

ANSWER MAZE



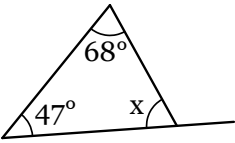
TRIANGLE ANGLE SUM AND THE EXTERIOR ANGLE THEOREM

Triangle Angle Sum & the Exterior Angle

15–20 minutes · one page · nothing to prepare

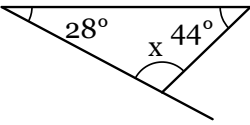
FREE

1



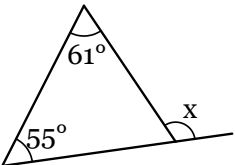
$65^\circ \rightarrow$ **go to 5**
 $115^\circ \rightarrow$ **go to 6**
Inside the triangle, or outside the corner?

2



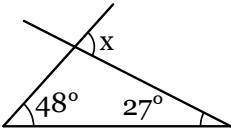
$72^\circ \rightarrow$ **go to 3**
 $108^\circ \rightarrow$ **go to 7**
Which two are the far angles from x?

3



$64^\circ \rightarrow$ **go to 5**
 $116^\circ \rightarrow$ **go to 8**
The other angle at that corner is not this one.

4



$105^\circ \rightarrow$ **go to 3**
 $75^\circ \rightarrow$ **you are out**
An exterior angle is bigger than either far angle.

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Every picture has a corner with two angles at it: one inside the triangle, one outside. Before you work anything out, decide which of the two has the x on it.”*
3. **Start at box 1.** Write every box number in the row at the bottom as you go. A clean run is 6 boxes, then out.

Student sheet page 3, one per student. There is nothing to cut and nothing to set up.

Answers page 4, with the reason for every step and the line that proves the angle sum.

The route is $1 \rightarrow 5 \rightarrow 8 \rightarrow 2 \rightarrow 7 \rightarrow 4 \rightarrow \text{out}$. Boxes 3 and 6 are not on it. They are where a wrong answer goes. **They look like every other box:** a triangle, two answers, two destinations and a hint. Both of their answers lead back to the route.

The wrong answer in every box is the angle on the other side of the line from x. It adds with the right answer to 180° . This is the most common mistake in this lesson: pairing the outside angle with the inside angle *beside* it, which is the one angle that is never in the sum. A student who lands on box 3 or 6 took the wrong one of the two angles at that corner. So the hint in those two boxes is worth reading.

In boxes 1, 2, 6, x is the angle inside the triangle at that corner. In the other boxes, it is outside. So adding the two given numbers is right in some boxes and wrong in others. The first thing to do in every box is to look at where the x is. In boxes 4 and 8, *both* sides are carried past the corner, and x is the angle made by the second one. It is the same size as the other exterior angle. Ask the class why.

If a student is stuck, do not give the answer. Lay a ruler on their page through the corner that the carried-on line does not pass through, parallel to the opposite side. Say nothing else. That line proves the angle sum, and finding it is the main step of this lesson. It is not drawn on the student page. It is drawn once on page 4, for you.

The row of box numbers is your check. A row that reads $1 \rightarrow 5 \rightarrow 8 \rightarrow 2 \rightarrow 7 \rightarrow 4$ is right. Any other row shows the box where the student went 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.

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Answer Maze

Start at box 1

Name _____

Period _____

Date _____

Find x in every box. Look first at where the x is: inside the triangle, or outside the corner. Do not measure.



The three inside
add to 180°

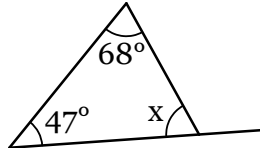


The outside one
the two FAR ones added



Not the near one
these two make 180°

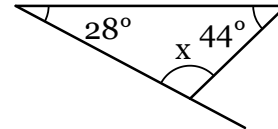
1



$65^\circ \rightarrow$ **go to 5**
 $115^\circ \rightarrow$ **go to 6**

Inside the triangle, or outside the corner?

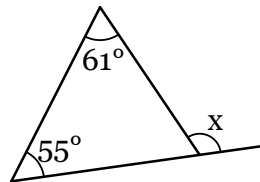
2



$72^\circ \rightarrow$ **go to 3**
 $108^\circ \rightarrow$ **go to 7**

Which two are the far angles from x ?

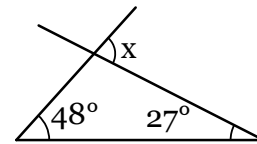
3



$64^\circ \rightarrow$ **go to 5**
 $116^\circ \rightarrow$ **go to 8**

The other angle at that corner is not this one.

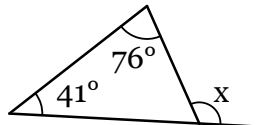
4



$105^\circ \rightarrow$ **go to 3**
 $75^\circ \rightarrow$ **you are out**

An exterior angle is bigger than either far angle.

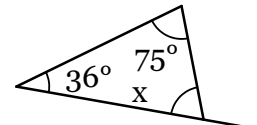
5



$63^\circ \rightarrow$ **go to 3**
 $117^\circ \rightarrow$ **go to 8**

The angle beside x is never in the sum.

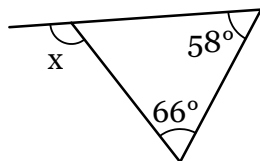
6



$111^\circ \rightarrow$ **go to 1**
 $69^\circ \rightarrow$ **go to 5**

Three inside make 180° . Check yours against both.

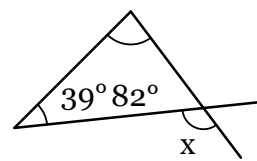
7



$124^\circ \rightarrow$ **go to 4**
 $56^\circ \rightarrow$ **go to 6**

Read which corner the arc stands at first.

8



$121^\circ \rightarrow$ **go to 2**
 $59^\circ \rightarrow$ **go to 6**

Both carried sides make the same exterior angle.

Write every box number here as you go. It shows you the way back if you get lost. **A clean run is 6 numbers.**

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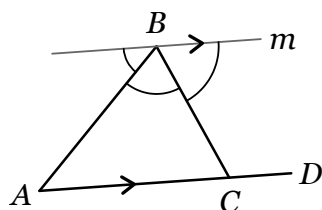
Answer Maze — answers

For the teacher

The route, in order. Boxes 3 and 6 are off the route and come last in the table. A student reaches them only by a wrong answer.

1 → 5 → 8 → 2 → 7 → 4 → out

	Box	Why it is right	Answer	Wrong answer goes to	Right answer goes to
1	Box 1	x is inside the triangle. The three angles of a triangle add to 180° , so $x = 180 - 47 - 68$.	65°	$115^\circ \rightarrow$ box 6	box 5
2	Box 5	x is an exterior angle, so it equals the sum of the two far angles: $x = 41 + 76$.	117°	$63^\circ \rightarrow$ box 3	box 8
3	Box 8	Both sides are carried past the corner, and x is the exterior angle made by the second one. The two exterior angles at a corner are vertical angles, so they are equal. So x is still the sum of the two far angles: $x = 39 + 82$.	121°	$59^\circ \rightarrow$ box 6	box 2
4	Box 2	x is inside the triangle. The three angles of a triangle add to 180° , so $x = 180 - 28 - 44$.	108°	$72^\circ \rightarrow$ box 3	box 7
5	Box 7	x is an exterior angle, so it equals the sum of the two far angles: $x = 58 + 66$.	124°	$56^\circ \rightarrow$ box 6	box 4
6	Box 4	Both sides are carried past the corner, and x is the exterior angle made by the second one. The two exterior angles at a corner are vertical angles, so they are equal. So x is still the sum of the two far angles: $x = 27 + 48$.	75°	$105^\circ \rightarrow$ box 3	out
	Box 3	x is an exterior angle, so it equals the sum of the two far angles: $x = 55 + 61$.	116°	$64^\circ \rightarrow$ box 5	box 8
	Box 6	x is inside the triangle. The three angles of a triangle add to 180° , so $x = 180 - 36 - 75$.	69°	$111^\circ \rightarrow$ box 1	box 5



Where the 180° comes from. This is box 1 again, with one line added: the line through B parallel to AC makes the angles at A and C into alternate interior angles at B, and the three angles there make a straight angle. The three angles now sit together along a straight line, and a straight angle is 180° . **Drawing that line is the step this lesson asks students to find.** If a student is stuck, lay a ruler along it and say nothing.

The wrong answer is never a slip in arithmetic. It is the other angle at the same corner, so it adds with the right answer to 180° . **Guessing does not get a student out.** Every simple guessing rule, such as always taking the first answer, goes wrong within the first two boxes.