LESSON MAKER PRO

Triangle Routes

Find lengths and areas in triangles without right angles.

HIGH SCHOOL · PC.T.2

PC.T.2 "Apply trigonometric concepts beyond the right triangle. Create models for situations involving trigonometry. Apply the Law of Sines and Law of Cosines to solve problems. Use trigonometry to find the area of triangles..."

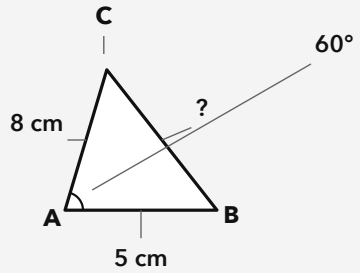
NAME _____ DATE _____

CHOOSE A TRIANGLE RULE

When you know two sides and the angle between them, use $c^2 = a^2 + b^2 - 2ab \cos C$ to find the opposite side. When you know a side and its opposite angle, use $a/\sin A = b/\sin B$ to find another side. To find area from two sides and their included angle, use Area = $(1/2)ab \sin C$.

WORKED EXAMPLE

Find BC in the triangle.

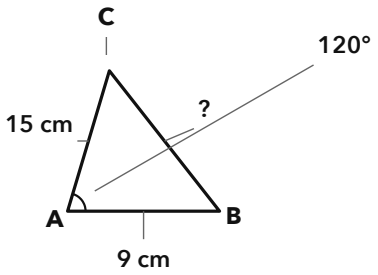


1. $BC^2 = 5^2 + 8^2 - 2(5)(8)\cos 60°$.
2. $BC^2 = 25 + 64 - 40 = 49$.
3. $BC = 7$.

Answer: 7 cm

PRACTICE 6 problems

1 Find BC in the triangle.

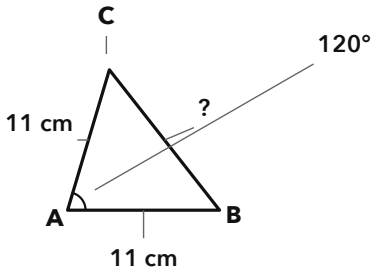


ANSWER _____

2 In triangle ABC, AB = 10 cm, AC = 14 cm, and angle A = 120°. Find BC.

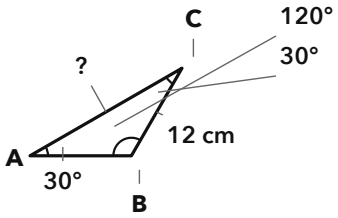
ANSWER _____

3 Find BC in the triangle.



ANSWER _____

4 Find AC in the triangle.

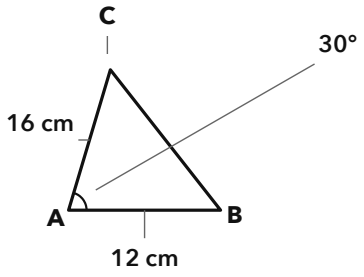


ANSWER _____

5 In triangle ABC, angle A = 120°, and angles B and C are each 30°. If BC = 18sqrt3 cm, find AB.

ANSWER _____

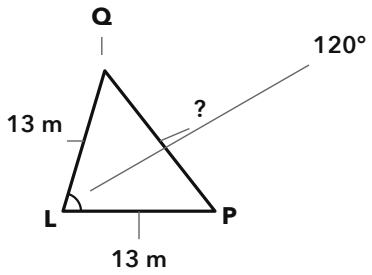
6 Find the area of the triangle.



ANSWER _____

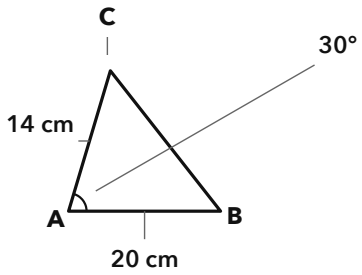
APPLY IT Show your work

1 At a concert, two cables run from a light at L to anchors P and Q. How far apart are the anchors? Use the diagram.



ANSWER _____

2 An art club designs the triangular banner shown. What is its area?



ANSWER _____

CHALLENGE One step up

In triangle ABC, angle A = 30°, BC = 12 cm, and AB = 12sqrt2 cm. Find all possible values of angle C. Explain why more than one value works.

WORK SPACE AND ANSWER

Triangle Routes

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find BC in the triangle.	**21 cm**
2	In triangle ABC, AB = 10 cm, AC = 14 cm, and angle A = 120°. Find BC.	**2sqrt109 cm**
3	Find BC in the triangle.	**11sqrt3 cm**
4	Find AC in the triangle.	**12sqrt3 cm**
5	In triangle ABC, angle A = 120°, and angles B and C are each 30°. If BC = 18sqrt3 cm, find AB.	**18 cm**
6	Find the area of the triangle.	**48 cm^2**

PART 2 · APPLY IT

1. **13sqrt3 m** Use the Law of Cosines: $PQ^2 = 13^2 + 13^2 - 2(13)(13)\cos 120° = 507$. Thus PQ = 13sqrt3 m.
2. **70 cm^2** Use the two sides and their included angle: Area = (1/2)(20)(14)sin 30° = 70 cm^2.

CHALLENGE

Angle C can be 45° or 135°. The Law of Sines gives sin C = sqrt2/2, and either angle leaves room for a positive third angle.

Accept equivalent exact radical forms, such as sqrt436 cm for problem 2. For the challenge, the third angle is 105° when C = 45° and 15° when C = 135°.