GRADE 7 ACCELERATED · UNIT 6 · LESSON 4

Pythagorean Theorem in Real-World Problems

MA.8.GR.1.1

I can find a length in a real situation by finding the right triangle inside it.

Warm-Up

1. A right triangle: hypotenuse 25 ft, one leg 24 ft. The other leg?
2. Do sides of 9, 40 and 41 make a right triangle?
3. A plan's scale is 1 in : 4 ft. A wall is 3.5 inches on it. Real length?
4. How many right angles does a rectangle have?

Warm-Up

1. A right triangle: hypotenuse 25 ft, one leg 24 ft. The other leg?

   7 ft

2. Do sides of 9, 40 and 41 make a right triangle?

   Yes — $81 + 1{,}600 = 1{,}681 = 41^2$

3. A plan's scale is 1 in : 4 ft. A wall is 3.5 inches on it. Real length?

   14 ft

4. How many right angles does a rectangle have? **4**

Vocabulary

diagonal

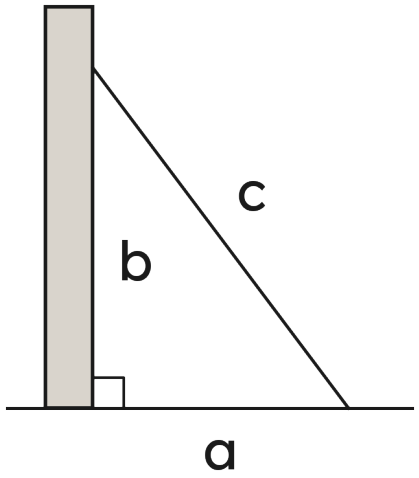
the segment from one corner of a rectangle to the opposite corner — the hypotenuse of the right triangle it cuts off

rise and run

a ramp's height and the distance along the ground it covers; the ramp itself is the hypotenuse

Notes

I. Find the right angle, then c

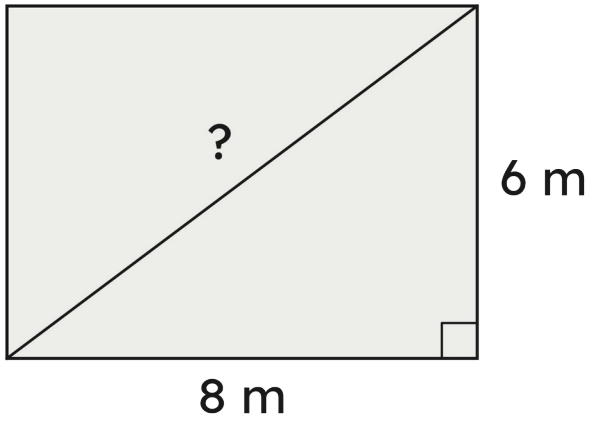


Sketch the story. Mark the right angle. The side across from it is c.

A ladder, a diagonal, a ramp, a kite string: each is the hypotenuse.

Notes

II. c in a story: the diagonal



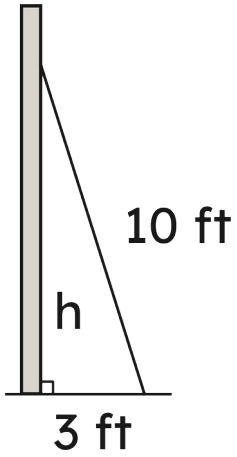
$$c^2 = 6^2 + 8^2 = 36 + 64 = 100$$

$$c = \sqrt{100} = 10$$

The path is 10 m. Along two sides is 14 m: the path is 4 m shorter.

Notes

III. A leg in a story: how high

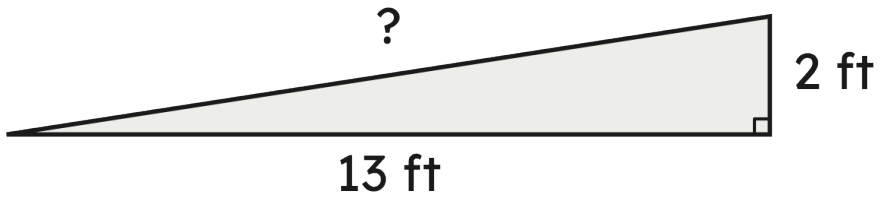


$$h^2 = 10^2 - 3^2 = 100 - 9 = 91$$

$$h = \sqrt{91} \approx 9.5$$

Example 1

A ramp rises 2 ft over a run of 13 ft along the ground.



How long is the ramp, to the nearest tenth of a foot?

Example 1

$$c^2 = 2^2 + 13^2 = 4 + 169 = 173$$

$$c = \sqrt{173} \approx 13.2$$

Answer: The ramp is about 13.2 ft long.

Your Turn

A computer screen is 7 inches tall and 10 inches wide.

How long is its diagonal, to the nearest tenth of an inch?

Your Turn

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How long is its diagonal, to the nearest tenth of an inch?

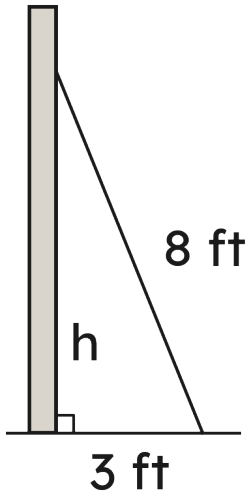
$$c^2 = 7^2 + 10^2 = 49 + 100 = 149$$

$$c = \sqrt{149} \approx 12.2$$

Answer: About 12.2 in

Example 2

An 8-ft ladder leans on a wall. Its foot is 3 ft from the wall.



How high up the wall does it reach, to the nearest tenth of a foot?

Example 2

$$h^2 = 8^2 - 3^2 = 64 - 9 = 55$$

$$h = \sqrt{55} \approx 7.4$$

Answer: It reaches about 7.4 ft up the wall.

Your Turn

A 13-ft ladder leans on a wall with its foot 6 ft from the wall.

How high does it reach, to the nearest tenth of a foot?

Your Turn

A 13-ft ladder leans on a wall with its foot 6 ft from the wall.

How high does it reach, to the nearest tenth of a foot?

$$h^2 = 13^2 - 6^2 = 169 - 36 = 133$$

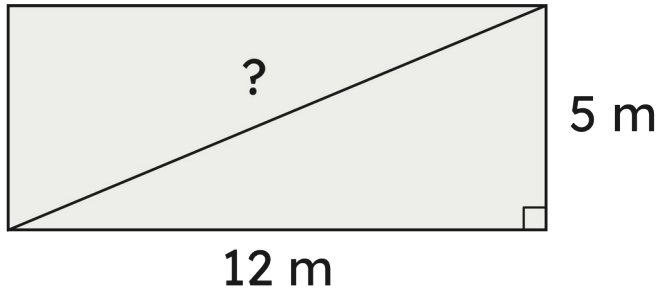
$$h = \sqrt{133} \approx 11.5$$

Answer: About 11.5 ft

Whiteboards · Question 1 of 9

A swimming pool is 12 m long and 5 m wide.

How long is its diagonal?

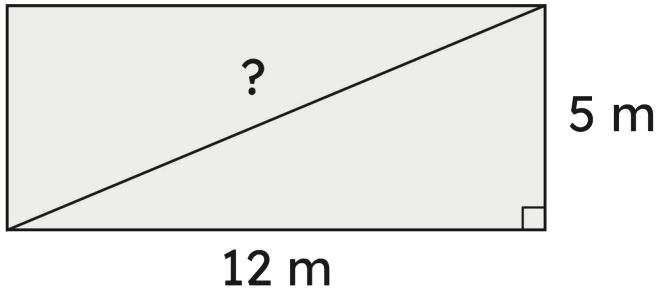


Answer it.

Whiteboards · Question 1 of 9

A swimming pool is 12 m long and 5 m wide.

How long is its diagonal?



$c^2 = 25 + 144 = 169$

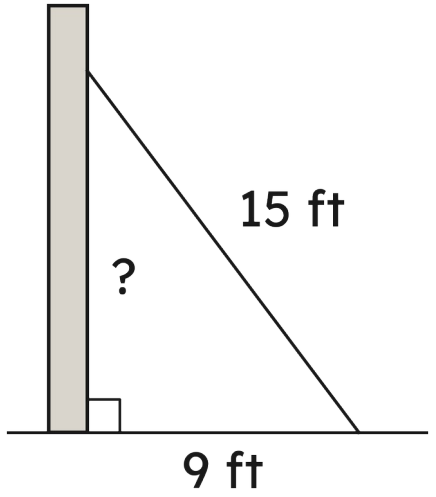
$c = \sqrt{169} = 13$

Answer: 13 m

Whiteboards · Question 2 of 9

A 15-ft ladder leans on a wall. Its foot is 9 ft from the wall.

How high up the wall does it reach?

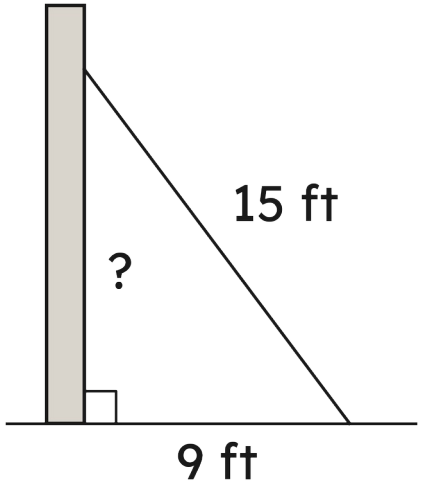


Answer it.

Whiteboards · Question 2 of 9

A 15-ft ladder leans on a wall. Its foot is 9 ft from the wall.

How high up the wall does it reach?



$h^2 = 225 - 81 = 144$

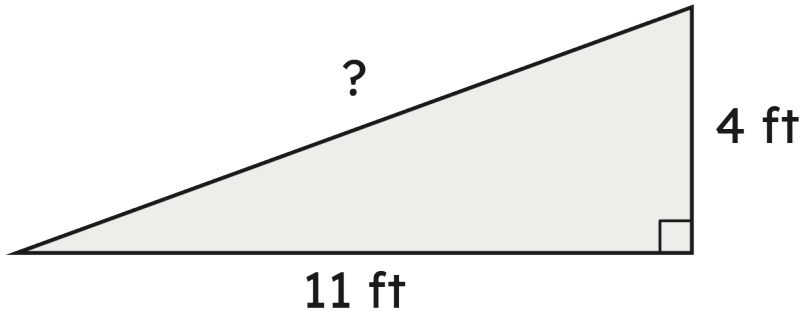
$h = \sqrt{144} = 12$

Answer: 12 ft

Whiteboards · Question 3 of 9

A ramp rises 4 ft over a run of 11 ft.

How long is the ramp, to the nearest tenth of a foot?

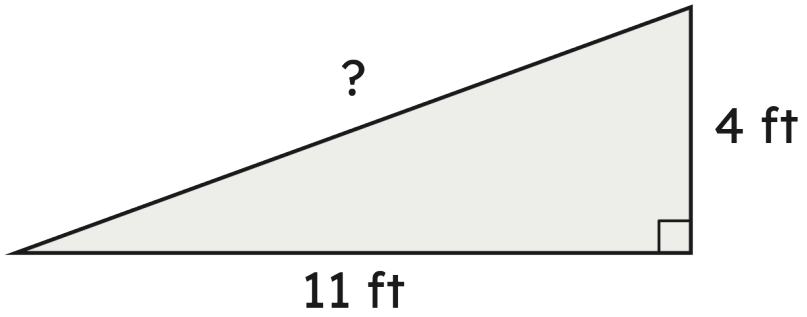


Answer it.

Whiteboards · Question 3 of 9

A ramp rises 4 ft over a run of 11 ft.

How long is the ramp, to the nearest tenth of a foot?



$c^2 = 16 + 121 = 137$

$c = \sqrt{137} \approx 11.7$

Answer: About 11.7 ft

Whiteboards · Question 4 of 9

A 26-ft ladder reaches 24 ft up a wall.

How far from the wall is its foot?

A. 10 ft

B. 35.4 ft

C. 2 ft

D. 100 ft

Answer it.

Whiteboards · Question 4 of 9

A 26-ft ladder reaches 24 ft up a wall.

How far from the wall is its foot?

$$a^2 = 676 - 576 = 100$$

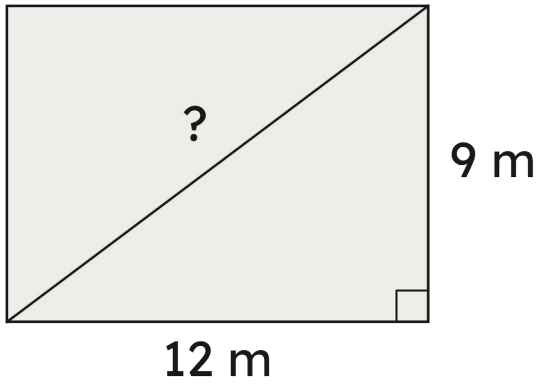
$$a = \sqrt{100} = 10$$

Answer: A — 10 ft

Whiteboards · Question 5 of 9

A lawn is 9 m by 12 m. Ben walks along two sides; Ava walks straight across, corner to corner.

How much shorter is Ava's walk?

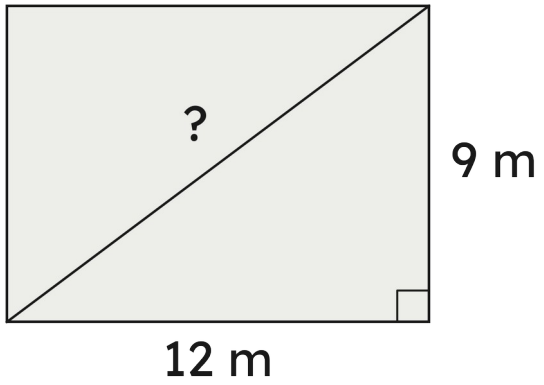


Answer it.

Whiteboards · Question 5 of 9

A lawn is 9 m by 12 m. Ben walks along two sides; Ava walks straight across, corner to corner.

How much shorter is Ava's walk?



Along two sides: $9 + 12 = 21$

Across: $\sqrt{81 + 144} = 15$

$21 - 15 = 6$

Answer: 6 m shorter

Whiteboards · Question 6 of 9

A drone is 30 m from Maya, straight above a spot on the ground 18 m from her.

Which length is the hypotenuse?

A. the 18 m on the ground

B. the drone's height

C. the 30 m to the drone

D. none: no right angle

Answer it.

Whiteboards · Question 6 of 9

A drone is 30 m from Maya, straight above a spot on the ground 18 m from her.

Which length is the hypotenuse?

The square corner is under the drone.

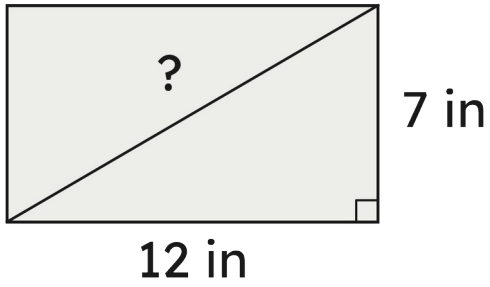
Across from it: the 30 m to the drone.

Answer: C — the 30 m to the drone

Whiteboards · Question 7 of 9

A box is 7 inches wide and 12 inches long.

Will a 14-in umbrella lie flat in it, corner to corner?



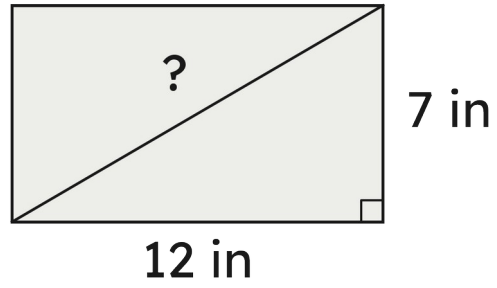
the umbrella: 14 in

Answer it.

Whiteboards · Question 7 of 9

A box is 7 inches wide and 12 inches long.

Will a 14-in umbrella lie flat in it, corner to corner?



$$c^2 = 49 + 144 = 193$$

$$c = \sqrt{193} \approx 13.9$$

Answer: No — the diagonal is about 13.9 in.

Whiteboards · Question 8 of 9

A 10-ft ladder that weighs 25 pounds has its foot 7 ft from a wall.

How high does it reach, to the nearest tenth of a foot?

Answer it.

Whiteboards · Question 8 of 9

A 10-ft ladder that weighs 25 pounds has its foot 7 ft from a wall.

How high does it reach, to the nearest tenth of a foot?

$$h^2 = 100 - 49 = 51$$

$$h = \sqrt{51} \approx 7.1$$

Answer: About 7.1 ft

Whiteboards · Question 9 of 9

A window is 12 ft above the ground.

Why can an 11-ft ladder never reach it, wherever its foot stands?

Write your answer in sentences.

Whiteboards · Question 9 of 9

A window is 12 ft above the ground.

Why can an 11-ft ladder never reach it, wherever its foot stands?

The ladder is the hypotenuse, the longest side.

The height is a leg, so it is less than 11 ft.

Answer: The height is a leg — always shorter than the 11-ft ladder.

Independent Set

1. A tablet screen is 5 inches wide and 8 inches tall. How long is its diagonal, to the nearest tenth of an inch?

2. A fire truck's 50-ft ladder reaches 48 ft up a building. How far from the building is its foot?

3. A ramp rises 3 ft over a run of 14 ft. How long is the ramp, to the nearest tenth of a foot?

4. A park is 7 m by 11 m. How much shorter is the walk straight across, corner to corner, than the walk along two sides? Give it to the nearest tenth of a meter.

5. Will a 10-in pencil lie flat in a box 7 inches by 8 inches, corner to corner?

6. A kite flies on 19 m of tight string. Straight below the kite, level with the hand that holds the string, is a point 12 m from the hand. How high is the kite above that point, to the nearest tenth of a meter?

IXL

1. Open IXL and start today's skills.
2. Work on paper where the question needs work. The answer box does not show it.
3. Every skill listed is required, to a SmartScore of 67. Due by the Unit 6 test.

Today's skills — all required

Pythagorean theorem: word problems — 87U