LESSON MAKER PRO

Triangle Area Shortcut

Use an altitude and sine to find exact triangle areas.

HIGH SCHOOL · HSG-SRT.D.9

CCSS.Math.Content.HSG-SRT.D.9 "(+) Derive the formula A = 1/2 ab sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side."

NAME _____ DATE _____

BUILD THE FORMULA

When sides a and b meet at angle C, use side a as the base. Draw an altitude from the endpoint of b to the line containing a. The altitude is h = b sin(C), so A = 1/2 ah = 1/2 ab sin(C).

WORKED EXAMPLE

A triangle has a = 13, b = 8, and C = 90 degrees. Find its area.

1. Draw the altitude h from the endpoint of b to side a.
2. h = b sin(C) = 8 sin(90 degrees) = 8.
3. A = 1/2 ah = 1/2(13)(8).
4. A = 52.

Answer: 52 square units

PRACTICE 6 problems

1 A triangle has a = 9, b = 12, and C = 45 degrees. Find its area in exact form.

ANSWER _____

2 A triangle has a = 7, b = 6, and C = 30 degrees. Find its area in exact form.

ANSWER _____

3 A triangle has a = 14, b = 5, and C = 60 degrees. Find its area in exact form.

ANSWER _____

4 A triangle has a = 11, b = 4, and C = 15 degrees. Find its area in exact form.

ANSWER _____

5 A triangle has a = 2, b = 15, and C = 60 degrees. First find h = b sin(C), then find the area.

ANSWER _____

6 A triangle has a = 16, b = 3, and C = 45 degrees. Find its area in exact form.

ANSWER _____

APPLY IT Show your work

1 A school club is cutting a triangular fabric panel for a concert backdrop. Two sides that meet are 15 cm and 6 cm, and their included angle is 60 degrees. What is the panel's area in exact form?

WORK SPACE

ANSWER _____

2 A student designs a triangular graphic for a gaming event poster. Two sides of the graphic are 18 inches and 5 inches, with an included angle of 45 degrees. Find the exact area.

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A triangle has sides a and b enclosing angle C. Sketch an altitude h from the endpoint of b to the line containing side a. Explain why A = 1/2 ab sin(C). Include an equation for h and an equation for area.

_____

_____

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A triangle has a = 9, b = 12, and C = 45 degrees. Find its area in exact form.	**27sqrt(2) square units**
2	A triangle has a = 7, b = 6, and C = 30 degrees. Find its area in exact form.	**21/2 square units**
3	A triangle has a = 14, b = 5, and C = 60 degrees. Find its area in exact form.	**35sqrt(3)/2 square units**
4	A triangle has a = 11, b = 4, and C = 15 degrees. Find its area in exact form.	**11(sqrt(6) - sqrt(2))/2 square units**
5	A triangle has a = 2, b = 15, and C = 60 degrees. First find h = b sin(C), then find the area.	**h = 15sqrt(3)/2 units; area = 15sqrt(3)/2 square units**
6	A triangle has a = 16, b = 3, and C = 45 degrees. Find its area in exact form.	**12sqrt(2) square units**

PART 2 · APPLY IT

1. **45sqrt(3)/2 square centimeters** Use A = 1/2 ab sin(C). A = 1/2(15)(6)sin(60 degrees) = 45sqrt(3)/2 square centimeters.
2. **45sqrt(2)/2 square inches** Use A = 1/2 ab sin(C). A = 1/2(18)(5)sin(45 degrees) = 45sqrt(2)/2 square inches.

CHALLENGE

The altitude is h = b sin(C) because sin(C) = h/b. Then A = 1/2 ah = 1/2 a(b sin(C)) = 1/2 ab sin(C).

Accept equivalent exact radical forms, such as 27sqrt(2) or 27√2. For the challenge, accept a correct derivation that identifies h = b sin(C) and substitutes it into A = 1/2 ah.