

ANSWER MAZE

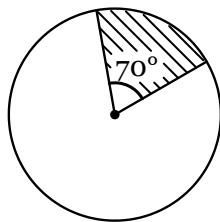


AREA OF A SECTOR

Area of a Sector: What Fraction of the Circle?

Radius or diameter · area or arc length · one page · 10–15 minutes · nothing to prepare

FREE



5

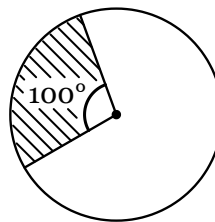
The diameter is 12 cm.

Find the area of the striped sector.

Area = 88 cm^2 → go to box 3

Area = 22 cm^2 → go to box 2

Hint: Read the words beside the box number. Which length do they give?



2

The radius is 9 cm.

Find the area of the striped sector.

Area = 71 cm^2 → go to box 7

Area = 16 cm^2 → go to box 6

Hint: Look at the units of the answers. Which working gives square units?

1. **Hand out page 3**, one per student, and a calculator with a π key. Nothing else is needed.
2. **Say this once:** *“Start at box 5. Find the radius first. The sector is its angle $\div$ 360 of the whole circle, $\pi \times \text{radius} \times \text{radius}$. Use the π key and round once, at the end, to the nearest whole square centimeter. Write every box number in the row at the bottom as you go.”*
3. **Check a sheet quickly.** A student with no mistakes writes **5 2 7 4 1 8**: six boxes, then out.

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

Every box shows a circle with two radii and the sector between them filled with slanted lines. The sector’s angle is marked at the center. In two boxes the striped sector is the big one, and its angle is marked the long way round. The words give the radius or the diameter. The area of the sector is its angle $\div$ 360° , times $\pi \times \text{radius} \times \text{radius}$. This sheet uses this definition: a *sector* is the part of a circle between two radii and one of their arcs. 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 uses the diameter as the radius and gets four times the area. These wrong answers send the student to box 3. In the second, the student finds the length of the arc (with $2\pi \times \text{radius}$) instead of the area. These wrong answers send the student to box 6. An area is in square units, and its working multiplies the radius by itself. Boxes 3 and 6 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.
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Answer Maze — how big is the striped sector?

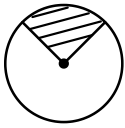
Start at box 5

Name _____

Period _____

Date _____

Start at box 5. Find the area of the striped sector. **Use the π key on your calculator. Round once, at the end, to the nearest whole square centimeter (cm^2).** Pick one answer and go to the box it names. Write each box number in the row at the bottom as you go.



a 90° sector



the other sector, 270°

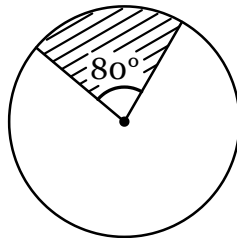
A **sector** is the part of a circle between two radii and one of their arcs.

The whole circle is 360° . Its area is $\pi \times \text{radius} \times \text{radius}$. We use this today. Why it is true comes later in the course.

A sector is a fraction of the circle. Its fraction is its angle $\div 360^\circ$.

An area is in square units, such as cm^2 . A length is in cm.

The diameter is twice the radius.



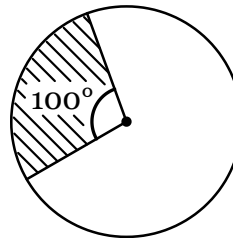
1 The diameter is 14 cm.

Find the area of the striped sector.

Area = 137 cm^2 → go to box 3

Area = 34 cm^2 → go to box 8

Hint: Check the words: radius or diameter? The radius goes into $\pi \times \text{radius} \times \text{radius}$.



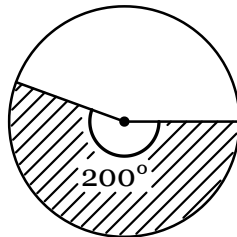
2 The radius is 9 cm.

Find the area of the striped sector.

Area = 71 cm^2 → go to box 7

Area = 16 cm^2 → go to box 6

Hint: Look at the units of the answers. Which working gives square units?



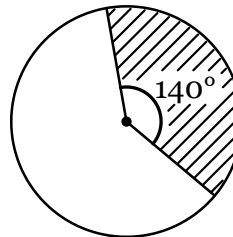
3 The diameter is 12 cm.

Find the area of the striped sector.

Area = 63 cm^2 → go to box 2

Area = 251 cm^2 → go to box 5

Hint: Read the length in the words. Is it the radius of the circle?



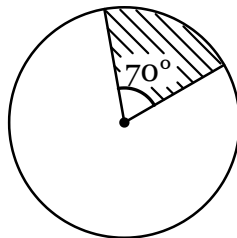
4 The radius is 7 cm.

Find the area of the striped sector.

Area = 17 cm^2 → go to box 6

Area = 60 cm^2 → go to box 1

Hint: An area multiplies a length by a length. Check the working for that.



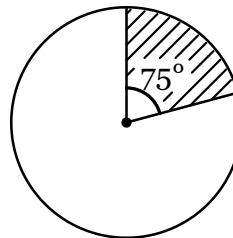
5 The diameter is 12 cm.

Find the area of the striped sector.

Area = 88 cm^2 → go to box 3

Area = 22 cm^2 → go to box 2

Hint: Read the words beside the box number. Which length do they give?



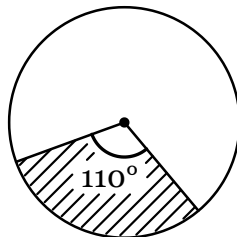
6 The radius is 7 cm.

Find the area of the striped sector.

Area = 9 cm^2 → go to box 2

Area = 32 cm^2 → go to box 7

Hint: Is the answer an area or a length? Which one does the box ask for?



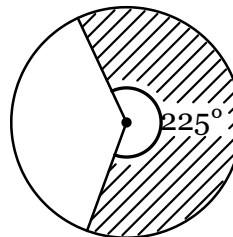
7 The diameter is 10 cm.

Find the area of the striped sector.

Area = 24 cm^2 → go to box 4

Area = 96 cm^2 → go to box 3

Hint: Find the radius first. What does a diameter go across?



8 The radius is 9 cm.

Find the area of the striped sector.

Area = 159 cm^2 → you are out

Area = 35 cm^2 → go to box 6

Hint: Which is the area of the whole circle: $\pi \times \text{radius} \times \text{radius}$, or the distance around?

Write every box number here, in order.

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Answer Maze — answers

For the teacher

The route, in order. Boxes 3 and 6 are not on it. A student reaches them only by a wrong answer. They are the last two rows of the table. Every area is found with the calculator's π and rounded only at the end, to the nearest whole square centimeter.

5 → 2 → 7 → 4 → 1 → 8 → out

	The box's question	Right answer, and why	Wrong answer, and why a student picks it
1	Box 5 The diameter is 12 cm. The striped sector's angle is marked 70° . Find the area of the striped sector, to the nearest whole cm^2 .	22 cm^2. The radius is half the diameter, 6 cm. The striped sector turns 70° , so it is $70/360 = 7/36$ of the circle. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$, so the sector is $7/36 \times 36\pi \approx 22 \text{ cm}^2$.	"88 cm^2 " goes to box 3. The diameter 12 is used as the radius: $7/36 \times \pi \times 12 \times 12 \approx 88$, four times the area.
2	Box 2 The radius is 9 cm. The striped sector's angle is marked 100° . Find the area of the striped sector, to the nearest whole cm^2 .	71 cm^2. The striped sector turns 100° , so it is $100/360 = 5/18$ of the circle. The whole circle's area is $\pi \times 9 \times 9 = 81\pi \text{ cm}^2$, so the sector is $5/18 \times 81\pi \approx 71 \text{ cm}^2$.	"16 cm^2 " goes to box 6. This is the length of the arc, not the area: $5/18 \times 2\pi \times 9 \approx 16 \text{ cm}$. The working never multiplies the radius by itself.
3	Box 7 The diameter is 10 cm. The striped sector's angle is marked 110° . Find the area of the striped sector, to the nearest whole cm^2 .	24 cm^2. The radius is half the diameter, 5 cm. The striped sector turns 110° , so it is $110/360 = 11/36$ of the circle. The whole circle's area is $\pi \times 5 \times 5 = 25\pi \text{ cm}^2$, so the sector is $11/36 \times 25\pi \approx 24 \text{ cm}^2$.	"96 cm^2 " goes to box 3. The diameter 10 is used as the radius: $11/36 \times \pi \times 10 \times 10 \approx 96$, four times the area.
4	Box 4 The radius is 7 cm. The striped sector's angle is marked 140° . Find the area of the striped sector, to the nearest whole cm^2 .	60 cm^2. The striped sector turns 140° , so it is $140/360 = 7/18$ of the circle. The whole circle's area is $\pi \times 7 \times 7 = 49\pi \text{ cm}^2$, so the sector is $7/18 \times 49\pi \approx 60 \text{ cm}^2$.	"17 cm^2 " goes to box 6. This is the length of the arc, not the area: $7/18 \times 2\pi \times 7 \approx 17 \text{ cm}$. The working never multiplies the radius by itself.
5	Box 1 The diameter is 14 cm. The striped sector's angle is marked 80° . Find the area of the striped sector, to the nearest whole cm^2 .	34 cm^2. The radius is half the diameter, 7 cm. The striped sector turns 80° , so it is $80/360 = 2/9$ of the circle. The whole circle's area is $\pi \times 7 \times 7 = 49\pi \text{ cm}^2$, so the sector is $2/9 \times 49\pi \approx 34 \text{ cm}^2$.	"137 cm^2 " goes to box 3. The diameter 14 is used as the radius: $2/9 \times \pi \times 14 \times 14 \approx 137$, four times the area.
6	Box 8 The radius is 9 cm. The striped sector's angle is marked 225° , the long way round. Find the area of the striped sector, to the nearest whole cm^2 .	159 cm^2. The striped sector turns 225° , the long way round, so it is $225/360 = 5/8$ of the circle. The whole circle's area is $\pi \times 9 \times 9 = 81\pi \text{ cm}^2$, so the sector is $5/8 \times 81\pi \approx 159 \text{ cm}^2$.	"35 cm^2 " goes to box 6. This is the length of the arc, not the area: $5/8 \times 2\pi \times 9 \approx 35 \text{ cm}$. The working never multiplies the radius by itself.
	Box 3 The diameter is 12 cm. The striped sector's angle is marked 200° , the long way round. Find the area of the striped sector, to the nearest whole cm^2 .	63 cm^2. The radius is half the diameter, 6 cm. The striped sector turns 200° , the long way round, so it is $200/360 = 5/9$ of the circle. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$, so the sector is $5/9 \times 36\pi \approx 63 \text{ cm}^2$.	"251 cm^2 " goes to box 5. The diameter 12 is used as the radius: $5/9 \times \pi \times 12 \times 12 \approx 251$, four times the area.
	Box 6 The radius is 7 cm. The striped sector's angle is marked 75° . Find the area of the striped sector, to the nearest whole cm^2 .	32 cm^2. The striped sector turns 75° , so it is $75/360 = 5/24$ of the circle. The whole circle's area is $\pi \times 7 \times 7 = 49\pi \text{ cm}^2$, so the sector is $5/24 \times 49\pi \approx 32 \text{ cm}^2$.	"9 cm^2 " goes to box 2. This is the length of the arc, not the area: $5/24 \times 2\pi \times 7 \approx 9 \text{ cm}$. The working never multiplies the radius by itself.

How to check any box. Find the radius: half the diameter, if the words give the diameter. The sector is its angle $\div 360^\circ$ of the circle. Multiply that fraction by the whole circle's area, $\pi \times \text{radius} \times \text{radius}$. The answer is in square centimeters.

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.