

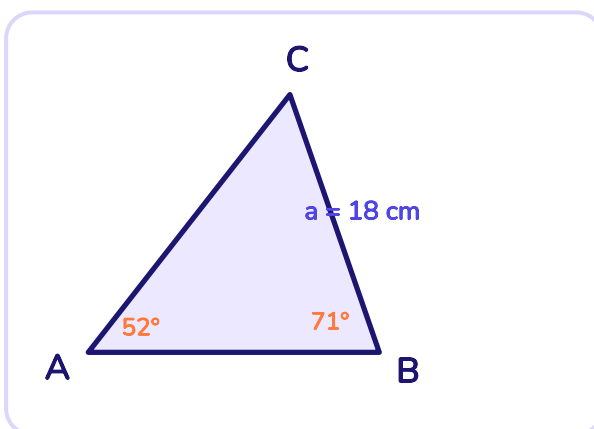
Law of Sines and Law of Cosines: math practice, Grade 12 – download the PDF

21 problems graded by difficulty (★ easy, ★★ medium, ★★★ hard). Try first, without looking at the solutions!

1 Solving an AAS triangle

★ ★ ★

In triangle ABC , $A = 52^\circ$, $B = 71^\circ$ and $a = 18$ cm.



Find angle C , then sides b and c , rounded to the nearest tenth.

2 A missing angle

★ ★ ★

In triangle ABC , $A = 48^\circ$, $a = 9$ in and $b = 7$ in. Since $\angle B$

3 A side from SAS



In triangle ABC , $b = 12$, $c = 15$ and $A = 60^\circ$. Find a .

4 Area from two sides and the angle



A triangular sail has two edges of 10 m and 13 m that meet at an angle of 30° . Find its area.

5 Heron's formula



Find the exact area and a decimal approximation of a triangle with sides 7, 8 and 9.

6 True or false?



Decide whether each statement is true or false and justify.

- If $C = 90^\circ$, the Law of Cosines reduces to $c^2 = a^2 + b^2$.
- If $c^2 > a^2 + b^2$, then angle C is acute.
- The Law of Sines alone can find the angles of a triangle whose three sides are known.

7 Which law first?



For each situation, state whether you start with the Law of Sines or the Law of Cosines, and why.

- $A = 32^\circ$, $B = 81^\circ$, $c = 9$
- $a = 6$, $b = 9$, $C = 40^\circ$
- $a = 5$, $b = 7$, $c = 10$
- $A = 25^\circ$, $a = 8$, $b = 11$

8 No triangle



Can a triangle have $A = 40^\circ$, $a = 6$ and $b = 10$? Explain.

9 Two triangles



Let $A = 35^\circ$, $a = 8$ and $b = 11$. Show that two triangles exist and solve both, to the nearest tenth.

10 A right-triangle borderline



Let $A = 30^\circ$, $a = 5$ and $b = 10$. Solve the triangle and name its special feature.

11 Across the river



A surveyor wants the distance across a river to a tree T. She marks points A and B on her bank, 80 ft (about 24.4 m) apart, and measures $\angle TAB = 62^\circ$ and $\angle TBA = 71^\circ$. How far is the tree from A, and from B?

12 All angles from three sides



A triangle has sides $a = 5$, $b = 7$ and $c = 9$. Find all three angles to the nearest hundredth of a degree.

13 Area with two angles and a side



In triangle ABC , $A = 50^\circ$, $B = 60^\circ$ and $c = 10$. Find the area.

14 Diagonals of a parallelogram

★★★

A parallelogram has sides of 8 cm and 11 cm and one angle of 70° . Find the lengths of both diagonals.

15 A ship's return trip

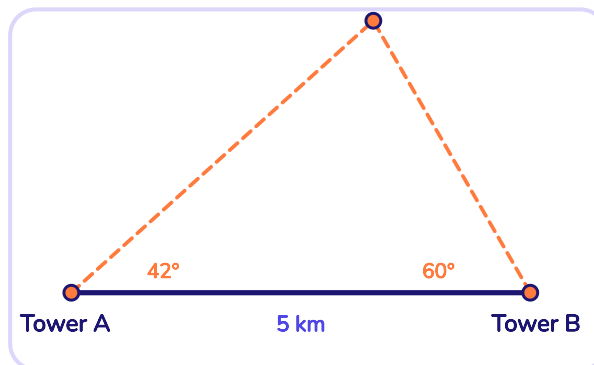
★★★

A ship leaves port P and sails 30 mi on bearing 050° to Q, then 45 mi on bearing 125° to R (1 mi is about 1.61 km). Find the distance PR and the bearing the ship should follow to return directly from R to P.

16 Spotting a fire

★★★

Two lookout towers A and B stand 5 km apart on an east-west line, B being east of A. The ranger at A sees a fire on bearing 048° ; the ranger at B sees it on bearing 330° .



Find the distances AF and BF, and how far north of line AB the fire is.

17 Heron, altitude and inscribed circle

★★★

A triangle has sides 17, 25 and 28.

a. Find its area.

b. Find its shortest altitude.

c. The radius of the inscribed circle is $r = \frac{K}{s}$. Find r .

18 A land parcel



A quadrilateral parcel ABCD has $AB = 50$ m, $BC = 70$ m, $CD = 45$ m, $DA = 55$ m and $\angle B = 60^\circ$. Find its total area. (Cut it along diagonal AC.)

19 Recognizing a 120 degree angle



A triangle has sides 7, 8 and 13. Show that its largest angle is exactly 120° , then find the exact area in two ways.

20 How many triangles for each side?



Angle $A = 30^\circ$ and side $b = 12$ are fixed. For which values of a does the triangle exist in 0, 1 or 2 versions?

21 The circumscribed circle



For the triangle with sides 13, 14 and 15 (area 84), use $R = \frac{abc}{4K}$ to find the circumradius. Then use $\frac{a}{\sin A} = 2R$ to find $\sin A$ for the angle opposite 13.



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