Name:	School:	Target Grade:

PARADIGM

SECONDARY 4 E Math WA1

MOCK EXAM PAPER (Arc and Circle)

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a nice comfortable spot without distraction.

2. Be fully focused for the whole duration of the test.

3. Speed is KING. Finish the paper as soon as possible then return-back to Check Your Answers.

4. As you are checking your answers, always find ways to VALIDATE your answer.

5. Avoid looking through line by line as usually you will not be able to see your Blind Spot.

6. If there is no alternative method, cover your answer and REDO the question.

7. Give non-exact answers to 3 significant figures, or 1 decimal place for angles in degree, or 2 decimal place for $$$, unless a different level of accuracy is specified in the question.

Wish you guys all the best in this test.

You can do it.

I believe in you.

Team Paradigm

If you are struggling in this paper, it's an indication to work harder!
If you need support and personalised guidance, you can find us here
www.mathtutor.com.sg

Name: ______________________________ Class: ______ Date: _________

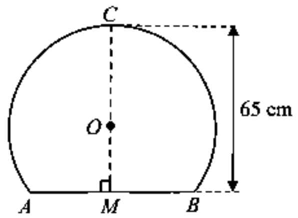
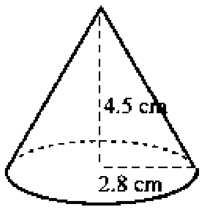
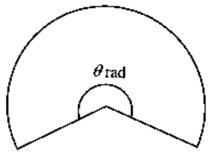
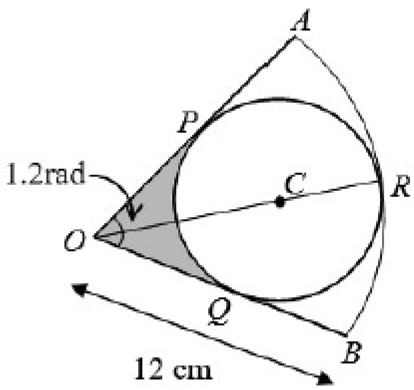
Secondary 4 E Mathematics
WA1 Mock Paper

Topic: Arc Sector Segment and Circles

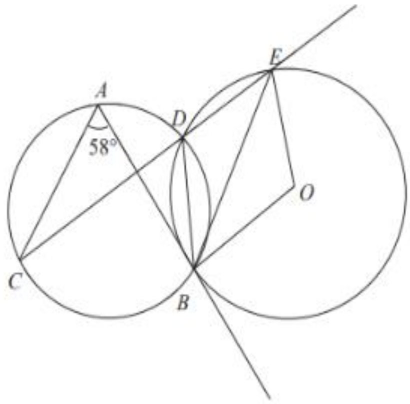
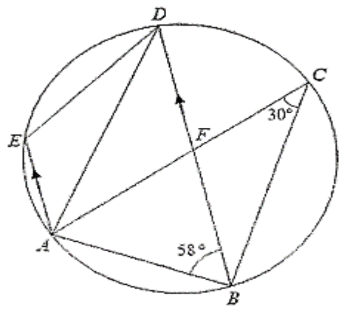
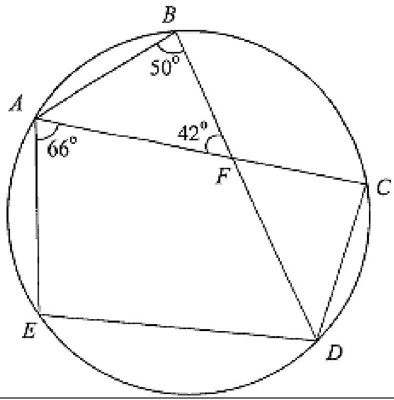
Duration: 45 minutes

30

Arc Sector Segment

1	$AMBC$ is a major segment of a circle, centre O and diameter 90 cm. $CM = 65$ cm. Angle $AMC = 90°$. Find the area of the segment.  	[5]
2	The diagram shows a paper cup in s shape of a cone with radius 2.8 cm and vertical height 4.5cm.  (a) Show that the curved surface area is $14.84\,\pi\ cm^2$. (b)The paper cup is cut open to form a sector of a circle with angle θ radians. Find angle θ  	[2] [2]
3	In the diagram, $OARB$ is a sector of a circle with centre O, radius 12 cm and angle $AOB = 1.2$ radians. C is the centre of the circle enclosed inside the sector, OCR is a straight line and the circle touches the sector at P, Q and R.  (i)Show that the radius of the enclosed circle is 4.3305 cm, correct to 4 decimal places. (ii)Calculate the perimeter of the shaded region POQ.	

Circles

1	(a) In the diagram, *AB* is a tangent to the circle with centre *O*, $\angle CAB = 58^{\circ}$ and *CDE* is a straight line. Find, $\angle$ stating your reasons, clearly. (i) $\angle BDE$, (ii) Obtuse $\angle BOE$, (iii) $\angle EBO$, (iv) $\angle ABE$.  	[2] [2] [1] [2]
2	In the diagram, *A*, *B*, *C*, *D* and *E* are points on a circle. *AC* is the diameter of the circle and *AE* is parallel to *BD*. *F* is the point of intersection of *AC* and *BD*. Given that angle $ABD = 58°$ and angle $ACB = 30°$, Find (a) angle *DBC*, (b) angle *AED*, (c) angle *ADE*.  	[1] [1] [1]
3	In the diagram, A, B, C, D and E are points on the circumference of a circle. Angle $ABD = 50°$, angle $EAC = 66°$ and angle $AFB = 42°$. Find, giving reasons for each answer, (a) angle FDC, (b) angle AED, (c) angle EDF.  	[2] [2] [2]

Answer Key

Arc Sector Segment

1	Given that midpoint of *AB* is *M*. $AO = BO =$ radius $= \frac{90}{2} = 45$ cm, $OM = 65 - 45 = 20$ cm $\cos\frac{1}{2}\angle AOB = \frac{20}{45}$ $\angle AOB = 2\cos^{-1}\frac{20}{45}$ $\angle AOB = 127.2244001° = 127.2°$(1d.p.) Area of triangle AOB $= \frac{1}{2}(45^2)(\sin 127.2244001°)$ $= 806.2257746$ cm^2 Area of sector *ACB* $= \left(\frac{360°-127.2244001°}{360°}\right)(\pi)(45^2)$ $= 4113.48435$ cm^2 Area of major segment *AMBC* = Area of triangle *AOB* + Area of sector *ACB* $= 806.2257746 + 4113.48435 = 4919.710125$ $= 4920$ cm^2 (3 s.f.) Ans: 4920 cm^2(3s.f)	
2	(a) To find slant height (using Pythagoras' Theorem) $l^2 = 2.8^2 + 4.5^2$ $l = 5.3$ Curved surface area= $\pi r l$ $= \pi \times 2.8 \times 5.3$ $= 14.84\pi$ cm^2 (Shown) (b) Area Sector = Area Curved Surface Cone $\frac{1}{2}r^2\theta = 14.84\pi$ $\frac{1}{2}(5.3)^2\theta = 14.84\pi$ $\theta = \frac{14.84\pi}{\frac{1}{2}(5.3)^2}$ $\theta = 3.32$ rad Ans: (b) $\theta = 3.32\ rad$	
3	Ans:	

(i) Let r be the radius of the enclosed circle.
In ΔCOP,

$$\sin 0.6 = \frac{CP}{OC}$$
$$= \frac{r}{12-r}$$
$$\sin 0.6(12-r) = r$$
$$r\sin 0.6 + r = 12\sin 0.6$$
$$r = \frac{12\sin 0.6}{\sin 0.6 + 1}$$

$\therefore\ r =\ 4.3305$ cm (4 dp) (shown)

(ii) $\angle PCQ = 2\pi - \frac{\pi}{2} - \frac{\pi}{2} - 1.2 = \pi - 1.2 = 1.9415$ rad

In ΔCOP, $\tan 0.6 = \frac{4.3305}{OP}$
$OP = 6.3298$ cm $= OQ$

Perimeter of shaded region $= 2\,(6.3298) + (4.3305)(1.9415)$
$= 21.0672$
≈ 21.1 cm (3sf)

Circles

1	(a)(i) $\angle CDB = \angle CAB = 58°$ ($\angle s$ in the same segment) $\angle BDE = 180° - 58° = 122°$ (ii) Reflex $\angle BOE = 122° \times 2 = 244°$ ($\angle s$ at centre = 2$\angle$ at circumference) Obtuse $\angle BOE = 360° - 244° = 116°$ (iii) $\angle EBO = \frac{180°-116°}{32°} = 32°$ (iv) $\angle ABO = 90°$ (radius $\perp$ tangent) $\angle ABE = 90° - 32° = 58°$ Ans: (a)(i) $122°$, (a)(ii) 116,(a)(iii) $32°$, (a)(iv) $58°$	
2	(a) $\angle DBC = 90° - 58° = 32°$($\angle s$ in a semicircle) (b) $\angle AED = 180° - 58° = 122°$($\angle s$ in opp. segment) (c) $\angle ADF = 130°$($\angle s$ in the same segment) $\angle ADF = 180° - 30° - 122° = 28°(int\ \angle s, AE//DF)$ Ans: (a) $\angle DBC = 32°$ (b) $\angle AED = 122°$ (c) $\angle ADF = 28°$	
3	(a) $\angle FAB = 180° - 50° - 42° = 88°$ (Angle sum of triangle) $\angle FDC = 88°$ (Angles in the same segment) (b) $\angle AED = 180° - 50° = 130°$ (Opp. Angles of cyclic quad.) $\angle CDE = 180° - 66° = 114°$ (Opp. Angles of cyclic quad.) **OR** $\angle AED = 360° - 114° - 66° - 50° = 130°$ ($\angle$ sum of quad.) (c) $\angle EDC = 180° - 66° = 114°$ (Opp. Angles of cyclic quad.) $\angle EDF = 114° - 88° = 26°$ **OR** $\angle EDC = 180° - \angle EAB$ (Opp. Angles of cyclic quad) $= 180° - 66° - 88° = 26°$ Ans: (a) $\angle FDC = 88°$ (b) $\angle AED = 130°$ (c) $\angle EDF = 26°$	