LESSON MAKER PRO

Triangle Distance Lab

Use sine and cosine rules to unlock unknown lengths.

HIGH SCHOOL · HSG-SRT.D.11

CCSS.Math.Content.HSG-SRT.D.11 "(+) Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces)."

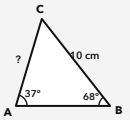
NAME _____ DATE _____

CHOOSE THE RIGHT RULE

For a triangle with sides a, b, and c opposite angles A, B, and C, use $a/\sin(A) = b/\sin(B) = c/\sin(C)$ when you know an angle-side pair. Use $a^2 = b^2 + c^2 - 2bc\cos(A)$ when you know two sides and their included angle.

WORKED EXAMPLE

Use the triangle in the figure. Find AC.

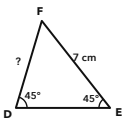


1. Let BC = 10 and AC = b.
2. Use $b/\sin(68°) = 10/\sin(37°)$.
3. Multiply by sin(68°): $b = 10\ \sin(68°)/\sin(37°)$.

Answer: AC = 10 sin(68°)/sin(37°) cm

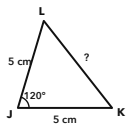
PRACTICE 6 problems

1 Use the triangle in the figure. Find DF.



ANSWER _____

2 Use the triangle in the figure. Find KL.



ANSWER _____

3 In triangle PQR, angle P = 30°, angle Q = 90°, and QR = 6 cm. Find PR.

ANSWER _____

4 In triangle ABC, AB = 9 cm, AC = 12 cm, and angle A = 90°. Use the Law of Cosines to find BC.

ANSWER _____

5 In triangle ABC, angle A = 40°, angle B = 65°, and the side opposite angle A is 12 cm. Use the Law of Sines to find the length of the side opposite angle B.

ANSWER _____

6 Two sides of a triangle are 7 cm and 11 cm, and the included angle is 120°. Find the side opposite the 120° angle.

ANSWER _____

APPLY IT Show your work

1 A robotics team uses two cables to pull a practice robot. One cable pulls with 5 N of force and the other pulls with 12 N of force. The angle between the two force directions is 90°. What is the magnitude of the resultant force?

WORK SPACE

ANSWER _____

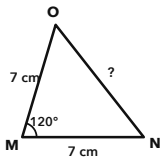
2 A drone club marks takeoff points A and B and a target at C. In triangle ABC, angle A is 45°, angle B is 90°, and BC is 11 m. What is the distance from A to C?

WORK SPACE

ANSWER _____

CHALLENGE One step up

Use the triangle in the figure. Find the exact perimeter of triangle MNO.



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the triangle in the figure. Find DF.	**DF = 7 cm**
2	Use the triangle in the figure. Find KL.	**KL = 5sqrt(3) cm**
3	In triangle PQR, angle P = 30°, angle Q = 90°, and QR = 6 cm. Find PR.	**PR = 12 cm**
4	In triangle ABC, AB = 9 cm, AC = 12 cm, and angle A = 90°. Use the Law of Cosines to find BC.	**BC = 15 cm**
5	In triangle ABC, angle A = 40°, angle B = 65°, and the side opposite angle A is 12 cm. Use the Law of Sines to find the length of the side opposite angle B.	**12 sin(65°)/sin(40°) cm**
6	Two sides of a triangle are 7 cm and 11 cm, and the included angle is 120°. Find the side opposite the 120° angle.	**sqrt(247) cm**

PART 2 · APPLY IT

1. **13 N** Use $r^2 = 5^2 + 12^2 - 2(5)(12)\cos(90°)$. Since $\cos(90°) = 0$, $r^2 = 169$, so r = 13.
2. **11sqrt(2) m** BC is opposite the 45° angle, and AC is opposite the 90° angle. Use AC/sin(90°) = 11/sin(45°) to get AC = 11sqrt(2).

CHALLENGE

14 + 7sqrt(3) cm

Accept equivalent exact forms, including 10sin(68°)/sin(37°) for the worked example and 12sin(65°)/sin(40°) for problem 5. Do not require decimal approximations.