

# Angle Area Lab

*Find triangle area from two sides and the included angle.*

**HIGH SCHOOL • MA.912.T.1.4**

**MA.912.T.1.4** "Solve mathematical problems involving finding the area of a triangle given two sides and the included angle."

NAME \_\_\_\_\_

DATE \_\_\_\_\_

## THE AREA RULE

When two sides and their included angle are known, find the triangle's area with  $A = \frac{1}{2} ab \sin C$ . Let  $a$  and  $b$  be the two known sides, and let  $C$  be the angle between them. Keep radical answers exact unless told otherwise.

## WORKED EXAMPLE

Find the area of a triangle with side lengths 7 cm and 8 cm and an included angle of  $30^\circ$ .

1.  $A = \frac{1}{2} ab \sin C$

2.  $A = \frac{1}{2}(7)(8)\sin 30^\circ$

3.  $A = 28(\frac{1}{2}) = 14$

**Answer: 14 cm<sup>2</sup>**

## PRACTICE 6 problems

- 1** Find the area of a triangle with side lengths 4 cm and 9 cm and an included angle of  $90^\circ$ .

**ANSWER** \_\_\_\_\_

- 2** Find the area of a triangle with side lengths 6 m and 10 m and an included angle of  $60^\circ$ .

**ANSWER** \_\_\_\_\_

- 3** Find the area of a triangle with side lengths 5 in. and 12 in. and an included angle of  $45^\circ$ .

**ANSWER** \_\_\_\_\_

- 4** Find the area of a triangle with side lengths 3 ft and 14 ft and an included angle of  $60^\circ$ .

**ANSWER** \_\_\_\_\_

- 5** Find the area of a triangle with side lengths 11 yd and 2 yd and an included angle of  $90^\circ$ .

**ANSWER** \_\_\_\_\_

- 6** Find the area of a triangle with side lengths 15 cm and 4 cm and an included angle of  $120^\circ$ .

**ANSWER** \_\_\_\_\_

## APPLY IT Show your work

- 1** For a school esports event, a triangular floor graphic has two edges that are 16 ft and 9 ft long. The angle between the edges is  $60^\circ$ . What is the area of the graphic?

WORK SPACE

ANSWER \_\_\_\_\_

- 2** A student designs a triangular panel for a music stage. Two sides that meet are 18 in. and 6 in., and their included angle is  $45^\circ$ . Find the area of the panel.

WORK SPACE

ANSWER \_\_\_\_\_

## CHALLENGE One step up

### CHALLENGE

A triangular sail has an area of  $54 \text{ m}^2$ . One side is 12 m, and the side of length  $x$  m forms a  $90^\circ$  included angle with it. Find  $x$ .

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## PART 1 · PRACTICE

| # | PROBLEM                                                                                              | ANSWER                                        |
|---|------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 1 | Find the area of a triangle with side lengths 4 cm and 9 cm and an included angle of $90^\circ$ .    | <b><math>18 \text{ cm}^2</math></b>           |
| 2 | Find the area of a triangle with side lengths 6 m and 10 m and an included angle of $60^\circ$ .     | <b><math>15\sqrt{3} \text{ m}^2</math></b>    |
| 3 | Find the area of a triangle with side lengths 5 in. and 12 in. and an included angle of $45^\circ$ . | <b><math>15\sqrt{2} \text{ in.}^2</math></b>  |
| 4 | Find the area of a triangle with side lengths 3 ft and 14 ft and an included angle of $60^\circ$ .   | <b><math>21\sqrt{3}/2 \text{ ft}^2</math></b> |
| 5 | Find the area of a triangle with side lengths 11 yd and 2 yd and an included angle of $90^\circ$ .   | <b><math>11 \text{ yd}^2</math></b>           |
| 6 | Find the area of a triangle with side lengths 15 cm and 4 cm and an included angle of $120^\circ$ .  | <b><math>15\sqrt{3} \text{ cm}^2</math></b>   |

## PART 2 · APPLY IT

1.  **$36\sqrt{3} \text{ ft}^2$**  Use  $A = 1/2 ab \sin C$ . Substitute 16, 9, and  $60^\circ$  to get  $36\sqrt{3} \text{ ft}^2$ .
2.  **$27\sqrt{2} \text{ in.}^2$**  Use  $A = 1/2 ab \sin C$ . Substitute 18, 6, and  $45^\circ$  to get  $27\sqrt{2} \text{ in.}^2$ .

## CHALLENGE

**$x = 9 \text{ m}$**

Accept equivalent exact forms, such as  $(21\sqrt{3})/2$ . Require square units for area answers and linear units for the challenge answer.