LESSON MAKER PRO

Angles to Area

Find triangle areas, even when an angle is obtuse.

HIGH SCHOOL · A2S.GM.B.37

A2S.GM.B.37 "Derive and apply the formula A = ½·ab·sin(C) for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side, extending the domain of sine to include right and obtuse angles."

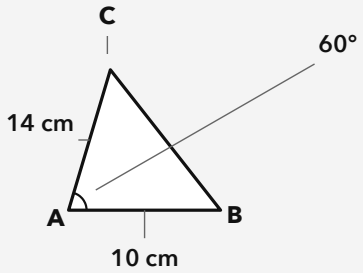
NAME _____ DATE _____

THE HEIGHT CONNECTION

When sides a and b meet at angle C, the height relative to side a is b sin(C). Since triangle area is half the base times the height, A = (1/2)ab sin(C). For an obtuse angle, the perpendicular height falls outside the triangle, but the formula still works.

WORKED EXAMPLE

Find the area of the triangle shown.

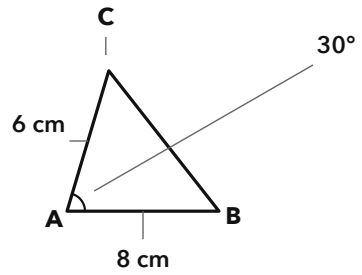


1. Use the two sides that meet at the marked angle: A = (1/2)(10)(14) sin(60°).
2. Substitute sin(60°) = √3/2.
3. Simplify: A = 70(√3/2) = 35√3.

Answer: $35\sqrt{3}$ cm²

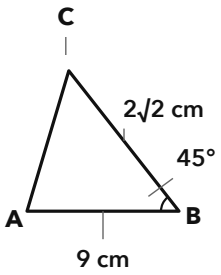
PRACTICE 6 problems

1 Find the area of the triangle shown.



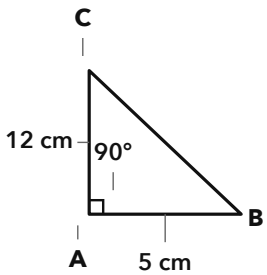
ANSWER _____

2 Find the area of the triangle shown.



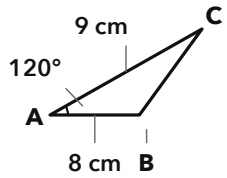
ANSWER _____

3 Find the area of the right triangle shown.



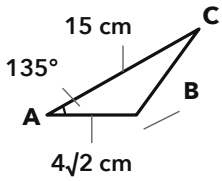
ANSWER _____

4 Find the area of the triangle shown.



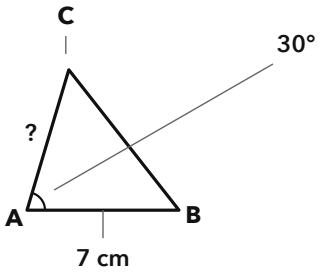
ANSWER _____

5 Find the area of the triangle shown.



ANSWER _____

6 The area is 21 cm^2. Find the missing side and the altitude to the labeled base.

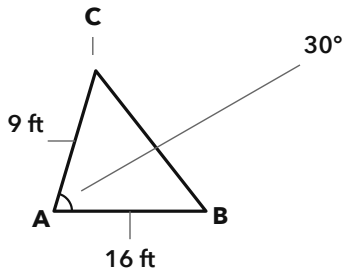


ANSWER _____

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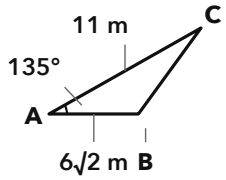
APPLY IT Show your work

1 A skate park will paint one triangular side of a ramp. Use the marked measurements to find the area to be painted.



ANSWER _____

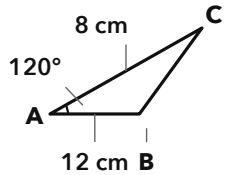
2 A school club orders fabric for a triangular banner. Use the marked measurements to find the fabric area.



ANSWER _____

CHALLENGE One step up

Find the area of the triangle shown. In two sentences, explain why an altitude outside the triangle gives the same area as the sine formula.



WORK SPACE AND ANSWER

ANSWER KEY # Angles to Area

PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the area of the triangle shown.	**12 cm²**
2	Find the area of the triangle shown.	**9 cm²**
3	Find the area of the right triangle shown.	**30 cm²**
4	Find the area of the triangle shown.	**18√3 cm²**
5	Find the area of the triangle shown.	**30 cm²**
6	The area is 21 cm^2. Find the missing side and the altitude to the labeled base.	**Missing side: 12 cm; altitude: 6 cm**

PART 2 · APPLY IT

1. **36 ft²** The sides meet at 30°, so the area is (1/2)(16)(9) sin(30°) = 36 ft^2.
2. **33 m²** Use sin(135°) = √2/2. The area is (1/2)(6√2)(11)(√2/2) = 33 m^2.

CHALLENGE

The altitude from C meets the extension of AB and measures 8 sin(60°) = 4√3 cm. Using AB as the base gives (1/2)(12)(4√3) = 24√3 cm², the same result as (1/2)(12)(8) sin(120°).

Accept equivalent exact forms, but not decimal approximations. In the challenge, look for an altitude on the extension of the base and recognition that sin(120°) = sin(60°).