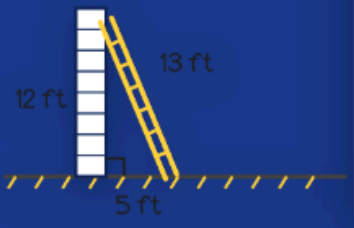
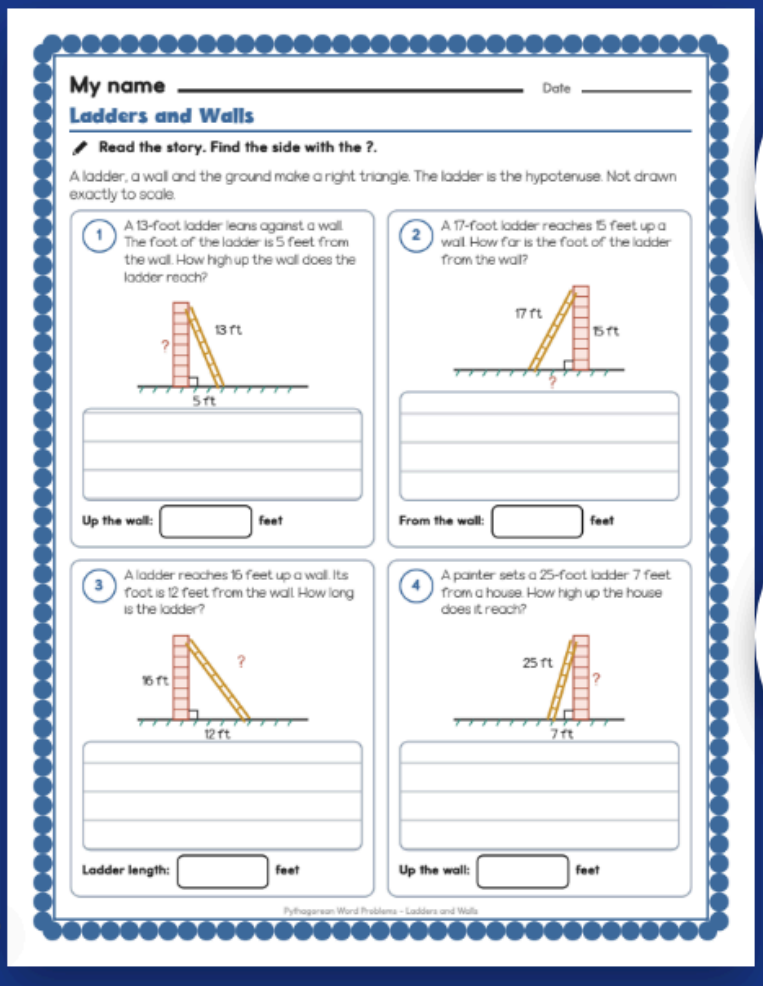
PYTHAGOREAN THEOREM WORD PROBLEMS

GRADE 8 WORKSHEETS





My name _____ Date _____

Ladders and Walls

Read the story. Find the side with the ?.

A ladder, a wall and the ground make a right triangle. The ladder is the hypotenuse. Not drawn exactly to scale.

1. A 13-foot ladder leans against a wall. The foot of the ladder is 5 feet from the wall. How high up the wall does the ladder reach?

13 ft, ?, 5 ft

Up the wall: ____ feet

2. A 17-foot ladder reaches 15 feet up a wall. How far is the foot of the ladder from the wall?

17 ft, 15 ft, ?

From the wall: ____ feet

3. A ladder reaches 16 feet up a wall. Its foot is 12 feet from the wall. How long is the ladder?

16 ft, ?, 12 ft

Ladder length: ____ feet

4. A painter sets a 25-foot ladder 7 feet from a house. How high up the house does it reach?

25 ft, ?, 7 ft

Up the wall: ____ feet

Pythagorean Word Problems - Ladders and Walls

26 PAGES

ANSWER KEY

Bright Path Sped

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Print at 100 percent

Turn off fit to page and shrink to fit so the ruled lines stay 0.34 inch apart. Every student page is black and white inside a colored border, so it still reads when copied in black and white.

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A filled-in tracker, class grid or team note carries a real student's name. Keep it in the data folder, and use a first name only on any page that leaves your hands.

Need help?

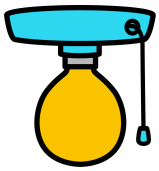
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PREVIEW

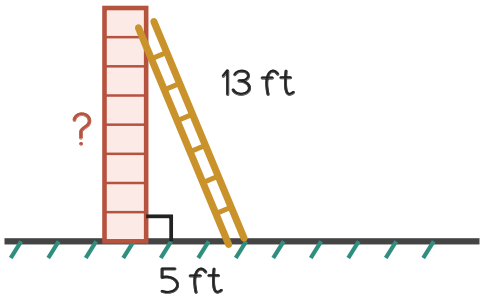
Preview - Bright Path Sped

My name _____ Date _____



Word Problem Plan

Read the four steps. Keep this page next to you.



Pythagorean theorem word problems all use the same four steps. Here they are on one story.

Story: A 13-foot ladder leans on a wall. Its foot is 5 feet from the wall. How high does it reach?

$$a^2 + b^2 = c^2$$

1 Draw it

Sketch the story. The wall and the ground make a right angle: mark it with a little square.

Example: the ladder, the wall and the ground make a right triangle.

2 Label it

Write each number on its side. The hypotenuse is across from the right angle. Put a ? on the side you need.

Example: the ladder is the hypotenuse, 13. The ground side is 5. The wall side is ?.

3 Solve it

Hypotenuse unknown: add the squares. A leg unknown: subtract.

Example: $5^2 + b^2 = 13^2$, so $b^2 = 169 - 25 = 144$, $b = 12$

4 Check it

Is the hypotenuse the longest side? Does the answer make sense? Write the units.

Example: 12 feet is shorter than 13 feet, so it makes sense. The ladder reaches 12 feet up.

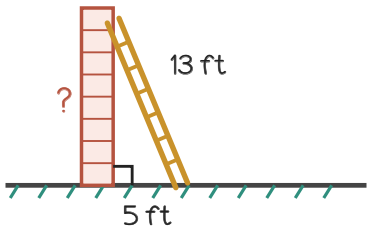
PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

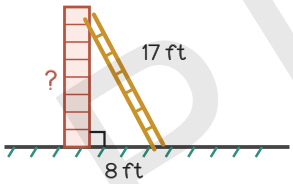
Worked Example 1: Ladder

Read the example. Then fill in the blanks.



Example. A 13-foot ladder leans against a wall. The foot of the ladder is 5 feet from the wall. How high does it reach? The numbers are made up for practice.

Start	$a^2 + b^2 = c^2$ Start with the formula.
Step 1	$5^2 + b^2 = 13^2$ Put in the leg you know and the hypotenuse.
Step 2	$25 + b^2 = 169$, so $b^2 = 169 - 25 = 144$ Square. Then subtract to get b^2.
Step 3	$b = 12$ Take the square root.
Check	$5^2 + 12^2 = 169$ and $13^2 = 169$. They match. Check. Put b back in.



Your turn. A 17-foot ladder is 8 feet from a wall. Do the same steps.

Start	Start with the formula.	$a^2 + b^2 = c^2$
Step 1	Put in the leg you know and the hypotenuse.	
Step 2	Square. Then subtract to get b^2.	
Step 3	Take the square root.	
Check	Check. Put b back in.	

PREVIEW

Preview - Bright Path Shed

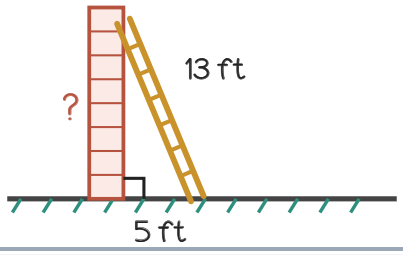
My name _____ Date _____

Ladders and Walls

Read the story. Find the side with the ?.

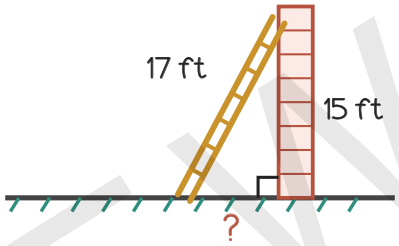
A ladder, a wall and the ground make a right triangle. The ladder is the hypotenuse. Not drawn exactly to scale.

1 A 13-foot ladder leans against a wall. The foot of the ladder is 5 feet from the wall. How high up the wall does the ladder reach?



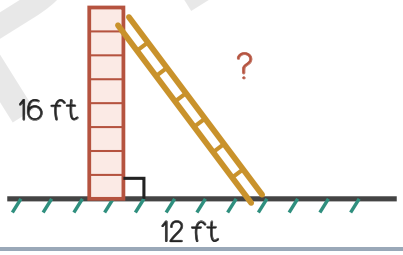
Up the wall: _____ **feet**

2 A 17-foot ladder reaches 15 feet up a wall. How far is the foot of the ladder from the wall?



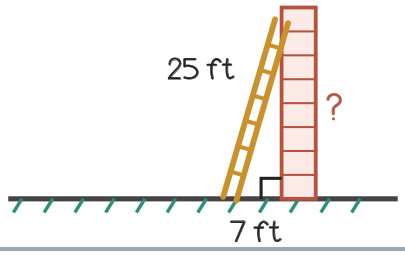
From the wall: _____ **feet**

3 A ladder reaches 16 feet up a wall. Its foot is 12 feet from the wall. How long is the ladder?



Ladder length: _____ **feet**

4 A painter sets a 25-foot ladder 7 feet from a house. How high up the house does it reach?



Up the wall: _____ **feet**

PREVIEW

Preview - Bright Path Shed

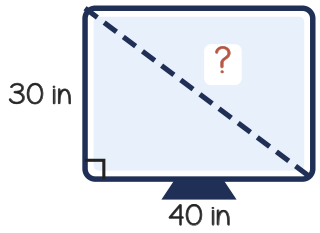
My name _____ Date _____

Screens and Rectangles

Read the story. Find the side with the ?.

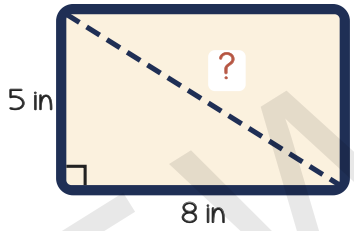
A diagonal cuts a rectangle into two right triangles. The diagonal is the hypotenuse. Not drawn exactly to scale.

1 A TV screen is 40 inches wide and 30 inches tall. How long is the diagonal of the screen?



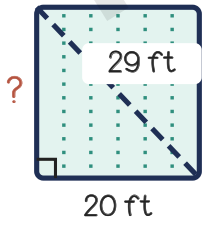
Length: _____ **inches**

2 A tablet screen is 8 inches wide and 5 inches tall. How long is its diagonal? Round to the tenth.



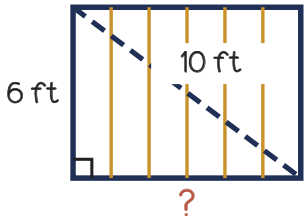
Length: _____ **inches**

3 A garden is 20 feet wide. A path across it from corner to corner is 29 feet long. How tall is the garden?



Height: _____ **feet**

4 A gate is 6 feet tall. A brace across it is 10 feet long. How wide is the gate?



Distance: _____ **feet**

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Two-Step Challenge

Solve each one in two steps.

1 A room is 12 feet by 16 feet. Walking along two walls from one corner to the opposite corner is 12 + 16 feet. A shortcut goes straight across the floor. How many feet does the shortcut save?

Step 1: draw and solve

Step 2: finish it

Answer, with units:

2 A 17-foot ladder stands with its foot 8 feet from a wall. The foot slides out to 15 feet from the wall. How far down the wall did the top of the ladder slide?

Step 1: draw and solve

Step 2: finish it

Answer, with units:

3 A sail is a right triangle. Its short sides are 9 feet and 12 feet. A ribbon goes around all three edges. How many feet of ribbon?

Step 1: draw and solve

Step 2: finish it

Answer, with units:

PREVIEW

Preview - Bright Path Shop

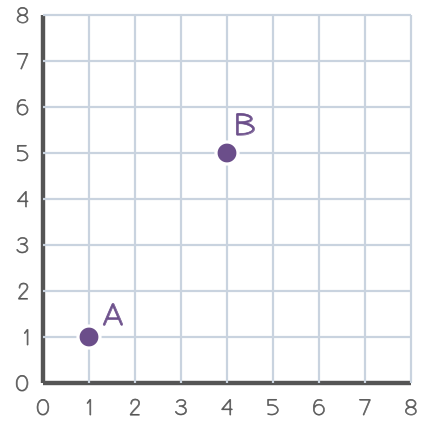
My name _____ Date _____

Distance on a Grid

Draw the legs. Find how far apart the points are.

Draw a right triangle with A and B at the ends of the long side. Count the legs. Round to the tenth if you need to.

1 **A (1, 1) and B (4, 5)**

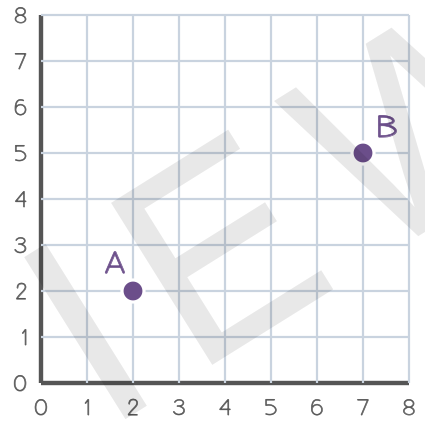


Across: _____

Up: _____

A to B: _____

2 **A (2, 2) and B (7, 5)**

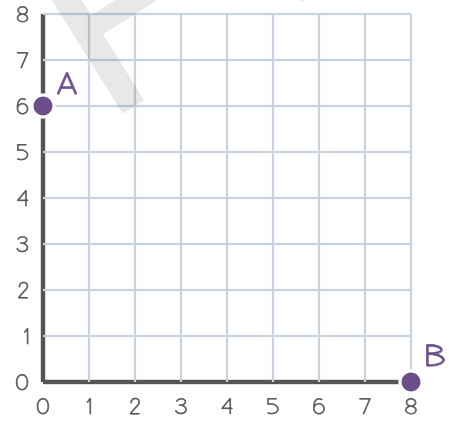


Across: _____

Up: _____

A to B: _____

3 **A (0, 6) and B (8, 0)**

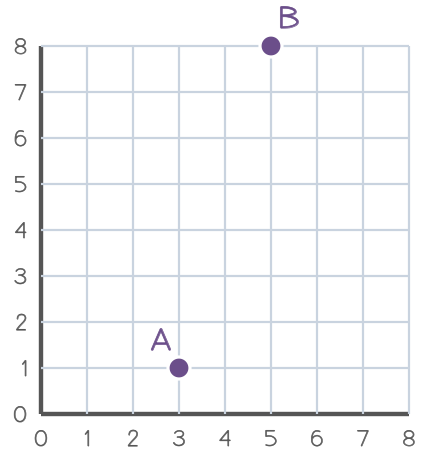


Across: _____

Up: _____

A to B: _____

4 **A (3, 1) and B (5, 8)**



Across: _____

Up: _____

A to B: _____

PREVIEW

Preview - Bright Path Sped

My name _____ Date _____

Cut and Paste

Cut out the six pieces. Paste each one in the right box.

Solve each story on scrap paper. Paste the piece in the box with the same answer.

8 feet	20 inches	13 feet

7 feet	15 miles	21 feet

Cut on the dashed lines: six pieces, two straight cuts across and two down.

A hiker goes 9 miles east and 12 miles north. How far is the hiker from the start?	A 10-foot ladder is 6 feet from a wall. How high does it reach?	A 25-foot wire is tied to a 24-foot pole. How far from the pole is the stake?
A gate is 20 feet wide. Its brace is 29 feet long. How tall is the gate?	A screen is 16 inches wide and 12 inches tall. How long is the diagonal?	A ramp runs 12 feet along the ground and rises 5 feet. How long is it?

Which one was hardest to match? Why?

PREVIEW

Answer Key: Picture Sets and Draw It

Every problem, its setup and its answer.

Ladders and Walls page 7

#	Finds	Setup	Answer
1	wall or tall side	$5^2 + b^2 = 13^2$, $b^2 = 144$	12 feet
2	ground or wide side	$15^2 + b^2 = 17^2$, $b^2 = 64$	8 feet
3	hypotenuse	$16^2 + 12^2 = c^2$, $c^2 = 400$	20 feet
4	wall or tall side	$7^2 + b^2 = 25^2$, $b^2 = 576$	24 feet

Ramps and Wires page 8

#	Finds	Setup	Answer
1	hypotenuse	$2^2 + 7^2 = c^2$, $c^2 = 53$	7.3 feet
2	ground or wide side	$5^2 + b^2 = 13^2$, $b^2 = 144$	12 feet
3	ground or wide side	$24^2 + b^2 = 25^2$, $b^2 = 49$	7 feet
4	hypotenuse	$9^2 + 12^2 = c^2$, $c^2 = 225$	15 feet

Screens and Rectangles page 9

#	Finds	Setup	Answer
1	hypotenuse	$30^2 + 40^2 = c^2$, $c^2 = 2500$	50 inches
2	hypotenuse	$5^2 + 8^2 = c^2$, $c^2 = 89$	9.4 inches
3	wall or tall side	$20^2 + b^2 = 29^2$, $b^2 = 441$	21 feet
4	ground or wide side	$6^2 + b^2 = 10^2$, $b^2 = 64$	8 feet

Draw It Yourself page 10

#	Setup	Answer
1	$30^2 + b^2 = 50^2$, $b^2 = 1600$	40 meters
2	$9^2 + 12^2 = c^2$, $c^2 = 225$	15 miles
3	$60^2 + 60^2 = c^2$, $c^2 = 7200$	84.9 feet
4	$15^2 + 8^2 = c^2$, $c^2 = 289$	17 feet

Your turn answers (guided copies)

Page 5: leg 8, hypotenuse 17: b = 15.
Page 6: legs 28 and 21: c = 35.

How the answers were made

Every square was added or subtracted as a whole number by program, and the square root was taken exactly when the result is a perfect square, otherwise rounded to the tenth. Accept an answer one tenth off if a student rounded a calculator's longer decimal. Accept the answer with or without the word for the unit if the units are written somewhere.

PREVIEW

Answer Key: Mistakes, Badge, Exit, Sort

Sam in each Find the Mistake problem is invented. Line numbers count the first line as line 1.

Item	Problem	Mistake	What went wrong	Right answer
Sam 1	a 10-foot ladder, foot 6 feet from the wall: how high?	Line 1	The ladder is the hypotenuse, so it goes alone on the right: $6^2 + h^2 = 10^2$. 100 - 36 = 64, h = 8.	8 feet
Sam 2	a TV is 24 inches wide and 18 inches tall: diagonal?	Line 3	900 is d squared, not d. Take the square root: d = 30.	30 inches
Sam 3	a map trip goes 5 blocks across and 12 blocks up: distance?	Line 2	Squaring is times itself, not times 2: 25 + 144 = 169, and d = 13.	13 blocks
Sam 4	a 13-foot ladder, foot 5 feet from the wall: how high?	Line 2	169 - 25 is 144, not 154. The square root of 144 is 12.	12 feet

My Self-Check Badge page 15

#	Claim	Answer	Why
1	Legs 5 and 12. Sam says the hypotenuse is 11.	Does not make sense	c must be longer than both legs, 5 and 12. 11 is shorter than 12. The right side is 13.
2	Leg 8 and hypotenuse 17. Sam says the other leg is 19.	Does not make sense	A leg must be shorter than the hypotenuse, 17. 19 is longer than 17. The right side is 15.
3	Legs 6 and 8. Sam says the hypotenuse is 10.	Makes sense	c must be longer than both legs, 6 and 8. 10 is longer than 8 and 6.
4	Leg 9 and hypotenuse 15. Sam says the other leg is 12.	Makes sense	A leg must be shorter than the hypotenuse, 15. 12 is shorter than 15.

Exit Tickets page 17

#	Problem	Answer
1	A 26-foot ladder is 10 feet from a wall.	b = 24
2	A TV is 24 inches tall and 32 inches wide.	c = 40
3	A trip goes 4 blocks across and 6 blocks up.	c = 7.2

Cut and Paste page 16

Piece	Story	Box
r1 c1	A hiker goes 9 miles east and 12 miles north	15 miles
r1 c2	A 10-foot ladder is 6 feet from a wall	8 feet
r1 c3	A 25-foot wire is tied to a 24-foot pole	7 feet
r2 c1	A gate is 20 feet wide	21 feet
r2 c2	A screen is 16 inches wide and 12 inches tall	20 inches
r2 c3	A ramp runs 12 feet along the ground and rises 5 feet	13 feet

Common slips to watch for

- Using the ladder, wire or diagonal as a leg: it is always the hypotenuse.
- Stopping at c squared and forgetting the square root.
- Adding when a leg has to be found: it is a subtraction.
- Leaving the units off the answer.

PREVIEW

Class Progress Grid

Every student on one grid: items right by page type.

Class or group _____ Month _____

Student	Picture sets (of 12)	Draw it (of 4)	Two-step (of 3)	Map, grid (of 8)	Mistakes (of 4)	Sense check (of 4)	Exit (of 3)	Sort (of 6)

PREVIEW

How to fill this in

For each column, add up how many items that student has right with no prompt (the tracker rows). One glance across a row shows which skill is easiest and which is next.

Grouping for small-group time

Students low on the picture sets need the plan page (page 4) and the worked examples (pages 5 and 6). Students low on Draw It need the plan page's first two steps again. Students near full marks can move to the two-step page and the mistakes (pages 11 and 14).

Marcus's Tracker (Invented Student)

Marcus T. is invented; nothing on this page describes a real student. The blank tracker is on page 21.

Student	Teacher	Month
Marcus T. (an invented student)	Ms. Reyes (invented)	November

Page	Page type and set	Items	Right	Date	Notes
7	Ladders and Walls	4	4	11/3	-
8	Ramps and Wires	4	3	11/5	Did not round the 7.28 to the tenth
9	Screens and Rectangles	4	4	11/10	-
10	Draw It Yourself	4	2	11/12	Added instead of subtracting on the kite
11	Two-Step Challenge	3	-	-	-
12	Map Distances	4	3	11/17	Miscounted one leg
13	Distance on a Grid	4	-	-	-
14	Find the Mistake	4	3	11/19	Missed the squaring slip
15	My Self-Check Badge	4	-	-	-
16	Cut and Paste	6	-	-	-
17	Exit Tickets	3	-	-	-

PREVIEW

How to read it

Marcus T. has done **6 of 11** scored pages and got **19 of 24** items right with no prompt. **2** pages were all right and **4** carry a note. Every number comes from the table.

What the table points to

The lowest page is Draw It Yourself (2 of 4). That is where the next practice goes. The 5 pages left blank are not tried yet, never wrong.