

SCAVENGER HUNT



AREA OF A SECTOR

Area of a Sector: What Fraction of the Circle?

Radius or diameter · which sector is striped · answers in terms of π · the cards check the answers

FREE

ANSWER

$$60\pi \text{ cm}^2$$

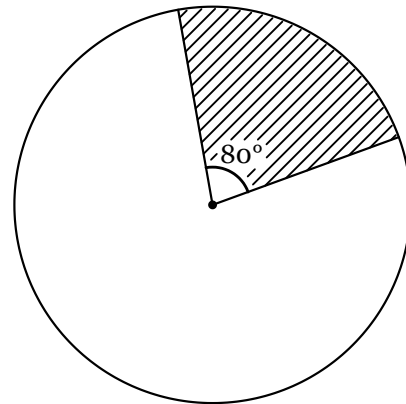
The diameter is 12 cm.

Find the area of the striped sector.

Leave π in your answer.

A diameter goes across the whole circle. Halve it to get the radius.

A



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Scavenger Hunt — how to run it

a full class period

1. **Tape the 16 cards around the room**, in any order. Each card has a large letter in its bottom left corner. Start each group at a *different* one of these eight cards: *A Q L B J M F R*.
2. **Say this once:** *“Find the radius first. Find the angle of the striped sector. The sector is that fraction of $\pi \times \text{radius} \times \text{radius}$. Leave π in the answer, like $6\pi \text{ cm}^2$. Then walk to the card with that answer at the top.”*
3. **Each group writes one line per card.** Eight right answers bring the group back to its first card.

16 cards	pages 3–10, one copy. There are two cards on each sheet. Cut the whole stack once.
Record sheet	page 11, one per student. It has a box that shows a 90° sector and the 270° sector that is the rest of the same circle.
Answers	pages 12–13, for you only. Do not put them up in the room.

Every card shows a circle with two radii, the sector between them filled with slanted lines, and an angle at the center with its degrees. The words give the radius or the diameter. The area of the sector is a fraction of the area of the whole circle: the sector’s angle $\div 360^\circ$, times $\pi \times \text{radius} \times \text{radius}$. No calculator is needed, because every answer is a whole number times π . 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.

Eight of the sixteen cards make the ring. A group reaches the other eight only by a wrong answer, but all the cards look the same. There are two mistakes. On four ring cards the words give the diameter, and a student who uses it as the radius gets four times the area. On the other four, the angle at the center belongs to the white sector, and a student who uses it without taking it from 360° finds the area of the wrong sector. Each of these lands on a card off the ring. That card sends the group to the card it got wrong.

The check is the length of the group’s list. A clean run is **eight lines**. Each wrong answer adds two. Every card has a line in italics under its question. It tells a group that arrived by a wrong answer what to check. A group that arrived by a right answer skips it. Guessing does not work: no single rule, such as always using the printed angle, gets more than eight of the cards. If a group keeps coming back to the same cards, ask: *“Is the length in the words the radius? Put a finger on the stripes. Which angle at the center belongs to them?”*



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

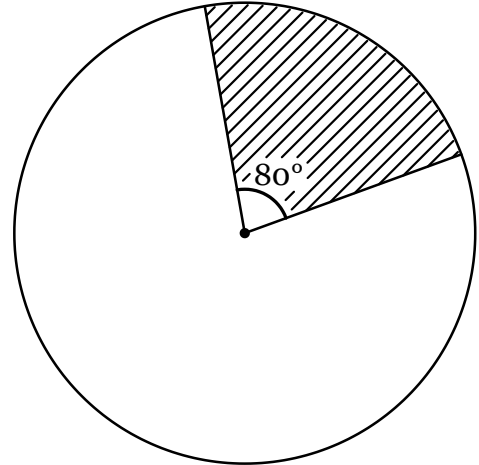
$$60\pi \text{ cm}^2$$

The diameter is 12 cm.

Find the area of the striped sector.

Leave π in your answer.

A diameter goes across the whole circle. Halve it to get the radius.



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A

ANSWER

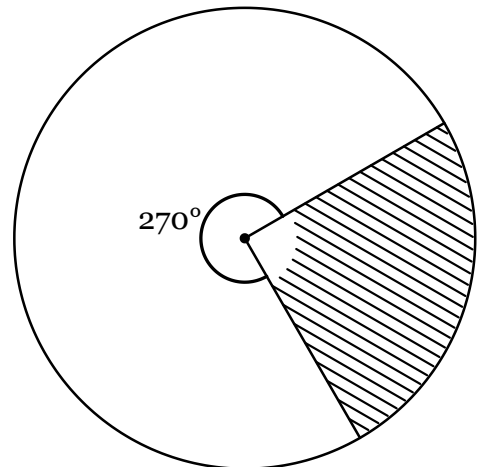
$$24\pi \text{ cm}^2$$

The radius is 14 cm.

Find the area of the striped sector.

Leave π in your answer.

The two sectors share one circle. Their angles add up to 360°.



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B

ANSWER

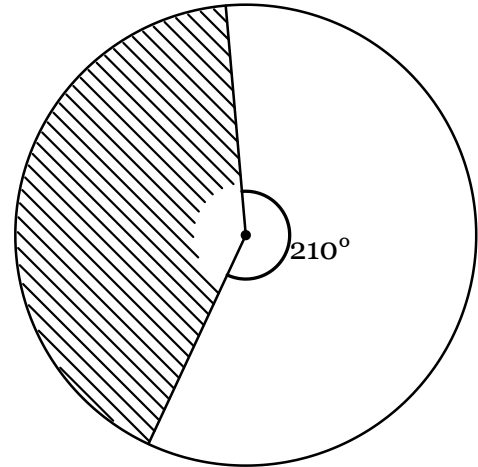
$$32\pi \text{ cm}^2$$

The radius is 12 cm.

Find the area of the striped sector.

Leave π in your answer.

Check the words. Is this length the radius? The radius is half the diameter.



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C

ANSWER

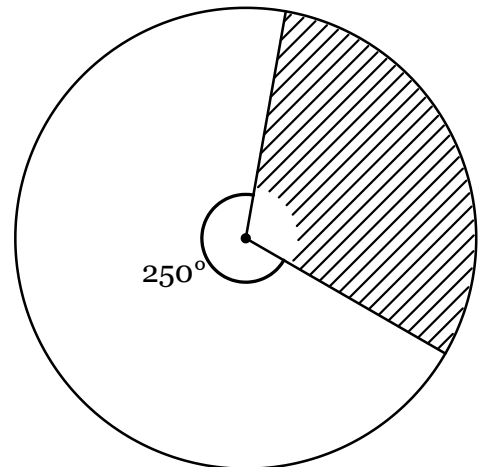
$$96\pi \text{ cm}^2$$

The radius is 6 cm.

Find the area of the striped sector.

Leave π in your answer.

Find the radius before anything else. Is the diameter in the words?



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D

ANSWER

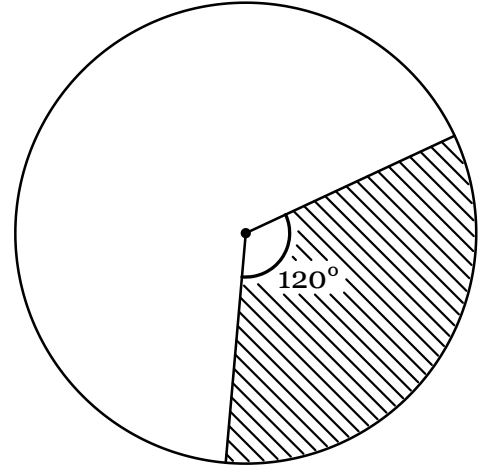
$$20\pi \text{ cm}^2$$

The diameter is 18 cm.

Find the area of the striped sector.

Leave π in your answer.

Trace the stripes with a pencil. Which angle belongs to that part?



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E

ANSWER

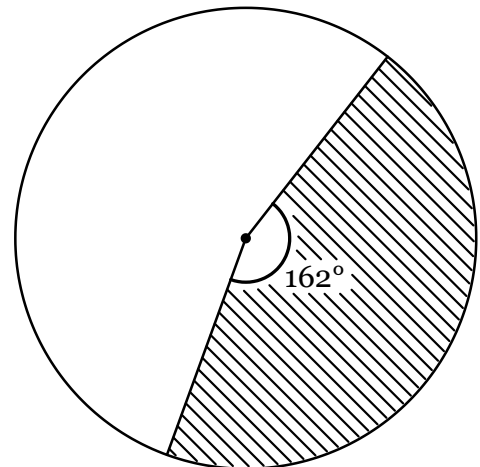
$$80\pi \text{ cm}^2$$

The diameter is 20 cm.

Find the area of the striped sector.

Leave π in your answer.

Estimate first. Half the circle is half of $\pi \times \text{radius} \times \text{radius}$.



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F

ANSWER

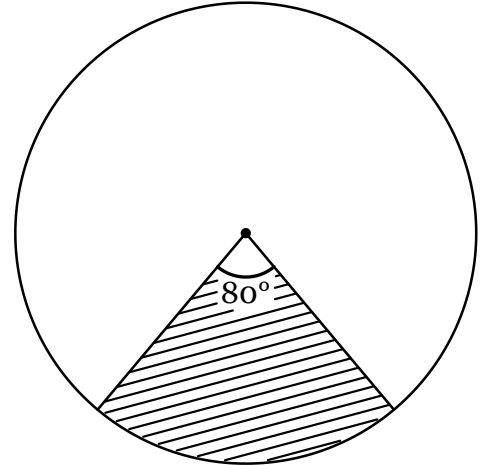
$$25\pi \text{ cm}^2$$

The diameter is 12 cm.

Find the area of the striped sector.

Leave π in your answer.

The angle mark can stand in the white part. Which part has the stripes?



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G

ANSWER

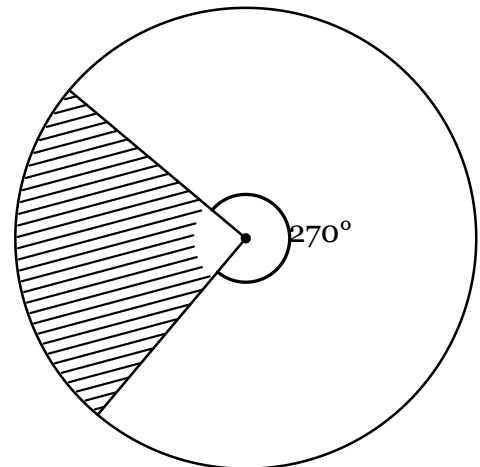
$$108\pi \text{ cm}^2$$

The radius is 14 cm.

Find the area of the striped sector.

Leave π in your answer.

A diameter is two radii. Which one goes into $\pi \times \text{radius} \times \text{radius}$?



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H

ANSWER

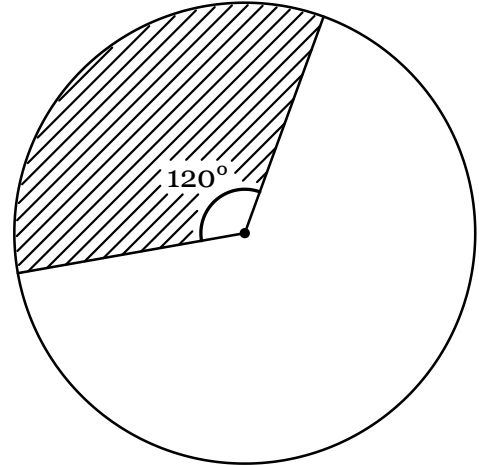
$$49\pi \text{ cm}^2$$

The diameter is 18 cm.

Find the area of the striped sector.

Leave π in your answer.

Square the radius, not the diameter. Then take the fraction of the circle.



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J

ANSWER

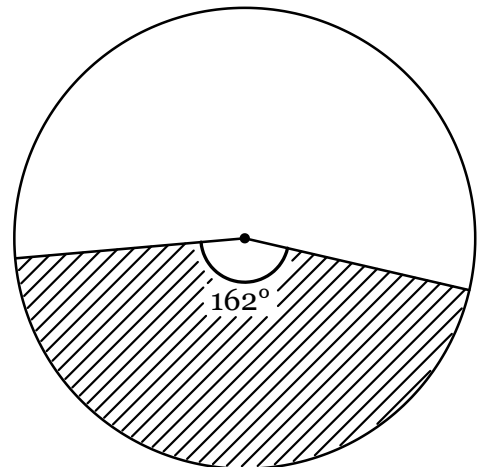
$$84\pi \text{ cm}^2$$

The diameter is 20 cm.

Find the area of the striped sector.

Leave π in your answer.

The angle of a sector is the angle on its own side of the center.



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K

ANSWER

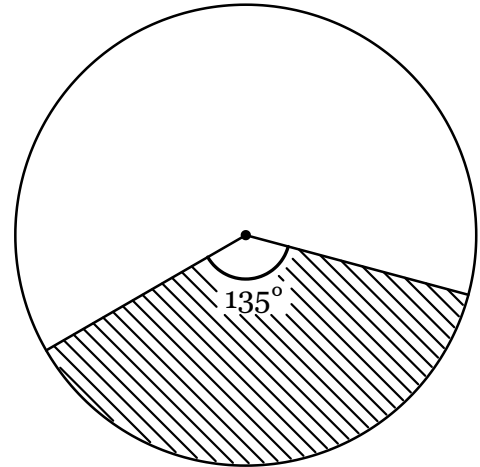
$$11\pi \text{ cm}^2$$

The diameter is 16 cm.

Find the area of the striped sector.

Leave π in your answer.

Is the length in the words the radius or the diameter? Read the words again.



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L

ANSWER

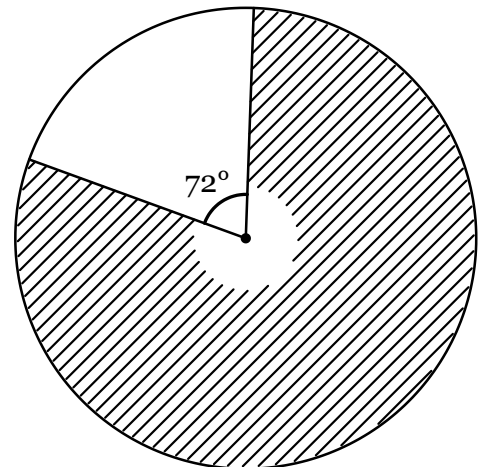
$$27\pi \text{ cm}^2$$

The radius is 10 cm.

Find the area of the striped sector.

Leave π in your answer.

Put a finger on the stripes. Is the angle mark on that side?



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M

ANSWER

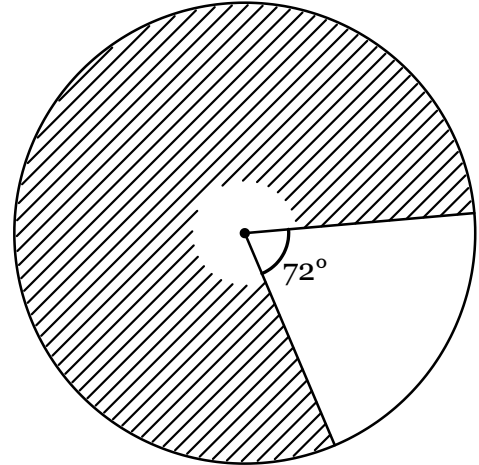
$$180\pi \text{ cm}^2$$

The radius is 10 cm.

Find the area of the striped sector.

Leave π in your answer.

Halve the diameter first. The radius is the length to square.



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N

ANSWER

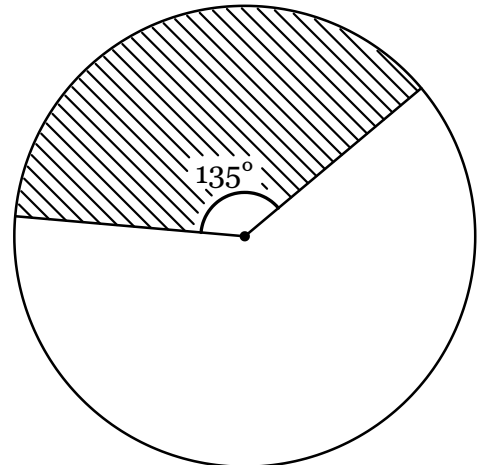
$$147\pi \text{ cm}^2$$

The diameter is 16 cm.

Find the area of the striped sector.

Leave π in your answer.

Two sectors make the whole circle. Which of them has the stripes here?



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P

ANSWER

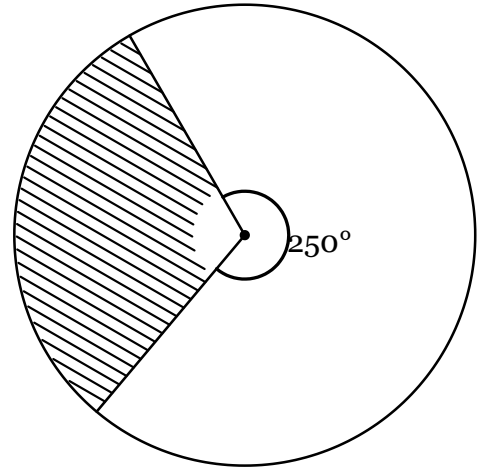
$$8\pi \text{ cm}^2$$

The radius is 6 cm.

Find the area of the striped sector.

Leave π in your answer.

Which part has the stripes? Find the angle at the center on that side.



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Q

ANSWER

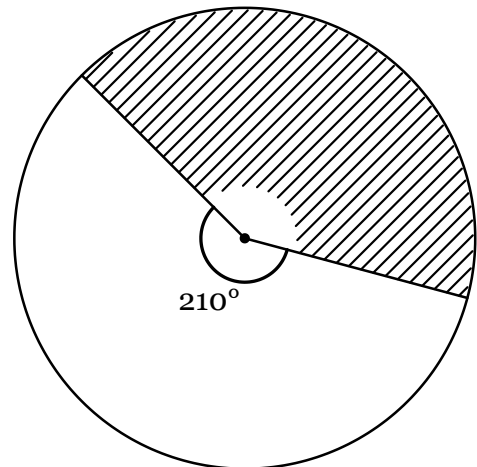
$$45\pi \text{ cm}^2$$

The radius is 12 cm.

Find the area of the striped sector.

Leave π in your answer.

A big sector has an angle over 180° . Check which angle goes in.



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R

Scavenger Hunt — where I went

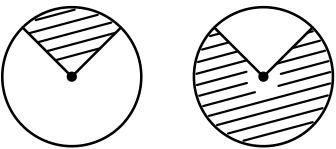
Area of a sector

Name _____

Period _____

Date _____

For each card, write the radius, then the fraction of the circle, then the area. **Leave π in your answer, like $6\pi \text{ cm}^2$. No calculator is needed.** Then find the card with your answer at the top. A clean run is eight lines. Each card has a line in italics under its question. **If you are on a card because you went wrong, its line says what to check. If you were right, skip it.**



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.

Card letter	The radius	The fraction: the sector's angle $\div$ 360	Area, in terms of π , in cm^2
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			

What is a sector's favorite food?

Every answer stands for a letter. Write the letter for each answer in the box above its number. Read the boxes you filled, left to right. **If they do not spell the answer, one of your answers is wrong.**

$8\pi = \text{P}$ $11\pi = \text{I}$ $20\pi = \text{A}$ $24\pi = \text{Z}$ $25\pi = \text{P}$ $27\pi = \text{Z}$ $32\pi = \text{E}$ $45\pi = \text{A}$ $49\pi = \text{P}$ $60\pi = \text{I}$ $80\pi = \text{E}$ $84\pi = \text{I}$ $96\pi = \text{Z}$
 $108\pi = \text{P}$ $147\pi = \text{Z}$ $180\pi = \text{I}$

8π	11π	20π	24π	25π	27π	32π	45π	49π	60π	80π	84π	96π	108π	147π	180π



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Scavenger Hunt — answers

For the teacher

The ring in order, with the answer found on each card. A group may begin anywhere on it. Wherever it begins, eight right answers bring it back to that card.

A ($8\pi \text{ cm}^2$) → Q ($11\pi \text{ cm}^2$) → L ($24\pi \text{ cm}^2$) → B ($49\pi \text{ cm}^2$) → J ($27\pi \text{ cm}^2$) → M ($80\pi \text{ cm}^2$) → F ($45\pi \text{ cm}^2$) → R ($60\pi \text{ cm}^2$) → A

What is a sector's favorite food? The answer is *PIZZA PIE!* It is read along the boxes of the record sheet, which run from the smallest number to the largest. Every answer is exact, in terms of π , in square centimeters.

Card	What the card shows	Answer, and why	The common wrong answer on this card, and why	Letter of its top
1 A	A circle, diameter 12 cm, 80° marked in the striped sector. The striped sector turns 80° . Find its area.	$8\pi \text{ cm}^2$. The diameter is 12 cm, so the radius is 6 cm. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$. The sector is $80/360 = 2/9$ of the circle, so its area is $2/9 \times 36\pi = 8\pi \text{ cm}^2$.	$32\pi \text{ cm}^2$. The diameter 12 is used as the radius: $2/9 \times \pi \times 12 \times 12 = 32\pi \text{ cm}^2$, four times the area.	I
2 Q	A circle, radius 6 cm, 250° marked in the white sector, the long way round. The striped sector turns 110° . Find its area.	$11\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 250^\circ = 110^\circ$. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$. The sector is $110/360 = 11/36$ of the circle, so its area is $11/36 \times 36\pi = 11\pi \text{ cm}^2$.	$25\pi \text{ cm}^2$. The 250° belongs to the white sector: $25/36 \times 36\pi = 25\pi \text{ cm}^2$.	P
3 L	A circle, diameter 16 cm, 135° marked in the striped sector. The striped sector turns 135° . Find its area.	$24\pi \text{ cm}^2$. The diameter is 16 cm, so the radius is 8 cm. The whole circle's area is $\pi \times 8 \times 8 = 64\pi \text{ cm}^2$. The sector is $135/360 = 3/8$ of the circle, so its area is $3/8 \times 64\pi = 24\pi \text{ cm}^2$.	$96\pi \text{ cm}^2$. The diameter 16 is used as the radius: $3/8 \times \pi \times 16 \times 16 = 96\pi \text{ cm}^2$, four times the area.	I
4 B	A circle, radius 14 cm, 270° marked in the white sector, the long way round. The striped sector turns 90° . Find its area.	$49\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 270^\circ = 90^\circ$. The whole circle's area is $\pi \times 14 \times 14 = 196\pi \text{ cm}^2$. The sector is $90/360 = 1/4$ of the circle, so its area is $1/4 \times 196\pi = 49\pi \text{ cm}^2$.	$147\pi \text{ cm}^2$. The 270° belongs to the white sector: $3/4 \times 196\pi = 147\pi \text{ cm}^2$.	Z
5 J	A circle, diameter 18 cm, 120° marked in the striped sector. The striped sector turns 120° . Find its area.	$27\pi \text{ cm}^2$. The diameter is 18 cm, so the radius is 9 cm. The whole circle's area is $\pi \times 9 \times 9 = 81\pi \text{ cm}^2$. The sector is $120/360 = 1/3$ of the circle, so its area is $1/3 \times 81\pi = 27\pi \text{ cm}^2$.	$108\pi \text{ cm}^2$. The diameter 18 is used as the radius: $1/3 \times \pi \times 18 \times 18 = 108\pi \text{ cm}^2$, four times the area.	P
6 M	A circle, radius 10 cm, 72° marked in the white sector. The striped sector turns 288° . Find its area.	$80\pi \text{ cm}^2$. The striped sector goes the long way round. Its angle is $360^\circ - 72^\circ = 288^\circ$. The whole circle's area is $\pi \times 10 \times 10 = 100\pi \text{ cm}^2$. The sector is $288/360 = 4/5$ of the circle, so its area is $4/5 \times 100\pi = 80\pi \text{ cm}^2$.	$20\pi \text{ cm}^2$. The 72° belongs to the white sector: $1/5 \times 100\pi = 20\pi \text{ cm}^2$.	Z
7 F	A circle, diameter 20 cm, 162° marked in the striped sector. The striped sector turns 162° . Find its area.	$45\pi \text{ cm}^2$. The diameter is 20 cm, so the radius is 10 cm. The whole circle's area is $\pi \times 10 \times 10 = 100\pi \text{ cm}^2$. The sector is $162/360 = 9/20$ of the circle, so its area is $9/20 \times 100\pi = 45\pi \text{ cm}^2$.	$180\pi \text{ cm}^2$. The diameter 20 is used as the radius: $9/20 \times \pi \times 20 \times 20 = 180\pi \text{ cm}^2$, four times the area.	E
8 R	A circle, radius 12 cm, 210° marked in the white sector, the long way round. The striped sector turns 150° . Find its area.	$60\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 210^\circ = 150^\circ$. The whole circle's area is $\pi \times 12 \times 12 = 144\pi \text{ cm}^2$. The sector is $150/360 = 5/12$ of the circle, so its area is $5/12 \times 144\pi = 60\pi \text{ cm}^2$.	$84\pi \text{ cm}^2$. The 210° belongs to the white sector: $7/12 \times 144\pi = 84\pi \text{ cm}^2$.	A

Scavenger Hunt — the cards off the ring

For the teacher

A group reaches these eight cards only by a wrong answer. The number at the top of each one is the wrong answer from one ring card. Its right answer is the number at the top of that ring card, so the group goes to the card it got wrong and tries it again. If the group makes the same mistake here, it goes to another card off the ring. So a second wrong answer never moves a group forward.

Card	What the card shows	Answer, and why	The common wrong answer on this card, and why	Letter of its top
C	A circle, radius 12 cm, 210° marked in the white sector, the long way round. The striped sector turns 150° . Find its area.	$60\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 210^\circ = 150^\circ$. The whole circle's area is $\pi \times 12 \times 12 = 144\pi \text{ cm}^2$. The sector is $150/360 = 5/12$ of the circle, so its area is $5/12 \times 144\pi = 60\pi \text{ cm}^2$.	$84\pi \text{ cm}^2$. The 210° belongs to the white sector: $7/12 \times 144\pi = 84\pi \text{ cm}^2$.	E
G	A circle, diameter 12 cm, 80° marked in the striped sector. The striped sector turns 80° . Find its area.	$8\pi \text{ cm}^2$. The diameter is 12 cm, so the radius is 6 cm. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$. The sector is $80/360 = 2/9$ of the circle, so its area is $2/9 \times 36\pi = 8\pi \text{ cm}^2$.	$32\pi \text{ cm}^2$. The diameter 12 is used as the radius: $2/9 \times \pi \times 12 \times 12 = 32\pi \text{ cm}^2$, four times the area.	P
D	A circle, radius 6 cm, 250° marked in the white sector, the long way round. The striped sector turns 110° . Find its area.	$11\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 250^\circ = 110^\circ$. The whole circle's area is $\pi \times 6 \times 6 = 36\pi \text{ cm}^2$. The sector is $110/360 = 11/36$ of the circle, so its area is $11/36 \times 36\pi = 11\pi \text{ cm}^2$.	$25\pi \text{ cm}^2$. The 250° belongs to the white sector: $25/36 \times 36\pi = 25\pi \text{ cm}^2$.	Z
P	A circle, diameter 16 cm, 135° marked in the striped sector. The striped sector turns 135° . Find its area.	$24\pi \text{ cm}^2$. The diameter is 16 cm, so the radius is 8 cm. The whole circle's area is $\pi \times 8 \times 8 = 64\pi \text{ cm}^2$. The sector is $135/360 = 3/8$ of the circle, so its area is $3/8 \times 64\pi = 24\pi \text{ cm}^2$.	$96\pi \text{ cm}^2$. The diameter 16 is used as the radius: $3/8 \times \pi \times 16 \times 16 = 96\pi \text{ cm}^2$, four times the area.	Z
H	A circle, radius 14 cm, 270° marked in the white sector, the long way round. The striped sector turns 90° . Find its area.	$49\pi \text{ cm}^2$. The striped sector is the small one. Its angle is $360^\circ - 270^\circ = 90^\circ$. The whole circle's area is $\pi \times 14 \times 14 = 196\pi \text{ cm}^2$. The sector is $90/360 = 1/4$ of the circle, so its area is $1/4 \times 196\pi = 49\pi \text{ cm}^2$.	$147\pi \text{ cm}^2$. The 270° belongs to the white sector: $3/4 \times 196\pi = 147\pi \text{ cm}^2$.	P
E	A circle, diameter 18 cm, 120° marked in the striped sector. The striped sector turns 120° . Find its area.	$27\pi \text{ cm}^2$. The diameter is 18 cm, so the radius is 9 cm. The whole circle's area is $\pi \times 9 \times 9 = 81\pi \text{ cm}^2$. The sector is $120/360 = 1/3$ of the circle, so its area is $1/3 \times 81\pi = 27\pi \text{ cm}^2$.	$108\pi \text{ cm}^2$. The diameter 18 is used as the radius: $1/3 \times \pi \times 18 \times 18 = 108\pi \text{ cm}^2$, four times the area.	A
N	A circle, radius 10 cm, 72° marked in the white sector. The striped sector turns 288° . Find its area.	$80\pi \text{ cm}^2$. The striped sector goes the long way round. Its angle is $360^\circ - 72^\circ = 288^\circ$. The whole circle's area is $\pi \times 10 \times 10 = 100\pi \text{ cm}^2$. The sector is $288/360 = 4/5$ of the circle, so its area is $4/5 \times 100\pi = 80\pi \text{ cm}^2$.	$20\pi \text{ cm}^2$. The 72° belongs to the white sector: $1/5 \times 100\pi = 20\pi \text{ cm}^2$.	I
K	A circle, diameter 20 cm, 162° marked in the striped sector. The striped sector turns 162° . Find its area.	$45\pi \text{ cm}^2$. The diameter is 20 cm, so the radius is 10 cm. The whole circle's area is $\pi \times 10 \times 10 = 100\pi \text{ cm}^2$. The sector is $162/360 = 9/20$ of the circle, so its area is $9/20 \times 100\pi = 45\pi \text{ cm}^2$.	$180\pi \text{ cm}^2$. The diameter 20 is used as the radius: $9/20 \times \pi \times 20 \times 20 = 180\pi \text{ cm}^2$, four times the area.	I

Other mistakes lead to no card. A group might find the arc length ($2\pi \times \text{radius}$ in place of $\pi \times \text{radius} \times \text{radius}$), divide the angle by 180 in place of 360, give the area of the whole circle, multiply by the angle without dividing by 360, or put the degrees into $1/2 \times \text{radius} \times \text{radius} \times \text{angle}$. Its answer is then not the number at the top of any card.