LESSON MAKER PRO

# Triangle Route Finder

*Find exact distances and angles without a calculator.*

**HIGH SCHOOL · PC.T.2.2**

**PC.T.2.2** "Apply the Law of Sines and Law of Cosines to solve problems."

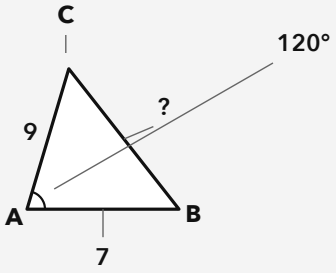
NAME _____ DATE _____

## CHOOSE THE RIGHT LAW

Match each side with its opposite angle. Use the Law of Sines when you know an opposite side-angle pair: $a/\sin A = b/\sin B$. Use the Law of Cosines when you know two sides and their included angle, or all three sides: $c^2 = a^2 + b^2 - 2ab \cos C$.

### WORKED EXAMPLE

Find the unknown side length in the figure.

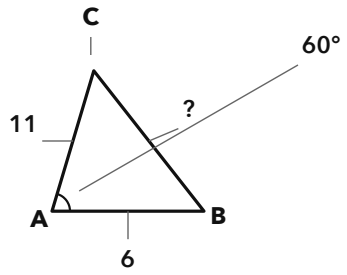



1. Use the Law of Cosines because the given angle is between the two known sides.
2. $x^2 = 7^2 + 9^2 - 2(7)(9)\cos 120°$.
3. Since $\cos 120° = -1/2$, $x^2 = 49 + 81 + 63 = 193$.
4. Take the positive square root: $x = \sqrt{193}$.

**Answer: $\sqrt{193}$**

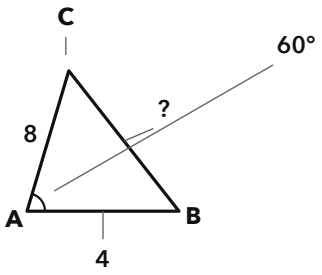
## PRACTICE 6 problems

**1** Find the unknown side length.



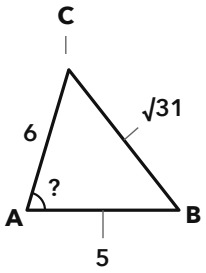

**ANSWER** _____

**2** Find the unknown side length.



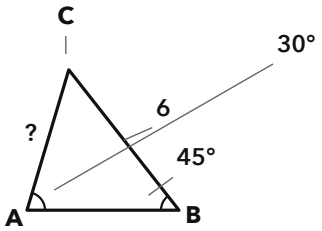

**ANSWER** _____

**3** Find angle A.



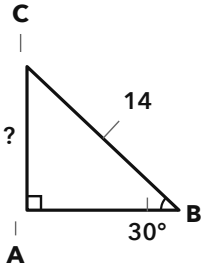

**ANSWER** _____

**4** Find the unknown side length.



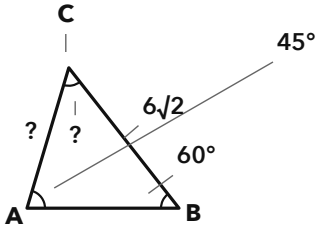

**ANSWER** _____

**5** Find the unknown side length.




**ANSWER** _____

**6** Find the unknown side length and angle C.

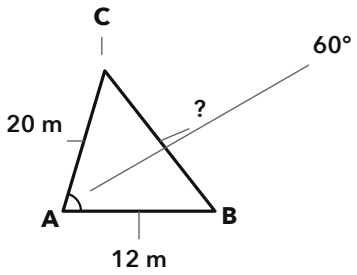



**ANSWER** _____

_____

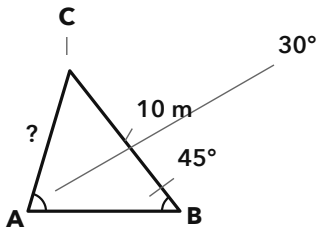
## APPLY IT Show your work

**1** At a music festival, A is the entrance, B is a merch booth, and C is a water station. How far apart are the two booths shown in the figure, in a straight line?




**ANSWER** _____

**2** At a drone race, A and B are launch markers and C is a checkpoint. Find the straight-line distance from A to C shown in the figure.




**ANSWER** _____

## CHALLENGE One step up

In a triangle, a side of length 6 is opposite a 30° angle. Another side has length $6\sqrt{2}$. Find both possible measures of the angle opposite the side of length $6\sqrt{2}$. Explain why both are possible.

WORK SPACE AND ANSWER

**ANSWER KEY**

# Triangle Route Finder



## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Find the unknown side length. | **$\sqrt{91}$** |
| 2 | Find the unknown side length. | **$4\sqrt{3}$** |
| 3 | Find angle A. | **60°** |
| 4 | Find the unknown side length. | **$6\sqrt{2}$** |
| 5 | Find the unknown side length. | **7** |
| 6 | Find the unknown side length and angle C. | **Unknown side length: $6\sqrt{3}$; angle C: 75°** |

## PART 2 · APPLY IT

1. **$4\sqrt{19}$ m** Use the Law of Cosines: $BC^2 = 12^2 + 20^2 - 2(12)(20)\cos 60° = 304$. Thus $BC = 4\sqrt{19}$ m.
2. **$10\sqrt{2}$ m** Use the Law of Sines: $AC/\sin 45° = 10/\sin 30°$. Therefore $AC = 10\sqrt{2}$ m.

## CHALLENGE

**45° and 135°. The Law of Sines gives $\sin B = \sqrt{2}/2$, which holds for both angles. Each can form a triangle with a 30° angle because each leaves a positive third angle.**

Accept equivalent exact radical forms. Do not accept decimal approximations as exact answers.