing a reason for each step, (a) through (e). Here $a = BC$, $b = AC$ and $\angle C$ is acute.

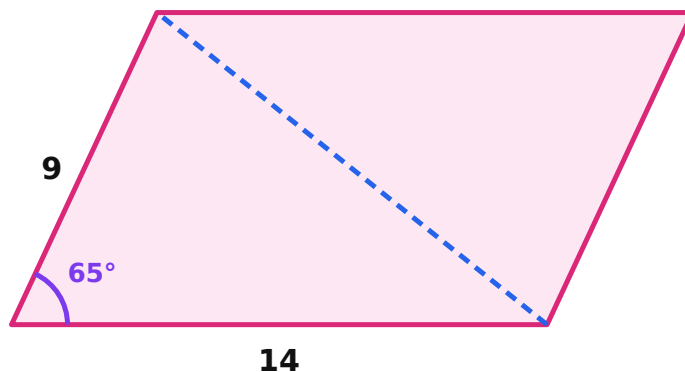
Step	Statements	Reasons
1	Draw altitude $\overline{AD}$ to $\overline{BC}$, with $AD = h$	(a)
2	$\text{Area} = \frac{1}{2}ah$	(b)
3	$\sin C = \frac{h}{b}$	(c)
4	$h = b\sin C$	(d)
5	$\text{Area} = \frac{1}{2}ab\sin C$	(e)

Problem 15: Area after the Law of Sines

In triangle ABC, $A = 40^\circ$, $B = 75^\circ$ and $a = 12$. Find the area of the triangle to the nearest tenth of a square unit.

Problem 16: Area of a parallelogram

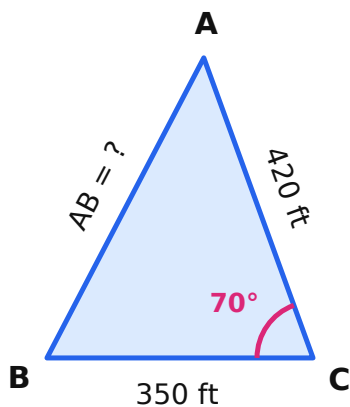
A parallelogram has sides 9 and 14 and an angle of 65° between them. Find its area to the nearest tenth. (Hint for the figure: the dashed diagonal splits it into two congruent triangles.)



A parallelogram with sides 14 and 9 and a 65 degree angle.

Problem 17: Distance across a pond

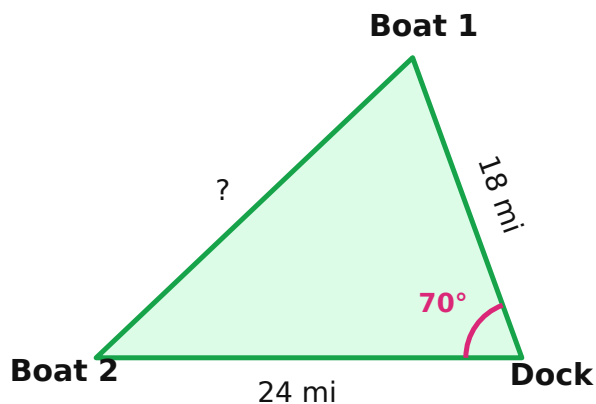
A surveyor at point C measures 420 ft to point A and 350 ft to point B on opposite sides of a pond. The angle $\angle ACB$ is 70° . How far apart are A and B? Round to the nearest foot.



Surveying triangle across a pond.

Problem 18: Two boats leave a dock

Two boats leave the same dock at the same time on paths that form a 70° angle. After an hour, one boat is 18 mi from the dock and the other is 24 mi from it. How far apart are the boats? Round to the nearest tenth of a mile.



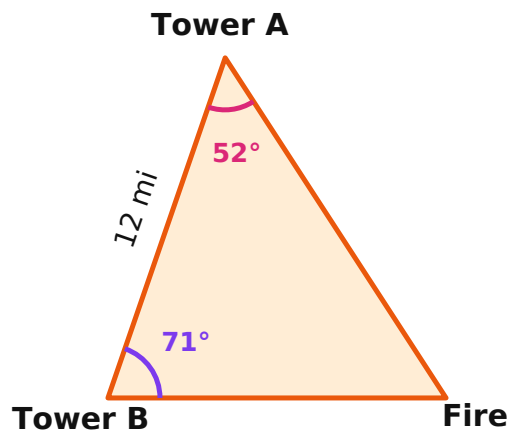
Boat paths forming a 70 degree angle.

Problem 19: Sod for a triangular lot

A triangular lot has two sides of 120 ft and 85 ft that meet at a 74° angle. Find the area to the nearest square foot. Then find the cost of sod at \$0.45 per square foot, using the rounded area.

Problem 20: Locating a fire

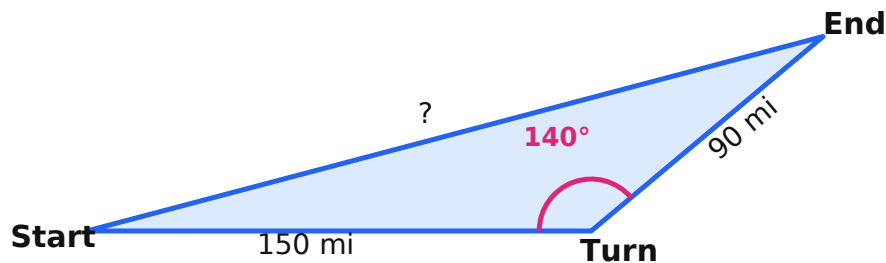
Fire towers A and B are 12 mi apart. The ranger at A sees a fire at an angle of 52° from line AB, and the ranger at B sees it at 71° from line BA. How far is the fire from each tower? Round to the nearest tenth of a mile.



Two sightings of a fire from towers 12 miles apart.

Problem 21: Plane with a turn

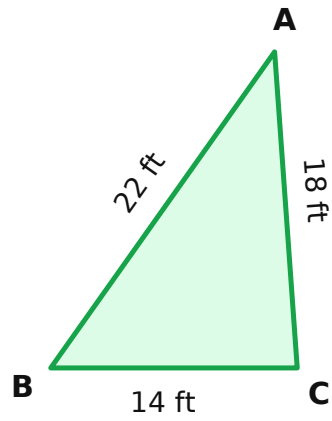
A plane flies 150 mi due east, turns 40° toward the north, and then flies 90 mi. How far is the plane from where it started? Round to the nearest tenth of a mile.



The interior angle at the turn is 180 degrees minus 40 degrees.

Problem 22: Garden angle and area

A triangular garden has sides 14 ft, 18 ft and 22 ft. Find the largest angle to the nearest tenth of a degree, then use it to find the area of the garden to the nearest tenth of a square foot.



A triangular garden with sides 14, 18 and 22 feet.