

Lesson 6

A-Level Pure Mathematics : Year 2 Applications of Trigonometry

6.1 Test

*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) $\frac{\pi}{3}$

(ii) $\frac{7\pi}{15}$

(iii) $\frac{17\pi}{12}$

[3 marks]

Question 2

Convert the following angles, written in degrees, into their radian equivalent.

Give exact answers in terms of π .

(i) 30°

(ii) 300°

(iii) 75°

[3 marks]

Question 3

Solve the following equation over the interval $0 \leq x \leq 2\pi$

Give exact answers in terms of π

$$2 \sin \left(2x - \frac{\pi}{6} \right) = \sqrt{3}$$

[5 marks]

Question 4

A-Level Specimen Examination Question 2019, Paper 2, Q2

- (a) Given that θ is small, use the small angle approximation for $\cos \theta$ to show that,

$$1 + 4 \cos \theta + 3 \cos^2 \theta \approx 8 - 5 \theta^2$$

[3 marks]

Adele uses $\theta = 5^\circ$ to test the approximation in part (a)

Adele's working is shown below,

Using my calculator

$$1 + 4 \cos (5^\circ) + 3 \cos^2 (5^\circ) = 7.962 \quad (3 \text{ decimal places})$$

Using the approximation $8 - 5 \theta^2$ gives $8 - 5 (5)^2 = -117$

Therefore, $1 + 4 \cos \theta + 3 \cos^2 \theta \approx 8 - 5 \theta^2$ is not true for $\theta = 5^\circ$

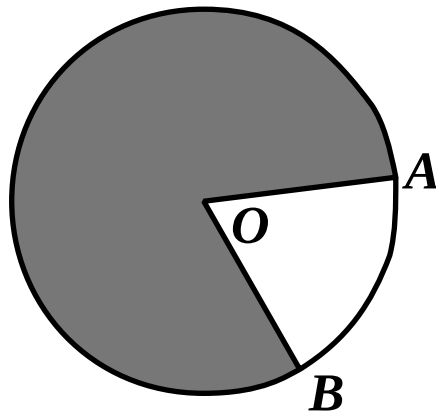
- (b) (i) Identify the mistake made by Adele in her working

- (ii) Show that $8 - 5 \theta^2$ can be used to give a good approximation to $1 + 4 \cos \theta + 3 \cos^2 \theta$ for an angle of size 5°

[2 marks]

Question 5

A-Level Specimen Examination Question 2019, Paper 2, Q2



The diagram shows a circle with centre O .
The points A and B lie on the circumference of the circle.
The area of the major sector, shown shaded, is 135 cm^2 .
The reflex angle AOB is 4.8 radians.

Find the exact length, in cm, of the minor arc AB , giving your answer in the form $a\pi + b$ where a and b are integers to be found.

[4 marks]

Question 6

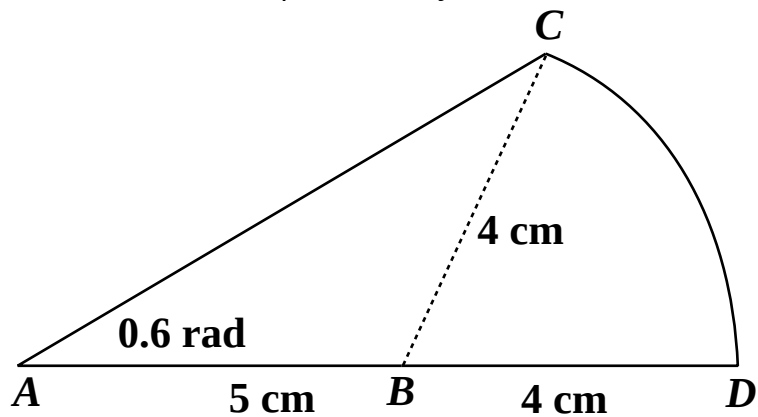
Solve the equation,

$$4 \cos x = \csc x \quad \text{for} \quad 0 \leq x < \frac{\pi}{2}$$

[4 marks]

Question 7

A-Level Examination Question from January 2010, C2, Q4



The emblem shown consists of a triangle ABC joined to a sector CBD of a circle with radius 4 cm and centre B . The points A , B and D lie on a straight line with $AB = 5$ cm and $BD = 4$ cm. Angle $BAC = 0.6$ radians and AC is the longest side of the triangle ABC .

(a) Show that angle $ABC = 1.76$ radians, correct to 3 significant figures.

[4 marks]

(b) Find the area of the emblem

[3 marks]

Question 8

A-Level Examination question from June 2008, C3, Q2

$$f(x) = 5 \cos x + 12 \sin x$$

Given that $f(x) = R \cos(x - \alpha)$ where $R > 0$ and $0 < \alpha < \frac{\pi}{2}$,

(a) find the value of R and the value of α to 3 decimal places

[4 marks]

(b) Hence solve the equation

$$5 \cos x + 12 \sin x = 6$$

for $0 < x < 2\pi$

[5 marks]

This document is a part of a **Mathematics Community Outreach Project** initiated by Shrewsbury School

It may be freely duplicated and distributed, unaltered, for non-profit educational use

In October 2020, Shrewsbury School was voted “**Independent School of the Year 2020**”

© 2025 Number Wonder

Teachers may obtain detailed worked solutions to the exercises by email from MHHShrewsbury@Gmail.com