LESSON MAKER PRO

Triangle Side Secrets

Use special right triangle ratios to find exact lengths.

HIGH SCHOOL · GDA.GM.J.35.a

GDA.GM.J.35.a "Derive and apply the constant ratios of the sides in special right triangles (45°-45°-90° and 30°-60°-90°)."

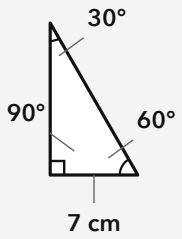
NAME _____ DATE _____

WHERE THE RATIOS COME FROM

Cutting a square along its diagonal makes a 45°-45°-90° triangle. If each leg is a, the Pythagorean theorem gives a hypotenuse of a*sqrt(2). Halving an equilateral triangle makes a 30°-60°-90° triangle with a short leg of a, a long leg of a*sqrt(3), and a hypotenuse of 2a.

WORKED EXAMPLE

Find the hypotenuse and longer leg of the triangle.

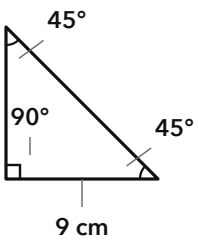


1. The side opposite 30° is the short leg, so a = 7 cm.
2. The hypotenuse is 2a = 2(7) = 14 cm.
3. The longer leg is a*sqrt(3) = 7*sqrt(3) cm.

Answer: Hypotenuse: 14 cm; longer leg: 7*sqrt(3) cm.

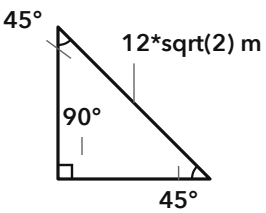
PRACTICE 6 problems

1 Find the hypotenuse.



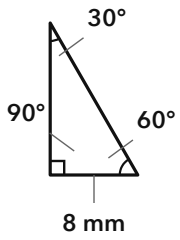
ANSWER _____

2 Find the length of either leg.



ANSWER _____

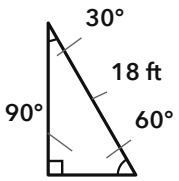
3 Find the longer leg and the hypotenuse.



ANSWER _____

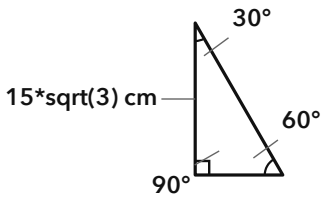
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4 Find the short leg.



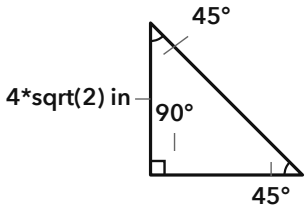
ANSWER _____

5 Find the hypotenuse.



ANSWER _____

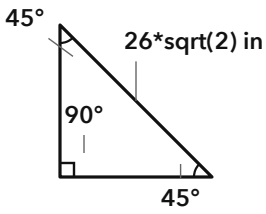
6 Find the hypotenuse.



ANSWER _____

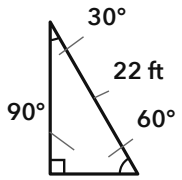
APPLY IT Show your work

1 A square gaming screen is split along its diagonal. The figure shows one half of the screen. How long is one side of the screen?



ANSWER _____

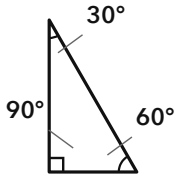
2 A portable stage ramp makes the angle shown with the ground. What is its vertical rise?



ANSWER _____

CHALLENGE One step up

The perimeter of the triangle is 18 + 6*sqrt(3) cm. Find its exact area.



WORK SPACE AND ANSWER

ANSWER KEY

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	Find the hypotenuse.	**9*sqrt(2) cm**
2	Find the length of either leg.	**12 m**
3	Find the longer leg and the hypotenuse.	**Longer leg: 8*sqrt(3) mm; hypotenuse: 16 mm**
4	Find the short leg.	**9 ft**
5	Find the hypotenuse.	**30 cm**
6	Find the hypotenuse.	**8 in**

PART 2 · APPLY IT

1. **26 in** A side of the screen is a leg of the triangle. Divide the diagonal by sqrt(2) to get 26 in.
2. **11 ft** The vertical rise is opposite the 30° angle, so it is the short leg. Divide the ramp length by 2 to get 11 ft.

CHALLENGE

18*sqrt(3) cm^2

Accept equivalent exact radical notation. For the challenge, the side lengths are 6 cm, 6*sqrt(3) cm, and 12 cm, giving an area of 18*sqrt(3) cm^2.