

Triangle Trig Toolkit

Use the Laws of Cosines and Sines to solve any triangle.

HIGH SCHOOL • HSG-SRT.D

CCSS.Math.Content.HSG-SRT.D "Apply trigonometry to general triangles"

NAME _____

DATE _____

CHOOSE THE RIGHT LAW

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

WORKED EXAMPLE

In triangle ABC, $a = 7$, $b = 9$, and $C = 60$ degrees. Find c .

1. $c^2 = 7^2 + 9^2 - 2(7)(9) \cos 60$
degrees

2. $c^2 = 49 + 81 - 126(1/2)$

3. $c^2 = 67$, so $c = \sqrt{67}$

Answer: $c = \sqrt{67}$

PRACTICE 6 problems

- 1** In triangle ABC, $a = 5$, $b = 5$, and $C = 60$ degrees. Find c .

ANSWER _____

- 2** In triangle ABC, $a = 8$, $b = 8$, and $C = 120$ degrees. Find c .

ANSWER _____

- 3** In triangle ABC, $a = 6$, $b = 10$, and $c = 8$. Find $\cos C$.

ANSWER _____

- 4** In triangle ABC, $A = 30$ degrees, $B = 90$ degrees, and $a = 4$. Find b .

ANSWER _____

- 5** In triangle ABC, $A = 45$ degrees, $B = 30$ degrees, and $a = 6$. Find b .

ANSWER _____

- 6** In triangle ABC, $A = 30$ degrees, $a = 12$, and $b = 18$. Find $\sin B$.

ANSWER _____

APPLY IT Show your work

- 1** The media club places two portable speakers 12 m and 16 m from the sound booth. The angle between the two speaker cables at the booth is 120 degrees. How far apart are the speakers?

WORK SPACE

ANSWER _____

- 2** At a school scavenger hunt, checkpoints A, B, and C form a triangle. Angle A is 30 degrees, angle B is 90 degrees, and the path from B to C is 5 m. How far is checkpoint A from checkpoint C?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In triangle ABC, $a = 10$, $b = 13$, and $c = 17$. Without finding the measure of angle C, decide whether angle C is acute, right, or obtuse. Use the Law of Cosines to support your answer.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	In triangle ABC, $a = 5$, $b = 5$, and $C = 60$ degrees. Find c .	$c = 5$
2	In triangle ABC, $a = 8$, $b = 8$, and $C = 120$ degrees. Find c .	$c = 8\sqrt{3}$
3	In triangle ABC, $a = 6$, $b = 10$, and $c = 8$. Find $\cos C$.	$\cos C = 3/5$
4	In triangle ABC, $A = 30$ degrees, $B = 90$ degrees, and $a = 4$. Find b .	$b = 8$
5	In triangle ABC, $A = 45$ degrees, $B = 30$ degrees, and $a = 6$. Find b .	$b = 3\sqrt{2}$
6	In triangle ABC, $A = 30$ degrees, $a = 12$, and $b = 18$. Find $\sin B$.	$\sin B = 3/4$

PART 2 • APPLY IT

- $4\sqrt{37}$ m** Use the Law of Cosines with sides 12 and 16 and included angle 120 degrees. The speaker separation squared is $12^2 + 16^2 - 2(12)(16)\cos 120$ degrees = 592.
- 10 m** BC is opposite angle A, so $a = 5$. Use the Law of Sines: $b/\sin 90$ degrees = $5/\sin 30$ degrees, giving $b = 10$.

CHALLENGE

$\cos C = -1/13$, so angle C is obtuse.

Accept equivalent exact radical forms, such as $\sqrt{192}$ for $8\sqrt{3}$. For problem 6, accept only $\sin B = 3/4$ because the problem does not ask for an angle measure.