

ANSWER MAZE



CONVERSE OF THE PYTHAGOREAN THEOREM

Acute, Right, Obtuse, or No Triangle?

One page · 10–15 minutes · nothing to prepare

FREE

5

What kind of triangle do the sides 7, 10 and 6 make?

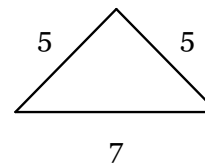
Acute → go to 3

Obtuse → go to 2

Think of two rods on a hinge. The wider the opening, the longer the third side.

4

The drawing shows sides of 5, 7 and 5. What kind of triangle is it?



Right → go to 8

Acute → go to 1

Decide from the numbers alone, whatever the drawing shows.

1. **Hand out page 3**, one per student. Calculators are allowed for the squares.
2. **Say this once:** *“Start at box 5. Put the three numbers in order first. Check that the two smaller ones add to more than the biggest. Then compare $a^2 + b^2$ with c^2 . Write every box number in the row at the bottom.”*
3. **Check a sheet quickly.** A student with no mistakes writes **5 2 7 4 1 6**: six boxes, then out.

Student sheet page 3, one per student. At the top, four small drawings show acute, right, obtuse and “not a triangle”, each with its numbers.

Answers page 4.

The rule. Let c be the longest side and a and b the other two. First, the three lengths make a triangle only if $a + b$ is more than c . Then compare $a^2 + b^2$ with c^2 : more means acute, equal means right, and less means obtuse. The “equal means right” part is the converse of the Pythagorean theorem.

Every wrong answer comes from a real mistake. Three boxes on the route test the comparison: squaring the first two printed numbers instead of the two shorter ones, turning the comparison around, and saying “right” because two numbers look like a familiar right triangle. Those wrong answers send the student to box 3. The other three boxes on the route test the rest: skipping the triangle check, doing that check with the squares, and judging by a drawing. Those wrong answers send the student to box 8. Boxes 3 and 8 ask a question of the same kind, and both of their answers lead back to the route.

The drawing in box 4. It is drawn to scale, with sides 5, 7 and 5. Its top angle is about 88.9° , so it looks like a right angle, but the numbers say acute. The drawing in box 3 also looks right-angled, and it really is right. Only the numbers can tell them apart.

The row at the bottom is the check. A clean run is six numbers. Each wrong answer adds more. Guessing does not get a student out: every simple guessing rule, such as always taking the answer printed first, goes wrong within the first four boxes.



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.
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Answer Maze

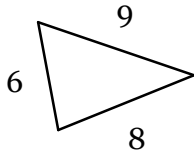
Start at box 5 · acute, right or obtuse?

Name _____

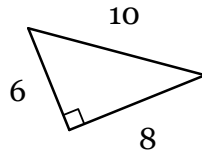
Period _____

Date _____

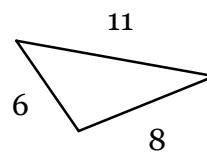
- Put the three numbers in order. Call the biggest one c , and the other two a and b .
- Check that $a + b$ is more than c . If it is not, the sides do not make a triangle. Stop there.
- Compare $a^2 + b^2$ with c^2 . More: **acute**. Equal: **right**. Less: **obtuse**.



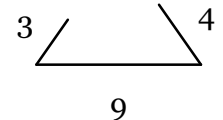
$6^2 + 8^2 = 100$. $9^2 = 81$. 100 is more than 81: **acute**.



$6^2 + 8^2 = 100$. $10^2 = 100$. They are equal: **right**.



$6^2 + 8^2 = 100$. $11^2 = 121$. 100 is less than 121: **obtuse**.



$3 + 4 = 7$. That is less than 9. The sides cannot meet: **not a triangle**.

Use the numbers. Do not judge by how a drawing looks. Choose an answer in each box, and go to the box it names.

1

What kind of triangle do the sides 9, 6 and 8 make?

Right → go to 3

Acute → go to 6

Two of these numbers may look familiar. Square all three anyway.

2

What kind of triangle do the sides 6, 10 and 4 make?

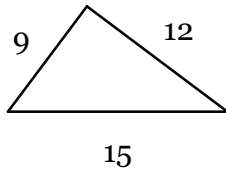
Not a triangle → go to 7

Obtuse → go to 8

Add the two shorter sides first. Compare that sum with the longest side.

3

The drawing shows sides of 15, 9 and 12. What kind of triangle is it?



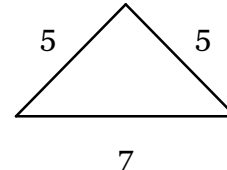
Acute → go to 5

Right → go to 2

Find the longest side before squaring anything.

4

The drawing shows sides of 5, 7 and 5. What kind of triangle is it?



Right → go to 8

Acute → go to 1

Decide from the numbers alone, whatever the drawing shows.

5

What kind of triangle do the sides 7, 10 and 6 make?

Acute → go to 3

Obtuse → go to 2

Think of two rods on a hinge. The wider the opening, the longer the third side.

6

What kind of triangle do the sides 8, 3 and 6 make?

Obtuse → you are out

Not a triangle → go to 8

The first check adds the lengths themselves. Squares come later.

7

What kind of triangle do the sides 17, 8 and 15 make?

Right → go to 4

Acute → go to 3

Find the longest side first, wherever it is printed. Only the other two are squared and added.

8

What kind of triangle do the sides 3, 9 and 5 make?

Not a triangle → go to 7

Obtuse → go to 2

Before any squares, check whether the two shorter sides reach each other.

Write each box number as you reach it:

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Answer Maze — answers

For the teacher

The route, in order. Boxes 3 and 8 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

5 → 2 → 7 → 4 → 1 → 6 → out

Box	Right answer, and why	Wrong answer, and why a student picks it
1 Box 5 What kind of triangle do the sides 7, 10 and 6 make?	Obtuse. In order: 6, 7, 10. $6 + 7 = 13$ is more than 10, so it is a triangle. $6^2 + 7^2 = 36 + 49 = 85$, and $10^2 = 100$. 85 is less than 100, so the triangle is obtuse.	“Acute” goes to box 3. A student who turns the comparison around picks this. 85 is less than 100, and less means obtuse. Squaring the first two printed numbers, 7 and 10, gives the same wrong answer.
2 Box 2 What kind of triangle do the sides 6, 10 and 4 make?	Not a triangle. In order: 4, 6, 10. $4 + 6 = 10$, which is exactly 10. The two shorter sides cannot meet above the longest one, so there is no triangle.	“Obtuse” goes to box 8. A student who skips the triangle check picks this. The squares still give an answer (52 is less than 100), but $4 + 6$ is not more than 10, so there is no triangle.
3 Box 7 What kind of triangle do the sides 17, 8 and 15 make?	Right. In order: 8, 15, 17. $8 + 15 = 23$ is more than 17, so it is a triangle. $8^2 + 15^2 = 64 + 225 = 289$, and $17^2 = 289$. They are equal, so the triangle is right.	“Acute” goes to box 3. A student who squares the first two printed numbers, 17 and 8, picks this. But 17 is the longest side, so 17 is c.
4 Box 4 The drawing shows sides of 5, 7 and 5. What kind of triangle is it?	Acute. In order: 5, 5, 7. $5 + 5 = 10$ is more than 7, so it is a triangle. $5^2 + 5^2 = 25 + 25 = 50$, and $7^2 = 49$. 50 is more than 49, so the triangle is acute.	“Right” goes to box 8. A student who judges by the drawing picks this. The drawing is to scale, and its top angle is about 88.9° , which looks just like 90° .
5 Box 1 What kind of triangle do the sides 9, 6 and 8 make?	Acute. In order: 6, 8, 9. $6 + 8 = 14$ is more than 9, so it is a triangle. $6^2 + 8^2 = 36 + 64 = 100$, and $9^2 = 81$. 100 is more than 81, so the triangle is acute.	“Right” goes to box 3. A student who sees 6 and 8 and thinks of the right triangle 6, 8, 10 picks this without squaring. Here the longest side is 9, not 10.
6 Box 6 What kind of triangle do the sides 8, 3 and 6 make?	Obtuse. In order: 3, 6, 8. $3 + 6 = 9$ is more than 8, so it is a triangle. $3^2 + 6^2 = 9 + 36 = 45$, and $8^2 = 64$. 45 is less than 64, so the triangle is obtuse.	“Not a triangle” goes to box 8. A student who does the triangle check with the squares picks this. 45 is less than 64, but the check adds the lengths: $3 + 6 = 9$ is more than 8.
Box 3 The drawing shows sides of 15, 9 and 12. What kind of triangle is it?	Right. In order: 9, 12, 15. $9 + 12 = 21$ is more than 15, so it is a triangle. $9^2 + 12^2 = 81 + 144 = 225$, and $15^2 = 225$. They are equal, so the triangle is right.	“Acute” goes to box 5. A student who squares the first two printed numbers, 15 and 9, picks this. But 15 is the longest side, so 15 is c.
Box 8 What kind of triangle do the sides 3, 9 and 5 make?	Not a triangle. In order: 3, 5, 9. $3 + 5 = 8$, which is less than 9. The two shorter sides cannot meet above the longest one, so there is no triangle.	“Obtuse” goes to box 2. A student who skips the triangle check picks this. The squares still give an answer (34 is less than 81), but $3 + 5$ is not more than 9, so there is no triangle.

How to check any box. Ask the student to say which number is c, and to add the other two. Then ask for $a^2 + b^2$ and c^2 , and which one is bigger.

This sheet counts three lengths whose two shorter sides add to exactly the longest as “not a triangle”. Some textbooks use other definitions, so tell the class which ones this sheet uses.

A student can find the last four boxes of the route by following the arrows backward from “you are out.” So ask a student with a clean row to explain one box.