LESSON MAKER PRO

Triangle Solver

Use sine and cosine laws to find missing sides and angles.

HIGH SCHOOL · MA.912.T.1.3

MA.912.T.1.3 "Apply the Law of Sines and the Law of Cosines to solve mathematical and real-world problems involving triangles."

NAME _____ DATE _____

CHOOSE THE RIGHT LAW

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

WORKED EXAMPLE

In triangle JKL, J = 30°, K = 90°, and j = 5. Find k.

1. j/sin 30° = k/sin 90°
2. k = 5(sin 90°)/(sin 30°)
3. k = 5(1)/(1/2) = 10

Answer: k = 10

PRACTICE 6 problems

1 In triangle ABC, A = 45°, B = 45°, and a = 7. Find b.

ANSWER _____

2 In triangle ABC, b = 6, c = 6, and A = 60°. Find a.

ANSWER _____

3 In triangle ABC, A = 60°, a = 3sqrt2, and b = 2sqrt3. Find B.

ANSWER _____

4 A triangle has side lengths 11, 11, and 11. Find each angle.

ANSWER _____

5 In triangle ABC, a = 8, b = 8, and C = 120°. Find c.

ANSWER _____

6 In triangle ABC, A = 45°, B = 75°, and a = 4. Find c.

ANSWER _____

APPLY IT Show your work

1 A skateboarder rides 8 km from a park to a skate shop, then 8 km from the skate shop to a concert venue. The angle between the two routes at the skate shop is 120°. How far is the concert venue directly from the park?

WORK SPACE

ANSWER _____

2 At a robotics competition, two student camera operators stand at points P and Q, 12 m apart. A robot is at point R, forming triangle PQR. Angle P is 45° and angle Q is 75°. Find QR.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In triangle ABC, A = 45°, a = 2sqrt2, and b = 2sqrt3. Find all possible triangles. Give B, C, and c for each triangle, then explain why there are two possible answers.

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ANSWER KEY # Triangle Solver

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	In triangle ABC, A = 45°, B = 45°, and a = 7. Find b.	**b = 7**
2	In triangle ABC, b = 6, c = 6, and A = 60°. Find a.	**a = 6**
3	In triangle ABC, A = 60°, a = 3sqrt2, and b = 2sqrt3. Find B.	**B = 45°**
4	A triangle has side lengths 11, 11, and 11. Find each angle.	**Each angle is 60°**
5	In triangle ABC, a = 8, b = 8, and C = 120°. Find c.	**c = 8sqrt3**
6	In triangle ABC, A = 45°, B = 75°, and a = 4. Find c.	**c = 2sqrt6**

PART 2 · APPLY IT

1. **8sqrt3 km** Use the Law of Cosines with sides 8 and 8 and included angle 120°. The direct distance squared is 192, so the distance is 8sqrt3 km.
2. **4sqrt6 m** First find angle R = 60°. Then use QR/sin 45° = 12/sin 60° to get QR = 4sqrt6 m.

CHALLENGE

Triangle 1: B = 60°, C = 75°, c = sqrt6 + sqrt2. Triangle 2: B = 120°, C = 15°, c = sqrt6 - sqrt2. There are two triangles because sin B = sqrt3/2, and both 60° and 120° have that sine value while still making the angle sum less than 180°.

Accept equivalent simplified radical forms and correctly labeled degree measures. For the challenge, students must give both valid SSA triangles and identify the ambiguous sine result.