

ANSWER MAZE



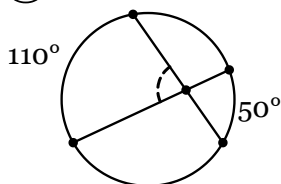
ANGLES FORMED BY CHORDS, SECANTS AND TANGENTS

Angles from Chords, Secants & Tangents

Half the sum or half the difference? · one page · 10–15 minutes ·
nothing to prepare

FREE

③ Two chords. Find the marked angle.

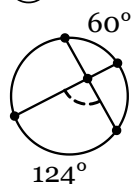


$160^\circ \rightarrow$ go to box 2

$80^\circ \rightarrow$ go to box 6

*Hint: Find the vertex. Then
read the rule for that place to
its end.*

⑥ Two chords. Find the marked angle.



$92^\circ \rightarrow$ go to box 5

$32^\circ \rightarrow$ go to box 8

*Hint: Where is the vertex: inside the circle or
outside it?*

1. **Hand out page 3**, one per student. Nothing else is needed.
2. **Say this once:** *“Start at box 3. First say where the vertex is: inside, on, or outside the circle. Then use the rule in the box at the top of the sheet, all the way to the end. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **3 6 5 1 4 7**: six boxes, then out.

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

Every box shows one circle, two lines and one marked angle, with two arc measures. If two chords cross inside the circle, the angle is half the sum of the arc inside it and the arc inside the angle across from it. If a tangent and a chord meet on the circle, the angle is half the arc inside it. If the lines meet outside the circle, the angle is half the difference of the two arcs inside the angle: $(\text{far arc} - \text{near arc}) \div 2$. The far arc is the one farther from the vertex. Answers are whole degrees.

This sheet calls a line a secant when it cuts the circle at two points, and a tangent when it touches the circle at exactly one point. The arcs an angle intercepts are the arcs inside the angle. Some textbooks use other definitions, so tell the class which ones this sheet uses.

Every wrong answer comes from one of two mistakes. In the first, the student forgets to halve. These wrong answers send the student to box 2. In the second, the student uses half the difference where half the sum belongs, or the reverse. These wrong answers send the student to box 8. Boxes 2 and 8 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 smaller number, goes wrong within the first three 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 — angles and arcs

Start at box 3

Name _____

Period _____

Date _____

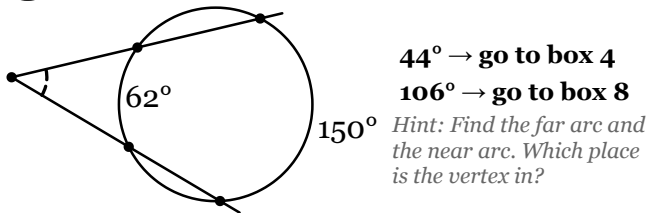
Start at box 3. Each number on a drawing is the arc it stands next to. Find the marked angle in whole degrees, like 37° . Then go to the box your answer names.

Vertex inside: the angle is **half the SUM** of the arc inside it and the arc across from it.

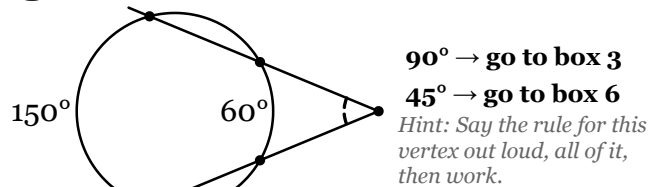
Vertex on the circle (a tangent and a chord): the angle is **half the arc** inside it.

Vertex outside: the angle is **half the DIFFERENCE**, far arc minus near arc.

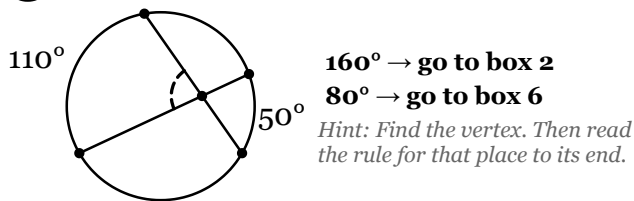
1 Two secants. Find the marked angle.



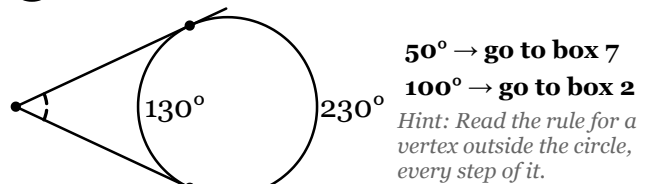
2 Two secants. Find the marked angle.



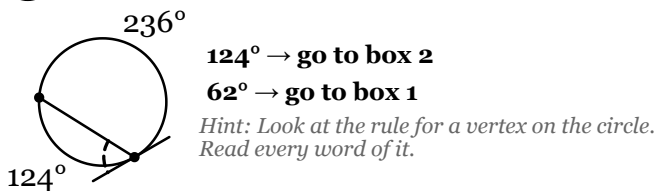
3 Two chords. Find the marked angle.



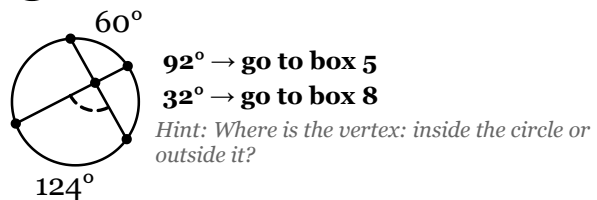
4 Two tangents. Find the marked angle.



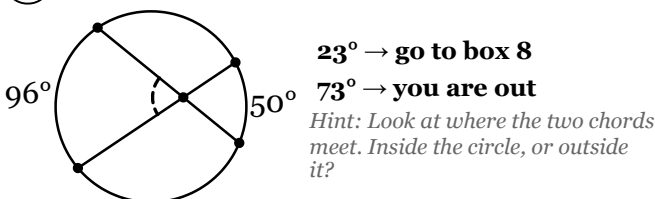
5 A tangent and a chord. Find the marked angle.



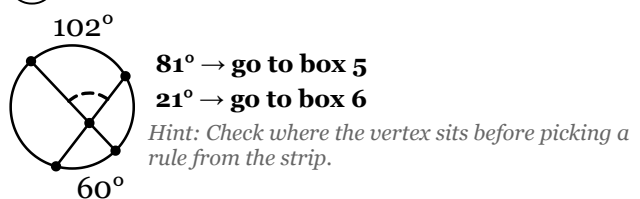
6 Two chords. Find the marked angle.



7 Two chords. Find the marked angle.



8 Two chords. Find the marked angle.



Write every box number here, in order.

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



chooseyourlesson.com
 135 free geometry lessons

The route, in order. Boxes 2 and 8 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table.

3 → 6 → 5 → 1 → 4 → 7 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 3 Two chords. Find the marked angle.	80°. The vertex is inside the circle. The arc inside the marked angle is 110°, and the arc inside the angle across from it is 50°. Half their sum: $(110^\circ + 50^\circ) \div 2 = 80^\circ$.	"160°" goes to box 2. 160° is the sum of the two arcs, not halved. Inside the circle the angle is half the sum: 80°.
2	Box 6 Two chords. Find the marked angle.	92°. The vertex is inside the circle. The arc inside the marked angle is 124°, and the arc inside the angle across from it is 60°. Half their sum: $(124^\circ + 60^\circ) \div 2 = 92^\circ$.	"32°" goes to box 8. 32° is half the difference of the arcs. That rule is for a vertex outside the circle. Inside, take half the sum: 92°.
3	Box 5 A tangent and a chord. Find the marked angle.	62°. The vertex is on the circle. The arc inside the marked angle is the short arc, 124°. Half of it is 62°.	"124°" goes to box 2. 124° is the arc itself. On the circle the angle is half of the arc inside it: 62°.
4	Box 1 Two secants. Find the marked angle.	44°. The vertex is outside the circle. The far arc is 150° and the near arc is 62°. Half their difference: $(150^\circ - 62^\circ) \div 2 = 44^\circ$.	"106°" goes to box 8. 106° is half the sum of the arcs. That rule is for a vertex inside the circle. Outside, take half the difference: 44°.
5	Box 4 Two tangents. Find the marked angle.	50°. The vertex is outside the circle. The far arc is 230° and the near arc is 130°. Half their difference: $(230^\circ - 130^\circ) \div 2 = 50^\circ$.	"100°" goes to box 2. 100° is the difference of the arcs, not halved. Outside the circle the angle is half the difference: 50°.
6	Box 7 Two chords. Find the marked angle.	73°. The vertex is inside the circle. The arc inside the marked angle is 96°, and the arc inside the angle across from it is 50°. Half their sum: $(96^\circ + 50^\circ) \div 2 = 73^\circ$.	"23°" goes to box 8. 23° is half the difference of the arcs. That rule is for a vertex outside the circle. Inside, take half the sum: 73°.
	Box 2 Two secants. Find the marked angle.	45°. The vertex is outside the circle. The far arc is 150° and the near arc is 60°. Half their difference: $(150^\circ - 60^\circ) \div 2 = 45^\circ$.	"90°" goes to box 3. 90° is the difference of the arcs, not halved. Outside the circle the angle is half the difference: 45°.
	Box 8 Two chords. Find the marked angle.	81°. The vertex is inside the circle. The arc inside the marked angle is 102°, and the arc inside the angle across from it is 60°. Half their sum: $(102^\circ + 60^\circ) \div 2 = 81^\circ$.	"21°" goes to box 6. 21° is half the difference of the arcs. That rule is for a vertex outside the circle. Inside, take half the sum: 81°.

How to check any box. Find the vertex first. Inside the circle, add the two arcs and halve. On the circle, halve the arc inside the angle. Outside the circle, take the near arc from the far arc and halve. On this sheet the angles with their vertex outside are 44°, 45° and 50°, so an answer of 90° or more there means a sum, or a difference not halved.

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.