

Arcs and sectors: choose the whole, then the fraction

Lesson overview

Level	Year 11 Mathematics, Cambridge IGCSE 0580; 9 December 2026; 50 minutes; 18 pupils.
Goal	Review Core C5.3: calculate arc length and sector area using a sector angle that is a factor of 360° . Optional Extended E5.3: reason about a major sector.
Success looks like	Identify radius and angle; select circumference for length or circle area for area; multiply by angle $\div 360$; state the correct units and check the answer is smaller than the whole.
Resources	Board, pupil paper, calculators and this lesson sheet. Before teaching, confirm the actual period and any published assessment arrangements; the timetable gives proposed slots, not a confirmed 9 December booking.
Key words	Radius: centre to edge. Arc: curved part of the circumference. Sector: region enclosed by two radii and an arc. Perimeter: total boundary length.

Teaching sequence

0–5 min Retrieve	Write $C = 2\pi r$ and $A = \pi r^2$. For radius 6 cm, pupils find the full circumference and area: 12π cm and 36π cm ² . Check that they have not used the diameter as the radius.
5–12 min Diagnose	Give a 120° sector of the same circle. Ask pupils to write its fraction of a circle, choose the full-circle quantity needed for its arc, and name the answer unit. Expect $\frac{1}{3}$, circumference, cm. Check angle fraction, method and units separately.
12–20 min Model	For that 120° sector, model arc = $(120 \div 360) \times 12\pi = 4\pi$ cm; area = $(120 \div 360) \times 36\pi = 12\pi$ cm ² . Explain that the same fraction applies to a circle's boundary and area, but the wholes and units differ.
20–27 min Guide	Work Part A together. Pause after each line so every pupil writes the fraction, full-circle quantity and sector result. For perimeter, add both straight radii to the arc; do not use the full circumference.
27–43 min Practise	Pace Part B one question at a time. After each, show the key and have pupils correct one line. Circulate to check radius from diameter and cm versus cm ² . Pupils ready after Core work take 3–4 minutes for the quick comparison stretch; if time remains, offer optional Part C.
43–50 min Check	Allow five minutes for the fresh, individual exit check, then collect it and use two minutes to restate the method. Sort responses by angle fraction, formula choice or units to choose the next retrieval example.

Learner material

Part A • Guided example

A sector has radius 8 cm and angle 90° . Complete each step with the teacher.

- Fraction of a circle: $90 \div 360 = \underline{\hspace{2cm}}$.
- Full circumference: $2 \times \pi \times 8 = \underline{\hspace{2cm}}$ cm. Arc length: fraction $\times$ circumference = $\underline{\hspace{2cm}}$ cm.
- Full area: $\pi \times 8^2 = \underline{\hspace{2cm}}$ cm². Sector area: fraction $\times$ full area = $\underline{\hspace{2cm}}$ cm².
- Sector perimeter: arc + radius + radius = $\underline{\hspace{2cm}}$ cm.

Part B · Core practice

For each question: 1. Identify radius and angle. 2. Write angle $\div$ 360 and the appropriate full-circle calculation. 3. Multiply, then check units. Give exact answers in terms of π .

1. A sector has radius 9 cm and angle 120° . Find its arc length and area.

Fraction: _____ Full circle: _____ Results: _____

2. A sector has radius 10 cm and angle 90° . Find its area and perimeter.

Fraction: _____ Full circle: _____ Results: _____

3. A sector has diameter 12 cm and angle 60° . Find its arc length and area.

Radius: _____ Fraction: _____ Results: _____

Quick stretch · Compare two sectors

Two sectors have the same radius, 6 cm. One has angle 90° ; the other has angle 120° . Find the arc length and area of each in terms of π . Which sector has the longer arc, and which has the greater area? For each type of result, write the formula you chose and explain why. Check that your units are correct.

90° : arc _____ area _____ 120° : arc _____ area _____

Comparison, formula choices and unit check: _____

Part C · Optional Extended challenge

A minor sector has radius 12 cm and angle 135° . Find the area and perimeter of the *major* sector. Show the major angle. Check its area a second way by subtracting the minor sector area from the full circle area.

Major angle: _____ Major area: _____ Major perimeter: _____

Exit check · Work independently

A sector has radius 15 cm and angle 72° . Find its arc length and area in terms of π . Write one sentence explaining why one answer is in cm and the other is in cm^2 .

Fraction: _____ Arc: _____ Area: _____ Reason: _____

Teacher-only answer key

Part A	$\frac{1}{4}$; 16π cm; arc 4π cm; 64π cm^2 ; sector area 16π cm^2 ; perimeter $16 + 4\pi$ cm.
Part B	1. $\frac{1}{3}$; circumference 18π cm, area 81π cm^2 ; arc 6π cm, sector area 27π cm^2 . 2. $\frac{1}{4}$; circumference 20π cm, area 100π cm^2 ; sector area 25π cm^2 , perimeter $20 + 5\pi$ cm. 3. Radius 6 cm, fraction $\frac{1}{6}$; arc 2π cm, area 6π cm^2 .
Quick stretch	Arc formula = $(\text{angle} \div 360) \times 2\pi r$, a fraction of the circumference: 90° gives 3π cm; 120° gives 4π cm. Area formula = $(\text{angle} \div 360) \times \pi r^2$, a fraction of the circle's area: 90° gives 9π cm^2 ; 120° gives 12π cm^2 . The 120° sector has both the longer arc (by π cm) and the greater area (by 3π cm^2). Arc is a length in cm; area covers a region in cm^2 .
Part C	Major angle 225° . Major area = $(225 \div 360) \times 144\pi = 90\pi$ cm^2 . Check: $144\pi - (135 \div 360) \times 144\pi = 144\pi - 54\pi = 90\pi$ cm^2 . Major arc = 15π cm; perimeter = $24 + 15\pi$ cm.
Exit check	$72 \div 360 = \frac{1}{5}$; arc = $\frac{1}{5} \times 30\pi = 6\pi$ cm; area = $\frac{1}{5} \times 225\pi = 45\pi$ cm^2 . The arc measures length; the sector covers area.

Student Adaptations

Support	Keep Part A visible during Part B for pupils who need the sequence. Point to the specific line where radius, fraction or unit first goes wrong; ask for a corrected line before the next question.
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Stretch

Offer the quick comparison stretch after accurate Core work; listen for why circumference gives arc length and circle area gives sector area, with cm versus cm^2 . If time remains, offer Part C and look for both a direct calculation and a subtraction check.