LESSON MAKER PRO

Triangle Solver Lab

Use sine and cosine laws to solve exact triangle measures.

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."

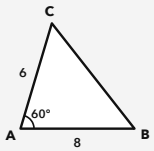
NAME _____ DATE _____

CHOOSE THE RIGHT LAW

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

WORKED EXAMPLE

Use the labeled triangle to find BC in exact form.

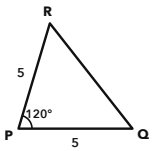


1. $BC^2 = 8^2 + 6^2 - 2(8)(6) \cos 60°$.
2. $BC^2 = 64 + 36 - 96(1/2) = 52$.
3. BC = sqrt52 = 2sqrt13.

Answer: BC = 2sqrt13

PRACTICE 6 problems

1 Use the labeled triangle to find QR in exact form.



ANSWER _____

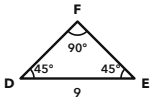
2 In triangle ABC, a = 7, b = 7, and C = 90°. Find c in exact form.

ANSWER _____

3 In triangle ABC, A = 30°, B = 90°, and a = 4. Find b.

ANSWER _____

4 Use the labeled triangle to find DF and EF in exact form.



ANSWER _____

5 In triangle ABC, A = 30°, B = 120°, and a = 3. Find b in exact form.

ANSWER _____

6 A triangle has side lengths 3, 4, and 5. Use the Law of Cosines to find the angle opposite the side of length 5.

ANSWER _____

APPLY IT Show your work

1 Two friends leave the same concert entrance on straight paths that form a 120° angle. After each friend walks 10 blocks, how far apart are they in exact form?

WORK SPACE

ANSWER _____

2 At an esports event, camera A, camera B, and the main screen S form triangle ABS. The angle at A is 30°, the angle at B is 120°, and BS is 12 m. Find AS in exact form.

WORK SPACE

ANSWER _____

CHALLENGE One step up

In triangle ABC, A = 30°, B = 45°, and a = 10. Find C, b, and c in exact form.

WORK SPACE AND ANSWER

ANSWER KEY

Triangle Solver Lab

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Use the labeled triangle to find QR in exact form.	**QR = 5sqrt3**
2	In triangle ABC, a = 7, b = 7, and C = 90°. Find c in exact form.	**c = 7sqrt2**
3	In triangle ABC, A = 30°, B = 90°, and a = 4. Find b.	**b = 8**
4	Use the labeled triangle to find DF and EF in exact form.	**DF = 9sqrt2/2; EF = 9sqrt2/2**
5	In triangle ABC, A = 30°, B = 120°, and a = 3. Find b in exact form.	**b = 3sqrt3**
6	A triangle has side lengths 3, 4, and 5. Use the Law of Cosines to find the angle opposite the side of length 5.	**90°**

PART 2 · APPLY IT

1. **10sqrt3 blocks** Use the Law of Cosines with sides 10 and 10 and included angle 120°. The distance squared is $10^2 + 10^2 - 2(10)(10)\cos 120° = 300$.
2. **12sqrt3 m** BS is opposite the 30° angle, and AS is opposite the 120° angle. Apply the Law of Sines: AS/sin 120° = 12/sin 30°.

CHALLENGE

C = 105°, b = 10sqrt2, c = 5sqrt6 + 5sqrt2

Accept equivalent radical forms, including 5(sqrt6 + sqrt2) for the challenge value of c. For the 3-4-5 triangle, accept an explanation that the Law of Cosines gives cos C = 0.