

MYSTERY PICTURE



PYTHAGOREAN THEOREM APPLICATIONS AND TRIPLES

Add the Squares or Subtract Them?

25 situations in words · decide the hypotenuse · a picture appears

FREE

1 A ladder leans on a wall. It is 13 ft long. Its foot is 5 ft from the wall. How high up the wall does it reach?	2 Ana walks east, then north. Ana walks 6 ft east. Ana ends 10 ft from the start. How far north does Ana walk?	3 A path crosses a lawn from corner to corner. The path is 17 ft long. The lawn is 8 ft wide. How long is the lawn?	4 Ben flies a kite. Ben holds the string at the ground. The kite is 30 ft high. The string is 50 ft long. How far is Ben from the point under the kite?	5 A tree casts a shadow. From the treetop to the tip of the shadow is 26 ft. The tree is 10 ft tall. How long is the shadow?
6 A wire runs from the top of a pole to the ground. The pole is 9 ft tall. The wire is 12 ft long. How far from the pole does the wire meet the ground?	7 A ramp goes up to a platform. The ramp is 15 ft long. The platform is 4 ft high. How much ground does the ramp cover?	8 Cal flies a kite. Cal holds the string at the ground. Cal stands 7 ft from the point under the kite. The string is 25 ft long. How high is the kite?	9 A path crosses a lawn from corner to corner. The path is 20 ft long. The lawn is 16 ft long. How wide is the lawn?	10 A ladder leans on a wall. It reaches 13 ft up the wall. Its foot is 5 ft from the wall. How long is the ladder?
11 Dev walks east, then north. Dev ends 25 ft from the start. Dev walks 24 ft north. How far east does Dev walk?	12 A tree casts a shadow. The shadow is 9 ft long. From the treetop to the tip of the shadow is 15 ft. How tall is the tree?	13 A wire runs from the top of a pole to the ground. The wire is 30 ft long. The wire meets the ground 18 ft from the pole. How tall is the pole?	14 Eva flies a kite. Eva holds the string at the ground. The kite is 8 ft high. Eva stands 17 ft from the point under the kite. How long is the string?	15 Gus walks east, then north. Gus walks 25 ft north. Gus walks 7 ft east. How far from the start is Gus?
16 A ramp goes up to a platform. The ramp covers 8 ft of ground. The ramp is 10 ft long. How high is the platform?	17 A ladder leans on a wall. It is 20 ft long. It reaches 19 ft up the wall. How far is its foot from the wall?	18 A path crosses a lawn from corner to corner. The lawn is 6 ft wide. The lawn is 10 ft long. How long is the path?	19 A tree casts a shadow. The shadow is 15 ft long. The tree is 12 ft tall. How far is it from the treetop to the tip of the shadow?	20 A wire runs from the top of a pole to the ground. The pole is 26 ft tall. The wire meets the ground 10 ft from the pole. How far is it from the top of the pole to the ground, along the wire?
21 A path crosses a lawn from corner to corner. The lawn is 5 ft wide. The path is 13 ft long. How long is the lawn?	22 A ramp goes up to a platform. The ramp covers 5 ft of ground. The platform is 3 ft high. How long is the ramp?	23 A ladder leans on a wall. Its foot is 4 ft from the wall. It reaches 9 ft up the wall. How long is the ladder?	24 Ivy walks east, then north. Ivy walks 40 ft east. Ivy walks 30 ft north. How far from the start is Ivy?	25 Fay flies a kite. Fay holds the string at the ground. Fay stands 21 ft from the point under the kite. The kite is 20 ft high. How far is the kite from Fay's hand?

1. **Give each student page 3** and a pencil. No calculator is needed.
2. **Say this once:** *“In each square, picture the right triangle. Is the length asked for a leg? Then you subtract the squares: fill the square with slanted lines. Is it the hypotenuse? Then you add: leave it white. Do not work out any numbers.”*
3. **Let them work.** The picture shows when they are right. Nothing else is needed.

Student sheet page 3, one per student. A strip at the top shows a right triangle with its sides named.
Answers pages 4–5, for you.

No square has a drawing, and no square needs a calculation. Each square is a short situation, two lengths and a question. The student decides one thing: is the length asked for the hypotenuse or a leg? The hypotenuse is the side across from the right angle. It is the ladder, the wire, the kite string, the path across the lawn, the straight distance back to the start, or the line from the treetop to the tip of the shadow. Fifteen squares ask for a leg and are filled. The other ten ask for the hypotenuse and stay white.

The numbers are a test too. In seven white squares the two numbers look like part of a known triple, with the bigger number in the place of the hypotenuse. Square 10 gives 13 ft and 5 ft, and both are legs. A student who decides from the numbers instead of the situation subtracts and fills it. This is the mistake that this lesson works hardest to stop.

If part of a student’s picture looks wrong, the mistake is in that square. Ask: *“Where is the right angle? Which side does not touch it?”* Guessing does not work. Every simple guessing rule, such as filling every square that asks “how far”, gets at least six squares wrong.



This is the free lesson this activity came from. The worksheet, the full answers and the lesson plan are on it, at three levels of difficulty.

chooseyourlesson.com — 135 free geometry lessons.

Mystery Picture — add or subtract?

Pythagorean applications

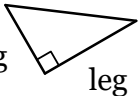
Name _____

Period _____

Date _____

Each square tells a situation. Picture the right triangle. **Is the length asked for a leg? Then you subtract the squares: fill the square with slanted lines. Is it the hypotenuse? Then you add: leave it white.** Do not work out any numbers. In every square, the ground is level. Walls, poles and trees stand straight up. Every walk goes due east, then due north. Every lawn is a rectangle. A picture appears. If part of it is missing, or one square does not fit, check that square again.

hypotenuse



leg leg

The **hypotenuse** is across from the right angle. It is the longest side. The other two sides are the **legs**. To find the hypotenuse, **add** the squares: $c^2 = a^2 + b^2$. To find a leg, **subtract** them: $b^2 = c^2 - a^2$. Triples to know: 3, 4, 5 · 5, 12, 13 · 8, 15, 17 · 7, 24, 25, and their multiples, like 6, 8, 10. Most right triangles do not have whole-number sides. Legs of 2 and 7 give a hypotenuse of $\sqrt{53}$, about 7.28. That is normal.

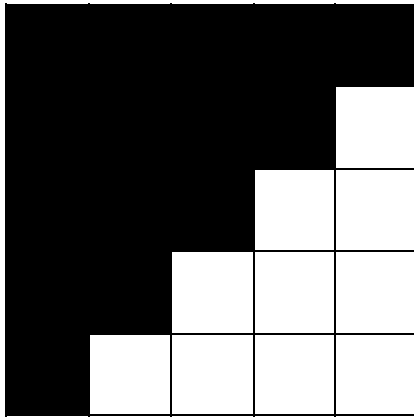
1 A ladder leans on a wall. It is 13 ft long. Its foot is 5 ft from the wall. How high up the wall does it reach?	2 Ana walks east, then north. Ana walks 6 ft east. Ana ends 10 ft from the start. How far north does Ana walk?	3 A path crosses a lawn from corner to corner. The path is 17 ft long. The lawn is 8 ft wide. How long is the lawn?	4 Ben flies a kite. Ben holds the string at the ground. The kite is 30 ft high. The string is 50 ft long. How far is Ben from the point under the kite?	5 A tree casts a shadow. From the treetop to the tip of the shadow is 26 ft. The tree is 10 ft tall. How long is the shadow?
6 A wire runs from the top of a pole to the ground. The pole is 9 ft tall. The wire is 12 ft long. How far from the pole does the wire meet the ground?	7 A ramp goes up to a platform. The ramp is 15 ft long. The platform is 4 ft high. How much ground does the ramp cover?	8 Cal flies a kite. Cal holds the string at the ground. Cal stands 7 ft from the point under the kite. The string is 25 ft long. How high is the kite?	9 A path crosses a lawn from corner to corner. The path is 20 ft long. The lawn is 16 ft long. How wide is the lawn?	10 A ladder leans on a wall. It reaches 13 ft up the wall. Its foot is 5 ft from the wall. How long is the ladder?
11 Dev walks east, then north. Dev ends 25 ft from the start. Dev walks 24 ft north. How far east does Dev walk?	12 A tree casts a shadow. The shadow is 9 ft long. From the treetop to the tip of the shadow is 15 ft. How tall is the tree?	13 A wire runs from the top of a pole to the ground. The wire is 30 ft long. The wire meets the ground 18 ft from the pole. How tall is the pole?	14 Eva flies a kite. Eva holds the string at the ground. The kite is 8 ft high. Eva stands 17 ft from the point under the kite. How long is the string?	15 Gus walks east, then north. Gus walks 25 ft north. Gus walks 7 ft east. How far from the start is Gus?
16 A ramp goes up to a platform. The ramp covers 8 ft of ground. The ramp is 10 ft long. How high is the platform?	17 A ladder leans on a wall. It is 20 ft long. It reaches 19 ft up the wall. How far is its foot from the wall?	18 A path crosses a lawn from corner to corner. The lawn is 6 ft wide. The lawn is 10 ft long. How long is the path?	19 A tree casts a shadow. The shadow is 15 ft long. The tree is 12 ft tall. How far is it from the treetop to the tip of the shadow?	20 A wire runs from the top of a pole to the ground. The pole is 26 ft tall. The wire meets the ground 10 ft from the pole. How far is it from the top of the pole to the ground, along the wire?
21 A path crosses a lawn from corner to corner. The lawn is 5 ft wide. The path is 13 ft long. How long is the lawn?	22 A ramp goes up to a platform. The ramp covers 5 ft of ground. The platform is 3 ft high. How long is the ramp?	23 A ladder leans on a wall. Its foot is 4 ft from the wall. It reaches 9 ft up the wall. How long is the ladder?	24 Ivy walks east, then north. Ivy walks 40 ft east. Ivy walks 30 ft north. How far from the start is Ivy?	25 Fay flies a kite. Fay holds the string at the ground. Fay stands 21 ft from the point under the kite. The kite is 20 ft high. How far is the kite from Fay's hand?



135 free geometry lessons — worksheets, worked answers and lesson plans.
chooseyourlesson.com

Mystery Picture — answers

For the teacher



The finished picture is a **right triangle**. Fifteen squares are filled.

To check a square, find the right angle in the situation. The side across from it is the hypotenuse. If the hypotenuse is given, the length asked for is a leg: subtract, and fill. If the hypotenuse is asked for: add, and leave it white.

	The square	Answer	Why
1	A ladder leans on a wall. It is 13 ft long. Its foot is 5 ft from the wall. How high up the wall does it reach?	fill	The ladder is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
2	Ana walks east, then north. Ana walks 6 ft east. Ana ends 10 ft from the start. How far north does Ana walk?	fill	The straight distance from the start is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
3	A path crosses a lawn from corner to corner. The path is 17 ft long. The lawn is 8 ft wide. How long is the lawn?	fill	The path is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
4	Ben flies a kite. Ben holds the string at the ground. The kite is 30 ft high. The string is 50 ft long. How far is Ben from the point under the kite?	fill	The string is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
5	A tree casts a shadow. From the treetop to the tip of the shadow is 26 ft. The tree is 10 ft tall. How long is the shadow?	fill	The line from the treetop to the tip of the shadow is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
6	A wire runs from the top of a pole to the ground. The pole is 9 ft tall. The wire is 12 ft long. How far from the pole does the wire meet the ground?	fill	The wire is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
7	A ramp goes up to a platform. The ramp is 15 ft long. The platform is 4 ft high. How much ground does the ramp cover?	fill	The ramp is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
8	Cal flies a kite. Cal holds the string at the ground. Cal stands 7 ft from the point under the kite. The string is 25 ft long. How high is the kite?	fill	The string is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
9	A path crosses a lawn from corner to corner. The path is 20 ft long. The lawn is 16 ft long. How wide is the lawn?	fill	The path is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
10	A ladder leans on a wall. It reaches 13 ft up the wall. Its foot is 5 ft from the wall. How long is the ladder?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the ladder, the hypotenuse, so add. The numbers look like a triple, but both are legs.
11	Dev walks east, then north. Dev ends 25 ft from the start. Dev walks 24 ft north. How far east does Dev walk?	fill	The straight distance from the start is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.

Mystery Picture — answers, squares 12 to 25

For the teacher

	The square	Answer	Why
12	A tree casts a shadow. The shadow is 9 ft long. From the treetop to the tip of the shadow is 15 ft. How tall is the tree?	fill	The line from the treetop to the tip of the shadow is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
13	A wire runs from the top of a pole to the ground. The wire is 30 ft long. The wire meets the ground 18 ft from the pole. How tall is the pole?	fill	The wire is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
14	Eva flies a kite. Eva holds the string at the ground. The kite is 8 ft high. Eva stands 17 ft from the point under the kite. How long is the string?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the string, the hypotenuse, so add. The numbers look like a triple, but both are legs.
15	Gus walks east, then north. Gus walks 25 ft north. Gus walks 7 ft east. How far from the start is Gus?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the straight distance from the start, the hypotenuse, so add. The numbers look like a triple, but both are legs.
16	A ramp goes up to a platform. The ramp covers 8 ft of ground. The ramp is 10 ft long. How high is the platform?	fill	The ramp is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
17	A ladder leans on a wall. It is 20 ft long. It reaches 19 ft up the wall. How far is its foot from the wall?	fill	The ladder is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
18	A path crosses a lawn from corner to corner. The lawn is 6 ft wide. The lawn is 10 ft long. How long is the path?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the path, the hypotenuse, so add. The numbers look like a triple, but both are legs.
19	A tree casts a shadow. The shadow is 15 ft long. The tree is 12 ft tall. How far is it from the treetop to the tip of the shadow?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the line from the treetop to the tip of the shadow, the hypotenuse, so add. The numbers look like a triple, but both are legs.
20	A wire runs from the top of a pole to the ground. The pole is 26 ft tall. The wire meets the ground 10 ft from the pole. How far is it from the top of the pole to the ground, along the wire?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the wire, the hypotenuse, so add. The numbers look like a triple, but both are legs.
21	A path crosses a lawn from corner to corner. The lawn is 5 ft wide. The path is 13 ft long. How long is the lawn?	fill	The path is across from the right angle, so it is the hypotenuse, and it is given. The length asked for is a leg, so subtract.
22	A ramp goes up to a platform. The ramp covers 5 ft of ground. The platform is 3 ft high. How long is the ramp?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the ramp, the hypotenuse, so add. The numbers look like a triple, but both are legs.
23	A ladder leans on a wall. Its foot is 4 ft from the wall. It reaches 9 ft up the wall. How long is the ladder?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the ladder, the hypotenuse, so add.
24	Ivy walks east, then north. Ivy walks 40 ft east. Ivy walks 30 ft north. How far from the start is Ivy?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the straight distance from the start, the hypotenuse, so add.
25	Fay flies a kite. Fay holds the string at the ground. Fay stands 21 ft from the point under the kite. The kite is 20 ft high. How far is the kite from Fay's hand?	white	Both given lengths meet at the right angle, so both are legs. The length asked for is the string, the hypotenuse, so add.