LESSON MAKER PRO

# Angles at Work

*Use right triangles to find real-world lengths.*

**HIGH SCHOOL · GDA.GM.J**

**GDA.GM.J** "Recognizing congruence, similarity, symmetry, measurement opportunities, and other geometric ideas, including right triangle trigonometry..."

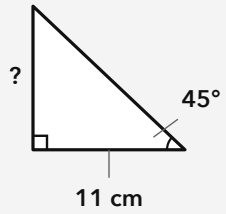
NAME _____ DATE _____

## CHOOSE A RATIO

In a right triangle, sin(angle) = opposite/hypotenuse, cos(angle) = adjacent/hypotenuse, and tan(angle) = opposite/adjacent. Useful exact ratios are sin 30° = cos 60° = 1/2, sin 60° = cos 30° = √3/2, and tan 45° = 1.

### WORKED EXAMPLE

Find the side marked ?.

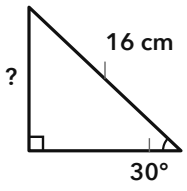



1. Use tangent because the known and unknown sides are adjacent and opposite the 45° angle.
2. tan 45° = opposite/adjacent, so 1 = x/11.
3. Multiply by 11: x = 11.

**Answer: 11 cm**

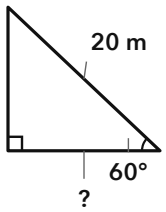
## PRACTICE 6 problems

**1** Find the side marked ?.



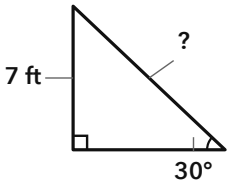

ANSWER _____

**2** Find the side marked ?.



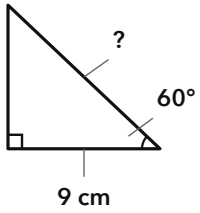

ANSWER _____

**3** Find the side marked ?.



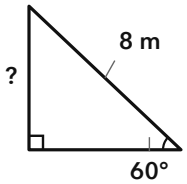

**ANSWER** _____

**4** Find the side marked ?.



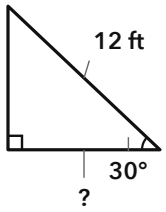

**ANSWER** _____

**5** Find the side marked ?.




**ANSWER** _____

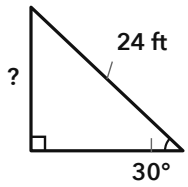
**6** Find the side marked ?.




**ANSWER** _____

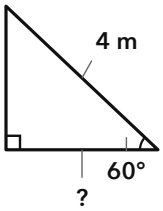
## APPLY IT Show your work

**1** A skate park is building a ramp. The triangle shows a side view, with the sloped side representing the ramp and the vertical side representing its rise. How high is the top of the ramp above the ground?




**ANSWER** _____

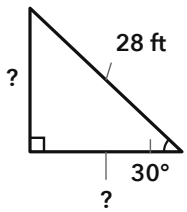
**2** An event crew attaches a support cable to a vertical stage pole. The triangle shows the pole, cable, and ground. How far is the cable's ground anchor from the pole?




**ANSWER** _____

## CHALLENGE One step up

A triangular frame supports a solar panel. Find its exact perimeter. Show how you found both missing sides.




WORK SPACE AND ANSWER

**ANSWER KEY** # Angles at Work



## PART 1 · PRACTICE

| # | PROBLEM | ANSWER |
|---|---|---|
| 1 | Find the side marked ?. | **8 cm** |
| 2 | Find the side marked ?. | **10 m** |
| 3 | Find the side marked ?. | **14 ft** |
| 4 | Find the side marked ?. | **18 cm** |
| 5 | Find the side marked ?. | **4√3 m** |
| 6 | Find the side marked ?. | **6√3 ft** |

## PART 2 · APPLY IT

1. **12 ft** The rise is opposite the 30° angle. Use sin 30° = x/24 = 1/2, so x = 12 ft.
2. **2 m** The ground distance is adjacent to the 60° angle. Use cos 60° = x/4 = 1/2, so x = 2 m.

## CHALLENGE

**The side opposite 30° is 14 ft, and the adjacent side is 14√3 ft. The perimeter is 42 + 14√3 ft.**

Accept equivalent exact expressions with correct units. For the challenge, look for both missing side lengths and their sum with the hypotenuse.