Name	Date started	Target end date

GCE AS / A LEVEL — PURE MATHEMATICS A QUESTION PACK

0974-01 (Legacy C2) · New spec Unit 1 Topic 10 · AS unit, 25% of A-level, 120 marks, 2h 30min paper

REVISE
.wales

MATHEMATICS — PURE A · RADIANS, ARC & SECTOR

Radians, Arc Length & Sector Area

Radian measure, arc length, sector area and segment area questions from the legacy WJEC C2 papers (June 2011 – June 2017)

LEGACY 2008 SPECIFICATION

Estimated time for entire question pack: ~32 minutes

*Derived from the legacy C1/C2 paper's pace of **~1.25 min/mark** (26 marks over 5 questions).*

*You are advised to **not** attempt to complete all of this in one sitting.*

ABOUT THIS QUESTION PACK

This is a **single-topic practice question pack**, drilling one narrow new-spec sub-topic. It contains questions from the legacy WJEC C1 and C2 papers (2008 modular spec) that map onto new-spec AS Unit 1 Topic 10 (2.1.5).

Questions are ordered chronologically.

INSTRUCTIONS

Use black ink or black ball-point pen. Show all working — method marks are awarded for clear setup.

A calculator is allowed (except where specified by individual questions). The WJEC Formula Booklet may be referred to.

For Examiner's use only

Q	Source	Max	Mark
1	Jan 12 Q9	6	
2	Jun 12 Q9	5	
3	Jun 13 Q9	5	

Q	Source	Max	Mark
4	Jun 15 Q9	5	
5	Jun 16 Q9	5	
Total		**26**	

Radians, Arc Length & Sector Area — what the new spec asks

WJEC GCE AS / A Level Mathematics (from 2017) · Unit 1: Pure Mathematics A · Topic 2.1.5.

Radian measure 2.1.5

- $180^\circ = \pi$ radians.
- Convert degrees to radians: multiply by $\pi/180$.
- Convert radians to degrees: multiply by $180/\pi$.

Arc length 2.1.5

- $s = r\theta$ when θ is in radians.
- Total perimeter of a sector: $s + 2r = r\theta + 2r$.
- Use to find unknown r, θ or s if two of the three are known.

Sector area 2.1.5

- Sector area: $A = \frac{1}{2}r^2\theta$ (in radians).
- Equivalent to $\frac{\theta}{2\pi} \times \pi r^2$ — fraction of the full disc.
- Often combined with another sector or area in compound figures.

Segment area 2.1.5

- Segment = sector area minus the chord-triangle area.
- Chord-triangle area: $\frac{1}{2}r^2 \sin\theta$.
- Segment area: $\frac{1}{2}r^2(\theta - \sin\theta)$.

Crib sheet »

Radians, Arc & Sector in one page

Quick-reference notes — revisit before each section. Don't use during questions.

Degree-radian conversion

$180^\circ = \pi$ rad.

Degrees to radians: $\theta_{\text{rad}} = \theta^\circ \cdot \pi/180$.

Radians to degrees: $\theta^\circ = \theta_{\text{rad}} \cdot 180/\pi$.

Arc length

Arc length: $s = r\theta$ (θ in radians).

Full circumference: $s = 2\pi r$ corresponds to $\theta = 2\pi$.

Sector area

Sector area: $A = \frac{1}{2}r^2\theta$ (θ in radians).

Fraction of full disc area: $\theta/(2\pi)$.

Full disc: $A = \pi r^2$ when $\theta = 2\pi$.

Perimeter of a sector

Perimeter: $P = s + 2r = r\theta + 2r = r(\theta + 2)$.

Don't forget the two radii on either side of the arc.

Segment area

Segment = sector minus triangle.

$A_{\text{seg}} = \frac{1}{2}r^2\theta - \frac{1}{2}r^2\sin\theta$.

Equivalent: $\frac{1}{2}r^2(\theta - \sin\theta)$.

Chord length

Cosine rule in triangle (centre + two endpoints of chord):

$c^2 = 2r^2 - 2r^2\cos\theta = 2r^2(1 - \cos\theta)$.

Hence $c = 2r\sin(\theta/2)$.

Compound sectors

Add or subtract sector areas; check whether the angles share a vertex.

Look for matching radii or angles to simplify.

Mixed degree / radian problems

If a calculator returns an unexpected answer, check the angle mode.

$s = r\theta$ and $A = \frac{1}{2}r^2\theta$ require radians.

Strategy

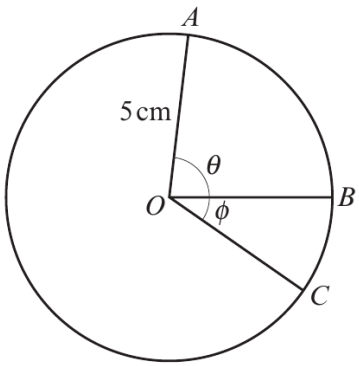
1. Convert everything to radians.
2. Identify r, θ, s, or A.
3. Pick the right formula.
4. For segments: sector − triangle.

SECTION T10

Radians, Arc Length & Sector Area

Questions 1–5 · 26 marks

9.

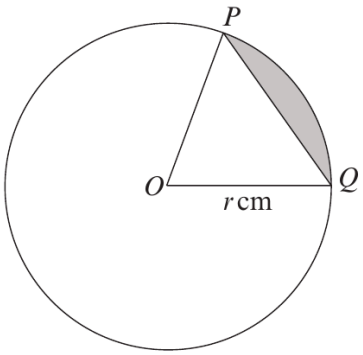


The diagram shows a circle with centre O and radius 5 cm. The points A, B and C lie on the circle and the angles θ and ϕ are measured in radians. The sum of the areas of the sectors AOB and BOC is $22{\cdot}5\,\text{cm}^2$.

(a) Show that $\theta + \phi = 1{\cdot}8$. [2]

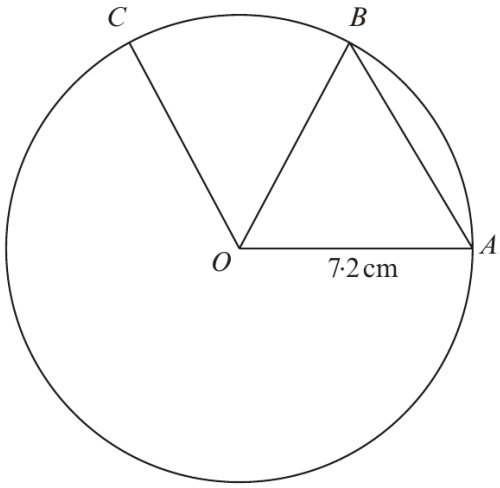
(b) Given that the arc AB is $3{\cdot}5$ cm longer than the arc BC, find the values of θ and ϕ. [4]

9.



The diagram shows a circle with centre O and radius r cm. The points P and Q are on the circle and $P\hat{O}Q = 1{\cdot}12$ radians. Given that the area of the shaded region is $10{\cdot}35\,\text{cm}^2$, find the value of r. Give your answer correct to one decimal place. [5]

9.

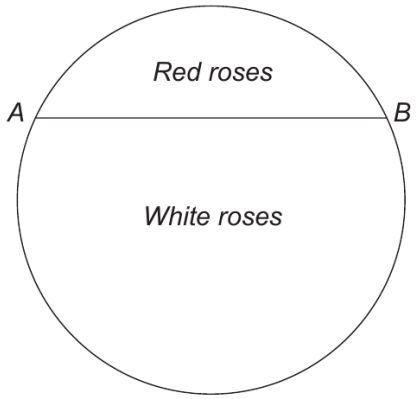


The diagram shows three points A, B and C on a circle with centre O and radius 7·2 cm.

(a) Given that $A\hat{O}B = 1{\cdot}1$ radians, find the area of **triangle** AOB. Give your answer correct to one decimal place. [2]

(b) The area of **sector** BOC is 19·44 cm^2. Find the length of the **arc** BC. [3]

9. Gwyn wants to turn part of his garden into a circular flower bed. In order to do this, he digs out a shallow circular hole of radius r m and then divides it into two segments by means of a thin plank AB, as shown in the diagram. He plants red roses in the minor segment and white roses in the major segment.

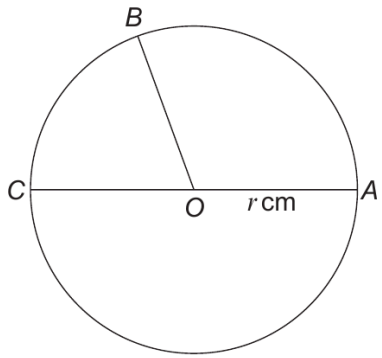


Let the centre of the flower bed be denoted by O. Show that when $A\hat{O}B$ equals 2·6 radians, the area of the flower bed containing white roses is approximately twice the area containing red roses.

[5]

END OF PAPER

9.



The diagram shows a sketch of a circle with centre O and radius r cm. Three points A, B and C lie on the circle. The line AC is a diameter of the circle and $A\hat{O}B = 2{\cdot}15$ radians.

Given that the area of sector BOC is $26\,\text{cm}^2$ less than the area of sector AOB, find the value of r. Give your answer correct to one decimal place. [5]

END OF PAPER

END OF RADIANS, ARC & SECTOR PACK

Source: WJEC C1 + C2 (2008 modular spec) · 2011–2017
Curated for WJEC Maths 2017 spec AS Unit 1 — Topic 10 (2.1.5)