Lesson 5

A-Level Pure Mathematics : Year 2

Applications of Trigonometry

5.1 Revision

Any solution based entirely on graphical
or numerical methods is not acceptable

Marks Available : 40

Question 1

Convert the following angles, written in radians, into their degrees equivalent,

(i) $\dfrac{\pi}{2}$ **(ii)** $\dfrac{5\pi}{6}$ **(iii)** $\dfrac{13\pi}{12}$

[3 marks]

Question 2

Convert the following angles, written in degrees, into their radian equivalent.
Give exact answers in terms of π.

(i) $45°$ **(ii)** $15°$ **(iii)** $330°$

[3 marks]

Question 3

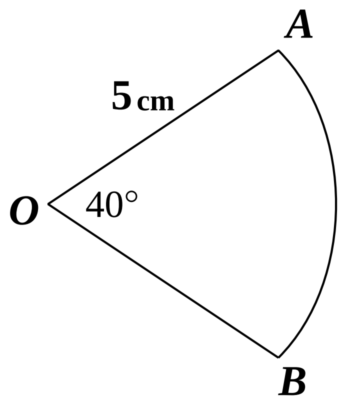
Solve the following equation over the interval $0 \leqslant x \leqslant 2\pi$
Give exact answers in terms of π

$$2\cos\left(2x + \frac{\pi}{8}\right) = \sqrt{2}$$

[6 marks]

Question 4

A-Level Examination question from June 2019, Paper 2, Q3



The diagram shows a sector *AOB* of a circle with centre *O*, radius 5 cm and angle *AOB* = 40°.

The attempt of a student to find the area of the sector is shown below,

$$\begin{aligned} \textit{Area of sector} &= \frac{1}{2} r^2 \theta \\ &= \frac{1}{2} \times 5^2 \times 40 \\ &= 500 \text{ cm}^2 \end{aligned}$$

(a) Explain the error made by this student.

[1 mark]

(b) Write out a correct solution.

[2 marks]

Question 5

(i) When θ is small and measured in radians, use the small angle approximations to show that,

$$\frac{1 - \cos 3\theta}{\theta \tan 2\theta} \approx \frac{9}{4}$$

[4 marks]

(ii) When $\theta = 0.1^c$ (about 6°) what is the percentage error introduced by using the small angle approximations ?

[3 marks]

Question 6

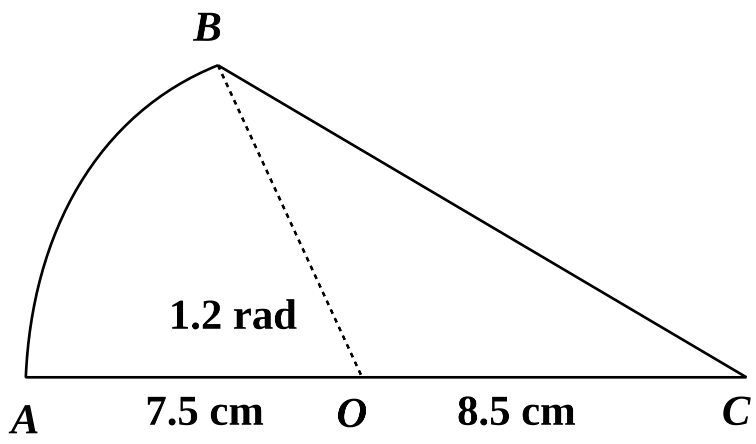
A-Level Examination question from June 2018, Paper 2, Q7 (i)

Solve the equation,

$$4\,sin\,x \;=\; sec\,x \qquad\qquad \text{for} \qquad 0 \leqslant x < \frac{\pi}{2}$$

[4 marks]

Question 7
A-Level Official Mock Examination Question from 2019, Paper 1, Q2



The shape $AOCBA$, shown, consists of a sector AOB of a circle centre O joined to a triangle BOC.

The points A, O and C lie on a straight line with $AO = 7.5$ cm and $OC = 8.5$ cm.

The size of angle AOB is 1.2 radians.

Find, in cm, the perimeter of $AOCBA$, giving your answer to one decimal place.

[5 marks]

Question 8

A-Level Examination question from June 2010, C3, Q3

(a) Express $5 \cos x - 3 \sin x$ in the form $R \cos (x + \alpha)$ where $R > 0$ and $0 < \alpha < \frac{1}{2} \pi$

[4 marks]

(b) Hence, or otherwise, solve the equation

$$5\,cos\,x \;-\; 3\,sin\,x \;=\; 4$$

for $0 \leqslant x < 2\pi$, giving your answers to 2 decimal places.

[5 marks]