

Triangle Area Power

Use two sides and the included angle to find exact areas.

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 _____

You will need: Pencil; Ruler

AREA WITH SINE

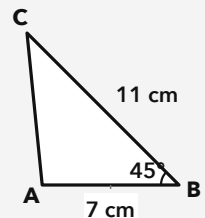
When two side lengths u and v enclose angle θ , the triangle's area is $K = (1/2)uv \sin \theta$. Use the angle between the given sides; θ is a generic name for that included angle, whatever its vertex label. Keep radical answers exact.

WORKED EXAMPLE

Find the area of the triangle shown.

- Here the included angle is $B = 45^\circ$. Use $K = (1/2)(AB)(BC) \sin B$.
- Substitute: $K = (1/2)(7)(11) \sin 45^\circ$.
- Since $\sin 45^\circ = \sqrt{2}/2$, $K = 77\sqrt{2}/4$.

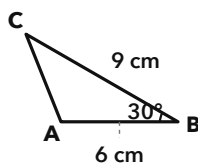
Answer: $77\sqrt{2}/4 \text{ cm}^2$



PRACTICE 6 problems

Show your calculation or reasoning. Include units when needed.

- 1** Find the area of the triangle shown.

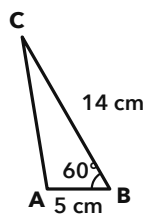


ANSWER _____

- 2** A triangle has side lengths 12 cm and 3 cm with an included angle of 90° . Find its area.

ANSWER _____

- 3** Find the area of the triangle shown.



ANSWER _____

- 4** A triangle has side lengths 4 m and 13 m with an included angle of 30° . Find its area.

ANSWER _____

- 5** A triangle has side lengths 15 yd and 16 yd with an included angle of 60° . Find its area.

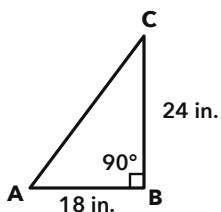
ANSWER _____

- 6** A triangle has side lengths 9 in. and 13 in. with an included angle of 120° . Find its area.

ANSWER _____

APPLY IT Show your work

- 1** The triangular pennant shown will hang at a school game. Find the amount of fabric needed for one side of the pennant.

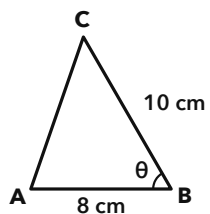


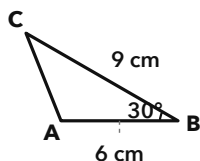
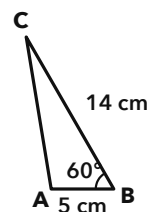
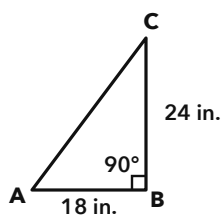
- 2** A gaming club is cutting a triangular fabric backdrop. Two edges are 25 ft and 16 ft, and the angle between them is 30° . Find the area of the backdrop.

CHALLENGE

One step up

The triangle shown has an area of $20\sqrt{3} \text{ cm}^2$. The included angle θ is acute. Find θ , and explain your reasoning.



PRACTICE 2 **18 cm^2** **PRACTICE 4** **13 m^2** **PRACTICE 5** **$60\sqrt{3} \text{ yd}^2$** **PRACTICE 6** **$117\sqrt{3}/4 \text{ in.}^2$** **APPLY IT 2** **$100 \text{ ft}^2$** Use $A = 1/2(25)(16)\sin(30^\circ)$. Since $\sin(30^\circ) = 1/2$, the area is 100 ft^2 .**PRACTICE 1** **$27/2 \text{ cm}^2$** **PRACTICE 3** **$35\sqrt{3}/2 \text{ cm}^2$** **APPLY IT 1** **216 in.^2** Use $A = 1/2(18)(24)\sin(90^\circ)$. Since $\sin(90^\circ) = 1$, the area is 216 in.^2 .**CHALLENGE** **$\theta = 60^\circ$, because $20\sqrt{3} = 1/2(8)(10)\sin(\theta)$, so $\sin(\theta) = \sqrt{3}/2$. Since θ is acute, $\theta = 60^\circ$.**

Accept equivalent exact forms and correct square units. Do not accept rounded decimal answers as the final answer when an exact radical form is available.

