

ANSWER MAZE



THE TRIANGLE INEQUALITY AND THE HINGE THEOREM

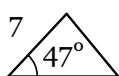
Does the Hinge Theorem Fit?

One page · 10–15 minutes · nothing to prepare

FREE

4

Both triangles have sides 9 and 7. Which triangle has the longer third side?



9



9

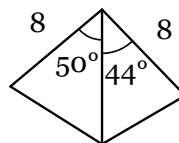
**Left triangle →
go to 2**

**Right triangle
→ go to 7**

Find the angle between the two numbered sides in each triangle. Compare those two angles.

7

The two triangles share the middle side. Which bottom side is longer?



**Left bottom side →
go to 1**

**No conclusion →
go to 5**

The middle side belongs to both triangles. Count it as a pair of equal sides.

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 4. Before you compare anything, name both pairs of equal sides. A shared side counts as a pair. Check that each angle is between the two equal sides. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **4 7 1 6 3 8**: six boxes, then out.

Student sheet	page 3, one per student. Every box has its own small drawing.
Answers	page 4.

The Hinge Theorem. Suppose two sides of one triangle are equal to two sides of another triangle. If the angle between those sides is bigger in the first triangle, then the third side of the first triangle is longer. The converse is also true: with the same two pairs of equal sides, the longer third side goes with the bigger angle.

Every wrong answer comes from one of two kinds of mistake. The first is going the wrong way: turning the converse around, or comparing the turns of two walkers instead of the angles inside their triangles. The angle inside the triangle is 180° minus the turn, so the walker who turns less ends farther away. These wrong answers send the student to box 2.

The second is using the theorem when it does not fit, or not using it when it does. The theorem needs two pairs of equal sides, and a side the two triangles share counts as one pair. It also needs the angle between those sides, not an angle at another corner. When the angles are equal, the triangles are congruent and the third sides are equal. The reason is congruence, not the Hinge Theorem. These wrong answers send the student to box 5. Boxes 2 and 5 ask the same kind of question again, and both of their answers lead back to the route.

The row at the bottom is the check. A clean run is six numbers. Each wrong answer adds at least one 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 4 · the Hinge Theorem

Name _____

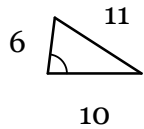
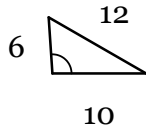
Period _____

Date _____

The Hinge Theorem. Two triangles have two pairs of equal sides. The **bigger angle between those sides** gives the **longer third side**. A shared side counts as a pair. If the theorem does not fit, choose “No conclusion”. Choose an answer in each box, and go to the box it names.

1

Both triangles have sides 10 and 6. Which triangle has the bigger angle between these sides?

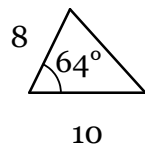
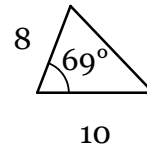


Right triangle
→ go to 2
Left triangle →
go to 6

Picture the two sides as a hinge. What makes the gap between their ends grow?

2

Both triangles have sides 10 and 8. Which triangle has the longer third side?

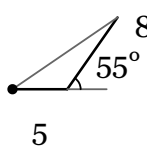
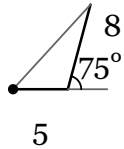


Right triangle
→ go to 4
Left triangle →
go to 7

Look only at the angle between the two sides that match.

3

Ben (left) and Ana (right) each walk 5, turn, then walk 8. Who ends farther from the start?

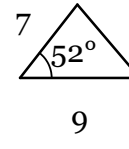
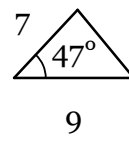


Ana → go to 8
Ben → go to 2

The angle inside the triangle and the turn make a straight line together.

4

Both triangles have sides 9 and 7. Which triangle has the longer third side?

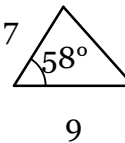
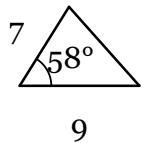


Left triangle →
go to 2
Right triangle →
go to 7

Find the angle between the two numbered sides in each triangle. Compare those two angles.

5

Both triangles have sides 9 and 7. Which third side is longer?

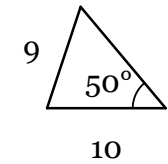
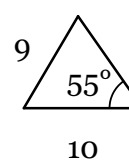


They are equal
→ go to 1
No conclusion
→ go to 7

Compare the two angles first. Then decide which theorem fits here.

6

Both triangles have sides 10 and 9. Which triangle has the longer third side?

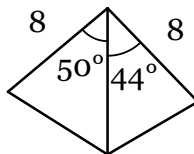


No conclusion
→ go to 3
Left triangle →
go to 5

Check where each angle sits. Is it between the two numbered sides?

7

The two triangles share the middle side. Which bottom side is longer?

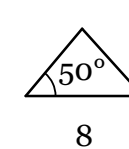
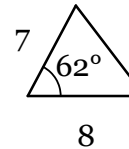


Left bottom side → go to 1
No conclusion → go to 5

The middle side belongs to both triangles. Count it as a pair of equal sides.

8

Which triangle has the longer third side?



Left triangle →
go to 5
No conclusion →
you are out

Name both pairs of equal sides before comparing any angles.

Write each box number as you reach it:

--	--	--	--	--	--	--	--	--



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Answer Maze — answers

For the teacher

The route, in order. Boxes 2 and 5 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

4 → 7 → 1 → 6 → 3 → 8 → out

	Box	Right answer, and why	Wrong answer, and why a student picks it
1	Box 4 Both triangles have sides 9 and 7. Which triangle has the longer third side?	Right triangle The two pairs of sides are equal (9 and 7). The angle between them is 52° in the right triangle and 47° in the other, so that third side is longer (the Hinge Theorem).	"Left triangle" goes to box 2. A student who judges by eye, or reverses the rule, picks this. The gap is only a few degrees.
2	Box 7 The two triangles share the middle side. Which bottom side is longer?	Left bottom side The arms are both 8, and the middle side is shared, so it is the second pair of equal sides. The left top angle is bigger ($50^\circ > 44^\circ$), so the left bottom side is longer.	"No conclusion" goes to box 5. A student who looks for two pairs of numbers finds only one and gives up. The shared side is the second pair.
3	Box 1 Both triangles have sides 10 and 6. Which triangle has the bigger angle between these sides?	Left triangle The two pairs of sides are equal (10 and 6). The third side is 12 in the left triangle and 11 in the other, so its angle is bigger (the converse of the Hinge Theorem).	"Right triangle" goes to box 2. A student who turns the rule around picks this. The longer third side goes with the bigger angle.
4	Box 6 Both triangles have sides 10 and 9. Which triangle has the longer third side?	No conclusion The 55° and 50° angles are not between the 10 and the 9. They sit at the end of the 10, next to the third side. The Hinge Theorem needs the angle between the two equal sides.	"Left triangle" goes to box 5. A student who compares any two printed angles picks this, because 55° is bigger.
5	Box 3 Ben (left) and Ana (right) each walk 5, turn, then walk 8. Who ends farther from the start?	Ana The angle inside each triangle is 180° minus the turn: 125° for Ana and 105° for Ben. Both walk 5 and 8, so the bigger inside angle, Ana's, gives the longer distance. Turning less ends farther away.	"Ben" goes to box 2. A student who compares the turns instead of the angles inside the triangles picks this.
6	Box 8 Which triangle has the longer third side?	No conclusion Only one pair of sides is known to be equal: the two sides marked 8. The other side of the right triangle has no number, so it may not equal 7. The Hinge Theorem needs two pairs of equal sides.	"Left triangle" goes to box 5. A student who compares the angles without checking the sides picks this, because 62° is bigger.
	Box 2 Both triangles have sides 10 and 8. Which triangle has the longer third side?	Left triangle The two pairs of sides are equal (10 and 8). The angle between them is 69° in the left triangle and 64° in the other, so that third side is longer (the Hinge Theorem).	"Right triangle" goes to box 4. A student who judges by eye, or reverses the rule, picks this. The gap is only a few degrees.
	Box 5 Both triangles have sides 9 and 7. Which third side is longer?	They are equal Two pairs of equal sides and equal angles between them make the triangles congruent (SAS). So the third sides are equal. The reason is congruence, not the Hinge Theorem.	"No conclusion" goes to box 7. A student who thinks the Hinge Theorem is the only tool here picks this.

How to check any box. Ask the student to name both pairs of equal sides, and to point at the angle between them. If both pairs cannot be named, or the angle is at another corner, no conclusion can be drawn. Otherwise the bigger angle goes with the longer third side.

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.