LESSON MAKER PRO

Squares Tell Stories

Use area models to test right triangles.

GRADE 8 · 8.GSR.8.1

8.GSR.8.1 "Explain a proof of the Pythagorean Theorem and its converse using visual models."

NAME _____ DATE _____

SEE THE SQUARES

Study this area model, a large square with side a+b, packed with four congruent right triangles and a center square: +---------- ----------+ | triangle a,b,c | | triangle a,b,c [center square c by c] triangle a,b,c | | triangle a,b,c | +---------- ----------+ The big square has area (a+b)^2, while its pieces have area 4(ab/2)+c^2, so matching the areas gives a^2+b^2=c^2. For the converse, build the right triangle shown with legs a and b, then a triangle with the same three side lengths and c^2=a^2+b^2 must match it, so the angle opposite c is right.

WORKED EXAMPLE

Use the area model to prove the relationship for a right triangle with legs 8 and 15 and hypotenuse c.

1. Place four copies of the 8-by-15 right triangle in a large square with side 8+15=23.
2. Find the large-square area: 23^2=529.
3. Find the area of four triangles: 4(8*15/2)=240.
4. The center-square area is 529-240=289=17^2, so c=17.

Answer: c=17

PRACTICE 6 problems

1 A right triangle has legs 7 cm and 24 cm. Find the hypotenuse c.

ANSWER _____

2 A right triangle has hypotenuse 26 and one leg 10. Find x, the other leg.

ANSWER _____

3 Can a triangle with side lengths 12, 35, and 37 be a right triangle?

ANSWER _____

4 Can a triangle with side lengths 12, 16, and 21 be a right triangle?

ANSWER _____

5 A right triangle has hypotenuse 29 and one leg 20. What is the area of the square built on the other leg?

ANSWER _____

6 A triangle has side lengths 11, 60, and 61. Which side is the hypotenuse, and is the triangle right?

ANSWER _____

APPLY IT Show your work

1 A gaming club uses a rectangular projection screen that is 18 feet wide and 24 feet tall. What is the length of the screen's diagonal?

WORK SPACE

ANSWER _____

2 A skateboard ramp rises 20 feet over a horizontal distance of 21 feet. How long is the ramp surface?

WORK SPACE

ANSWER _____

CHALLENGE One step up

CHALLENGE

In exactly two sentences, use the visual area model and the converse to explain why a triangle with side lengths 28, 45, and 53 is a right triangle.

_____

_____

ANSWER KEY

Squares Tell Stories

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PART 1 · PRACTICE

#	PROBLEM	ANSWER
1	A right triangle has legs 7 cm and 24 cm. Find the hypotenuse c.	**c=25 cm**
2	A right triangle has hypotenuse 26 and one leg 10. Find x, the other leg.	**x=24**
3	Can a triangle with side lengths 12, 35, and 37 be a right triangle?	**Yes, because 12^2+35^2=37^2.**
4	Can a triangle with side lengths 12, 16, and 21 be a right triangle?	**No, because 12^2+16^2=400 and 21^2=441.**
5	A right triangle has hypotenuse 29 and one leg 20. What is the area of the square built on the other leg?	**441 square units**
6	A triangle has side lengths 11, 60, and 61. Which side is the hypotenuse, and is the triangle right?	**61 is the hypotenuse, and the triangle is right.**

PART 2 · APPLY IT

1. **30 feet** Use 18^2+24^2=324+576=900. Since 900=30^2, the diagonal is 30 feet.
2. **29 feet** Use 20^2+21^2=400+441=841. Since 841=29^2, the ramp surface is 29 feet long.

CHALLENGE

Since 28^2+45^2=784+2025=2809=53^2, the side lengths pass the converse test. In the area model, a right triangle with legs 28 and 45 has a center square with side 53, and matching side lengths mean the given triangle has a right angle opposite 53.

Accept equivalent equations and correct unit labels. For the challenge, accept any two-sentence explanation that verifies the squared-length relationship and connects the matching side lengths to the visual model or converse.