LESSON MAKER PRO

Triangle Area Builder

Use an altitude and sine to find triangle area.

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."

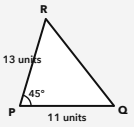
NAME _____ DATE _____

BUILD THE AREA FORMULA

Choose sides a and b that meet at angle C. Draw an altitude from the end of side b to side a. The altitude has length b sin(C), so A = 1/2 a[b sin(C)] = 1/2 ab sin(C).

WORKED EXAMPLE

Find the exact area of the triangle shown.

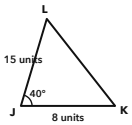


1. The sides around angle P are 11 and 13.
2. A = 1/2(11)(13)sin(45°).
3. sin(45°) = sqrt(2)/2, so A = 143sqrt(2)/4.

Answer: 143sqrt(2)/4 square units

PRACTICE 6 problems

1 Find the exact area of the triangle shown.



ANSWER _____

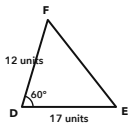
2 A triangle has sides 12 cm and 9 cm enclosing a 30° angle. Find its area.

ANSWER _____

3 Two sides of a triangle are 7 m and 16 m, and the included angle is 90°. Find the area.

ANSWER _____

4 Find the exact area of the triangle shown.



ANSWER _____

5 A triangle has area 30 square units. One side is 12 units, and the included angle with a second side is 30°. Find the length of the second side.

ANSWER _____

6 A triangle has area 24sqrt(3) square units. One side is 8 units, and the included angle with a second side is 60°. Find the length of the second side.

ANSWER _____

APPLY IT Show your work

1 The robotics club is making a triangular sponsor panel. Two metal edges are 24 ft and 18 ft, and they meet at a 60° angle. What is the exact area of the panel?

WORK SPACE

ANSWER _____

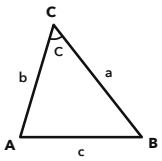
2 A concert crew hangs a triangular fabric backdrop between two support cables that are 14 m and 9 m long. The cables meet at a 90° angle. How many square meters of fabric does the backdrop cover?

WORK SPACE

ANSWER _____

CHALLENGE One step up

In the triangle shown, draw an altitude from A to side BC. Explain why the triangle's area is A = 1/2 ab sin(C).



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the exact area of the triangle shown.	**60sin(40°) square units**
2	A triangle has sides 12 cm and 9 cm enclosing a 30° angle. Find its area.	**27 cm^2**
3	Two sides of a triangle are 7 m and 16 m, and the included angle is 90°. Find the area.	**56 m^2**
4	Find the exact area of the triangle shown.	**51sqrt(3) square units**
5	A triangle has area 30 square units. One side is 12 units, and the included angle with a second side is 30°. Find the length of the second side.	**10 units**
6	A triangle has area 24sqrt(3) square units. One side is 8 units, and the included angle with a second side is 60°. Find the length of the second side.	**12 units**

PART 2 · APPLY IT

1. **108sqrt(3) ft^2** Use A = 1/2 ab sin(C). Substitute 24, 18, and sin(60°) = sqrt(3)/2.
2. **63 m^2** Use A = 1/2(14)(9)sin(90°). Since sin(90°) = 1, the area is 63 square meters.

CHALLENGE

The altitude from A to BC is the height for base a. In the right triangle formed, the height is b sin(C), so A = 1/2(a)(b sin(C)) = 1/2 ab sin(C).

Accept equivalent exact forms, such as 60sin(40°) for Problem 1. For the challenge, accept any correct explanation that identifies base a and height b sin(C).