

Diagonal Detectives

Use right-triangle math in flat shapes and solid objects.

GRADE 8 • 8.GSR.8.2

8.GSR.8.2 "Apply the Pythagorean Theorem to determine unknown side lengths in right triangles within authentic, mathematical problems in two and three dimensions."

NAME _____

DATE _____

FIND THE MISSING LENGTH

In a right triangle, the two legs and the hypotenuse follow $a^2 + b^2 = c^2$. For a rectangular prism, find a face diagonal first, then use that diagonal and the third edge to find the space diagonal.

WORKED EXAMPLE

A right triangle has legs that are 8 cm and 15 cm. Find x , the hypotenuse.

$$1. x^2 = 8^2 + 15^2$$

$$2. x^2 = 64 + 225 = 289$$

$$3. x = \sqrt{289} = 17$$

Answer: $x = 17$ cm

PRACTICE 6 problems

- 1** A right triangle has legs that are 5 cm and 12 cm. Find x , the hypotenuse.

ANSWER _____

- 2** A right triangle has a hypotenuse of 26 m and one leg of 10 m. Find x , the other leg.

ANSWER _____

- 3** A right triangle has legs that are 9 in. and 40 in. Find x , the hypotenuse.

ANSWER _____

- 4** A rectangle is 7 cm wide and 24 cm long. Find x , the length of its diagonal.

ANSWER _____

- 5** A right triangle has a hypotenuse of 29 ft and one leg of 20 ft. Find x , the other leg.

ANSWER _____

- 6** A rectangular prism is 3 cm long, 4 cm wide, and 12 cm high. Find x , the distance from one corner to the opposite corner.

ANSWER _____

APPLY IT Show your work

- 1** At a skate park, a ramp rises 12 feet over a horizontal distance of 16 feet. What is the ramp's length from the ground to the top?

WORK SPACE

ANSWER _____

- 2** A robotics team needs a diagonal support inside a rectangular equipment case. The case is 6 inches long, 9 inches wide, and 18 inches high. What is the length of a support that runs from one inside corner to the opposite inside corner?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

A rectangular prism is 4 cm long and 6 cm wide. Its space diagonal is 14 cm. Find its height. Explain with one equation that uses all three dimensions.

PART 1 • PRACTICE

#	PROBLEM	ANSWER
1	A right triangle has legs that are 5 cm and 12 cm. Find x , the hypotenuse.	$x = 13$ cm
2	A right triangle has a hypotenuse of 26 m and one leg of 10 m. Find x , the other leg.	$x = 24$ m
3	A right triangle has legs that are 9 in. and 40 in. Find x , the hypotenuse.	$x = 41$ in.
4	A rectangle is 7 cm wide and 24 cm long. Find x , the length of its diagonal.	$x = 25$ cm
5	A right triangle has a hypotenuse of 29 ft and one leg of 20 ft. Find x , the other leg.	$x = 21$ ft
6	A rectangular prism is 3 cm long, 4 cm wide, and 12 cm high. Find x , the distance from one corner to the opposite corner.	$x = 13$ cm

PART 2 • APPLY IT

- 20 feet** Use the rise and horizontal distance as the legs of a right triangle. $12^2 + 16^2 = 400$, so the ramp length is $\sqrt{400} = 20$.
- 21 inches** The space diagonal satisfies $d^2 = 6^2 + 9^2 + 18^2$. Since the sum is 441, $d = 21$.

CHALLENGE

12 cm, because $14^2 = 4^2 + 6^2 + 12^2$.

Accept correct equations and units. For the challenge, accept any explanation that shows the square of the space diagonal equals the sum of the squares of the three dimensions.