

ANSWER MAZE

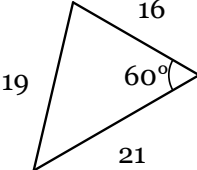


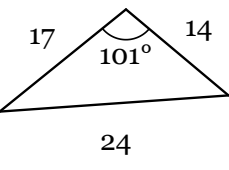
AREA OF A TRIANGLE USING SINE

Area = $\frac{1}{2}ab \sin C$: Which Two Sides?

Area of a triangle using sine · one page · 10–15 minutes · nothing to prepare

FREE

 **6** Find the area.
Area = 131.6 → go to box 3
Area = 145.5 → go to box 2
Hint: Put a finger on the arc. Which two sides run out from that corner?

 **2** Find the area.
Area = 116.8 → go to box 8
Area = 233.6 → go to box 5
Hint: Read the formula on the strip. Count its parts in the work.

1. **Hand out page 3**, one per student, and a calculator. Nothing else is needed.
2. **Say this once:** *“Start at box 6. Set your calculator to degrees: $\sin 30$ must show 0.5. Use only the two sides that meet at the arc. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **6 2 8 4 1 7**: six boxes, then out.

Student sheet page 3, one per student, and scrap paper for working.
Answers page 4.

Every box shows a triangle drawn to scale, turned a different way, with all three sides labeled and one angle marked. The area is $\frac{1}{2} \times a \times b \times \sin C$, where a and b are the two sides that meet at the marked angle C . The third side is not used. In three of the eight boxes the marked angle is more than 90° . The student does nothing extra there: the calculator gives $\sin 101^\circ$ directly, and it is the same number as $\sin 79^\circ$.

Every wrong answer comes from one of two mistakes. In the first, the student uses the side across from the marked angle in place of a side that meets it. These wrong answers send the student to box 3. In the second, the student leaves out the $\frac{1}{2}$ and gets twice the area. These wrong answers send the student to box 5. Boxes 3 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 larger number, goes wrong within the first two 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.
chooseyourlesson.com — 135 free geometry lessons.

Answer Maze — which two sides?

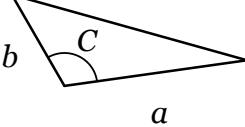
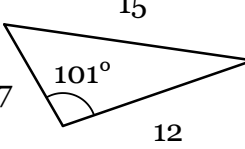
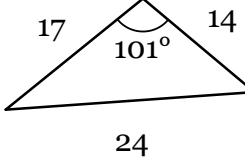
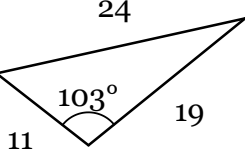
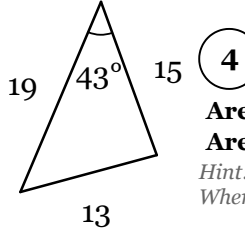
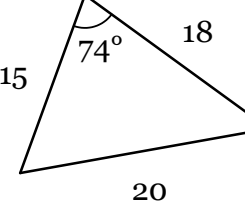
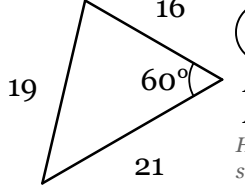
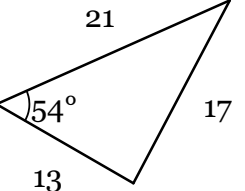
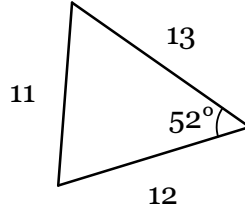
Start at box 6

Name _____

Period _____

Date _____

Start at box 6. Find the area to the nearest tenth. Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.

 Area = $\frac{1}{2} \times a \times b \times \sin C$. C is the angle between the sides a and b: the corner where the two sides meet. Calculator in degree mode: $\sin 30$ must show 0.5. Keep every digit. Round the area once, at the end, to the nearest tenth. The area is always less than $\frac{1}{2} \times a \times b$. An angle over 90° works the same way: $\sin 120^\circ = \sin 60^\circ$.	
 1 Find the area. Area = 88.3 → go to box 3 Area = 41.2 → go to box 7 <i>Hint: Trace each side that touches the arc. Those two sides are a and b.</i>	 2 Find the area. Area = 116.8 → go to box 8 Area = 233.6 → go to box 5 <i>Hint: Read the formula on the strip. Count its parts in the work.</i>
 3 Find the area. Area = 101.8 → go to box 2 Area = 128.6 → go to box 6 <i>Hint: Look at the corner with the arc. Which numbers sit on its two sides?</i>	 4 Find the area. Area = 97.2 → go to box 1 Area = 194.4 → go to box 5 <i>Hint: A triangle is half of a parallelogram. Where is that half in the work?</i>
 5 Find the area. Area = 259.5 → go to box 2 Area = 129.8 → go to box 8 <i>Hint: Write the formula from the strip first. Then put each number in its place.</i>	 6 Find the area. Area = 131.6 → go to box 3 Area = 145.5 → go to box 2 <i>Hint: Put a finger on the arc. Which two sides run out from that corner?</i>
 7 Find the area. Area = 110.4 → you are out Area = 220.9 → go to box 5 <i>Hint: Estimate half of a times b first. The area stays below that number.</i>	 8 Find the area. Area = 56.3 → go to box 3 Area = 61.5 → go to box 4 <i>Hint: Three sides carry numbers. Which side is across from the arc?</i>

Write every box number here, in order.

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



chooseyourlesson.com
 135 free geometry lessons

The route, in order. Boxes 3 and 5 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table. Every sine is the calculator's value in degree mode, to four places, and the area is rounded only at the end.

6 → 2 → 8 → 4 → 1 → 7 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 6 Find the area. The sides are 16, 21 and 19. The 60° arc is at the corner where 16 and 21 meet.	145.5. The 60° angle is between 16 and 21, so the area is $\frac{1}{2} \times 16 \times 21 \times \sin 60^\circ = \frac{1}{2} \times 16 \times 21 \times 0.8660 = 145.5$ square units.	"131.6" goes to box 3. The 19 is used in place of the 21: $\frac{1}{2} \times 16 \times 19 \times \sin 60^\circ = 131.6$. The side 19 is across from the marked angle and does not touch it.
2	Box 2 Find the area. The sides are 14, 17 and 24. The 101° arc is at the corner where 14 and 17 meet.	116.8. The 101° angle is between 14 and 17, so the area is $\frac{1}{2} \times 14 \times 17 \times \sin 101^\circ = \frac{1}{2} \times 14 \times 17 \times 0.9816 = 116.8$ square units.	"233.6" goes to box 5. The $\frac{1}{2}$ is left out: $14 \times 17 \times \sin 101^\circ = 233.6$, twice the area. It is more than $\frac{1}{2} \times 14 \times 17$. A sine is never more than 1, so the area is never more than $\frac{1}{2} \times 14 \times 17$.
3	Box 8 Find the area. The sides are 12, 13 and 11. The 52° arc is at the corner where 12 and 13 meet.	61.5. The 52° angle is between 12 and 13, so the area is $\frac{1}{2} \times 12 \times 13 \times \sin 52^\circ = \frac{1}{2} \times 12 \times 13 \times 0.7880 = 61.5$ square units.	"56.3" goes to box 3. The 11 is used in place of the 12: $\frac{1}{2} \times 13 \times 11 \times \sin 52^\circ = 56.3$. The side 11 is across from the marked angle and does not touch it.
4	Box 4 Find the area. The sides are 15, 19 and 13. The 43° arc is at the corner where 15 and 19 meet.	97.2. The 43° angle is between 15 and 19, so the area is $\frac{1}{2} \times 15 \times 19 \times \sin 43^\circ = \frac{1}{2} \times 15 \times 19 \times 0.6820 = 97.2$ square units.	"194.4" goes to box 5. The $\frac{1}{2}$ is left out: $15 \times 19 \times \sin 43^\circ = 194.4$, twice the area. It is more than $\frac{1}{2} \times 15 \times 19$. A sine is never more than 1, so the area is never more than $\frac{1}{2} \times 15 \times 19$.
5	Box 1 Find the area. The sides are 7, 12 and 15. The 101° arc is at the corner where 7 and 12 meet.	41.2. The 101° angle is between 7 and 12, so the area is $\frac{1}{2} \times 7 \times 12 \times \sin 101^\circ = \frac{1}{2} \times 7 \times 12 \times 0.9816 = 41.2$ square units.	"88.3" goes to box 3. The 15 is used in place of the 7: $\frac{1}{2} \times 12 \times 15 \times \sin 101^\circ = 88.3$. The side 15 is across from the marked angle and does not touch it.
6	Box 7 Find the area. The sides are 13, 21 and 17. The 54° arc is at the corner where 13 and 21 meet.	110.4. The 54° angle is between 13 and 21, so the area is $\frac{1}{2} \times 13 \times 21 \times \sin 54^\circ = \frac{1}{2} \times 13 \times 21 \times 0.8090 = 110.4$ square units.	"220.9" goes to box 5. The $\frac{1}{2}$ is left out: $13 \times 21 \times \sin 54^\circ = 220.9$, twice the area. It is more than $\frac{1}{2} \times 13 \times 21$. A sine is never more than 1, so the area is never more than $\frac{1}{2} \times 13 \times 21$.
	Box 3 Find the area. The sides are 11, 19 and 24. The 103° arc is at the corner where 11 and 19 meet.	101.8. The 103° angle is between 11 and 19, so the area is $\frac{1}{2} \times 11 \times 19 \times \sin 103^\circ = \frac{1}{2} \times 11 \times 19 \times 0.9744 = 101.8$ square units.	"128.6" goes to box 6. The 24 is used in place of the 19: $\frac{1}{2} \times 11 \times 24 \times \sin 103^\circ = 128.6$. The side 24 is across from the marked angle and does not touch it.
	Box 5 Find the area. The sides are 15, 18 and 20. The 74° arc is at the corner where 15 and 18 meet.	129.8. The 74° angle is between 15 and 18, so the area is $\frac{1}{2} \times 15 \times 18 \times \sin 74^\circ = \frac{1}{2} \times 15 \times 18 \times 0.9613 = 129.8$ square units.	"259.5" goes to box 2. The $\frac{1}{2}$ is left out: $15 \times 18 \times \sin 74^\circ = 259.5$, twice the area. It is more than $\frac{1}{2} \times 15 \times 18$. A sine is never more than 1, so the area is never more than $\frac{1}{2} \times 15 \times 18$.

How to check any box. Find the arc. The two sides that meet at that corner are a and b . The third side, across from the arc, is not used. Then the area is $\frac{1}{2} \times a \times b \times \sin C$, and it is always less than $\frac{1}{2} \times a \times b$.

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.