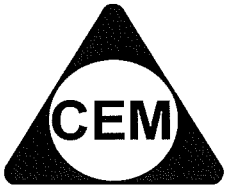


NAME:



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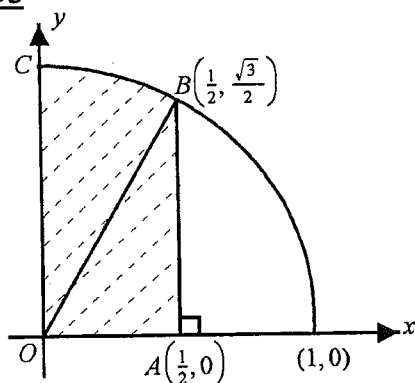
**YEAR 12 – ADVANCED MATHS**

**REVIEW TOPIC (SP1)**

**CIRCULAR FUNCTIONS**

**PAST HSC EXAMINATION QUESTIONS:****HSC '93**

(7) (a)



The diagram shows the first quadrant of the circle  $x^2 + y^2 = 1$ . The point  $A$  has coordinates  $\left(\frac{1}{2}, 0\right)$  and  $AB$  is perpendicular to the  $x$ -axis.

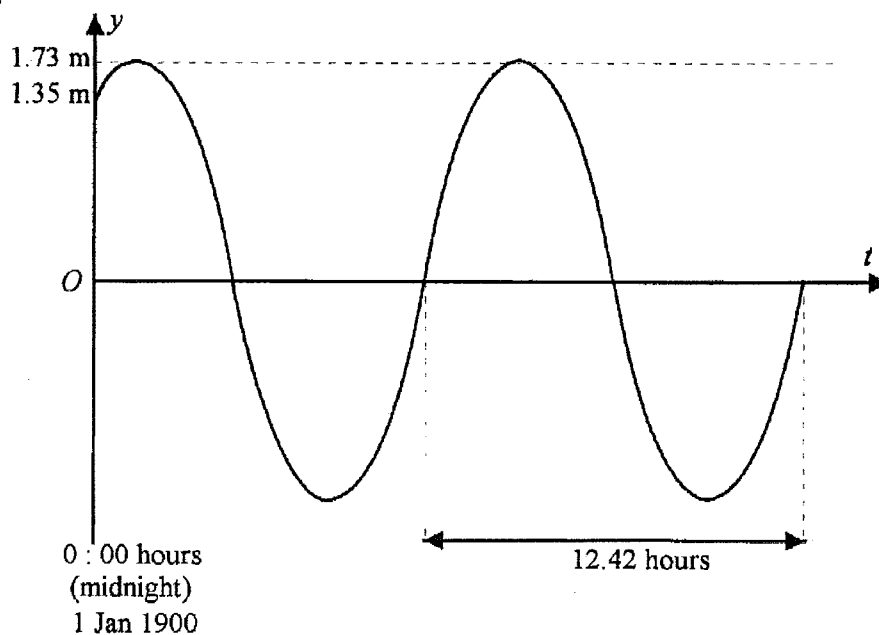
- (i) What is the exact value of  $\angle COB$ ?

$\frac{\pi}{6}$
-----------------

- (ii) Show that the exact value of the shaded area  $OABC$  is  $\frac{2\pi + 3\sqrt{3}}{24}$ .

**HSC '93**

(9) (b)



□

The diagram shows the tidal effect due to the Moon at Port Hedland on 1 January 1900. The water level can be approximated by a sine curve of the form  $y = A \sin(at + b)$  where  $y$  is the water level in metres measured as on the diagram and  $t$  is the time in hours after 0 : 00 hours.

- (i) Find the amplitude  $A$ .

1.73 m

- (ii) Estimate  $b$  by letting  $t = 0$ .

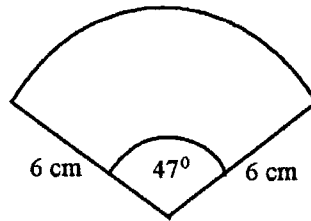
0.9 rad

- (iii) Estimate  $a$ .

0.5

**HSC 92**

(5) (a)



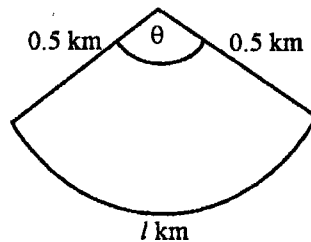
The diagram shows a sector of a circle. Find the area of this sector.  
Give your answer to the nearest square centimetre.

$$15 \text{ cm}^2$$

**HSC 91**

(5) (c)

Figure not to scale



A car travels at 45 km/hr on a circular curve whose radius is 0.5 km.

(i) Find the distance,  $l$  km, that the car travels in one minute.

$$0.75 \text{ km}$$

(ii) Calculate the size of the angle  $\theta$  through which the car turns in one minute. Give your answer to the nearest degree.

$$\theta = 86^\circ$$

**HSC '90**

(9) (a) Consider the function given by  $y = \sin^2 x$ .

- (i) Copy and complete the following table in your examination booklet.  
(Note that  $x$  is measure in radians.)

$x$	0	$\frac{\pi}{4}$	$\frac{\pi}{2}$	$\frac{3\pi}{4}$	$\pi$
$y$	0				

$\frac{1}{2}, 1, \frac{1}{2}, 0$

- (ii) Apply Simpson's rule with five function values to find an

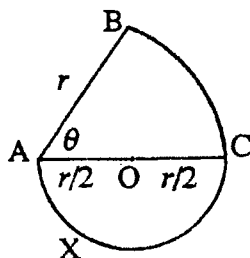
approximation to  $\int_0^{\pi} \sin^2 x \, dx$

$\frac{\pi}{2}$

HSC 89

(10)

- (b) A cam is formed with cross-section as shown in the figure.

Figure not  
to scale

The cross-section consists of a semi-circle AXC centre O and radius  $r/2$  and a sector ABC of radius  $r$ , centre A and angle  $\theta$ .

- (i) What is the perimeter ABCX of the cam in terms of
- $r$
- and
- $\theta$
- ?

$$r + r\theta + \frac{\pi r}{2}$$

- (ii) If the area of the cross-section of the cam is 1 square unit, show that the perimeter
- $P$
- is given by

$$P = \frac{2}{r} + r \left(1 + \frac{\pi}{4}\right).$$

- (iii) Show that the least perimeter occurs when  $r^2 = \frac{8}{\pi + 4}$  and calculate the value of  $\theta$  to the nearest degree.

$$\theta = 57^\circ$$

HSC'87

(7) (i) (a) Sketch the graph of  $y = \cos 2\theta$ , for  $0^\circ \leq \theta \leq 180^\circ$ .

(b) Find all the values of  $\theta$ , for  $0^\circ \leq \theta \leq 180^\circ$  such that  $\cos 2\theta = \frac{1}{2}$ .

30°, 150°