Saigon International College

Saigon International College
Department of Mathematics and Science
Semester 1, 2022
Year 11   Mathematics Methods ATAR
Test 2
Trigonometric Functions

Section One (Calculator Free)

Time Allowed: (3+25) minutes   Total mark: $\dfrac{24}{41}$

Name: . Chu ..Minh..Dang

$\cos\dfrac{2}{3} = \underline{\quad}$

Question 1   **(8 marks)**

(a)   If α and β are acute angles such that $\cos\alpha = \dfrac{2}{3}$ and $\sin\beta = \dfrac{3}{5}$, determine the value of $\cos(\alpha - \beta)$ as a single fraction.

(b) Solve the following equations.
   (i) $\sqrt{2}\sin x = -1$ where $0 \leq x \leq 2\pi$.   **(2 marks)**

(ii) tan (2x) = 0.4 where $0 \leq x \leq 180°$ and given that tan 22° = 0.4.   **(2 marks)**

Question 2.   **(8 marks)**

(a)   Solve the equation $\sqrt{3}\tan(x) - 3 = 0$ for $0 \leq x \leq 2\pi$.   (3 marks)

(b)   A function has a period of k and is defined by $f(x) = 4\cos(2x)$.

     (i)   State the value of k.   (1 mark)
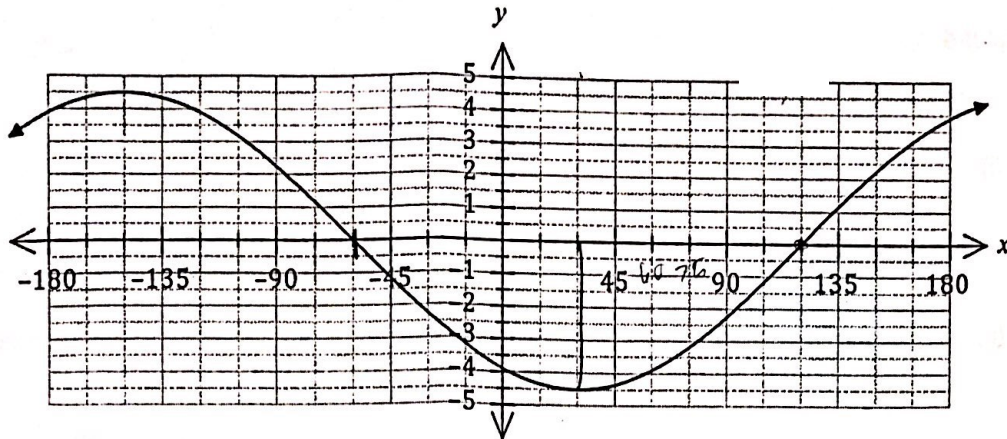
     (ii)   State the amplitude of f(x).   (1 mark)

(c)   Determine an exact value for $\cos 105°$.   (3 marks)

Question 3 (7 marks)

(a) Part of the graph of $y = c\sin(x - \theta)$ is shown below.

State the value of the constant c and the value of the constant θ, $0° \le \theta \le 180°$.
(2 marks)

(b) Show that $\sin(x - y) + \sin(x + y) = b\sin x \cos y$ and state the value of the constant b.
(2 marks)

(c) Determine an exact value for $\sin 15° + \sin 105°$.
(3 marks)

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Question 4

(a)   State the exact value of

   (i) $\cos\left(-\frac{\pi}{3}\right)$ (1 mark)

   (ii) $\cos 15°$ (3 marks)

(b)   Solve for θ

   (i) $\sin(\theta + 90°) = 0$ $0° \leq \theta \leq 360°$ (2 marks)

   (ii) $3\tan^2 \theta - 1 = 0$ $-\pi \leq \theta \leq \pi$ (3 marks)

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Question 5 (9 marks)

Given that $\sin A = \frac{4}{5}$ and $0 < A < \frac{\pi}{2}$, find the exact value of:

(a) $\cos A$ (2 marks)

(b) $\tan A$ (2 marks)

(c) $\sin\left(\frac{\pi}{2} + A\right)$ (2 marks)

(d) $\cos\left(\frac{\pi}{4} - A\right)$ (3 marks)

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Section Two (Calculator assumed)

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Time Allowed: **(5+50) minutes**   **Total mark available: 57**

Name: . Chu Minh Đức

Question 6   **(8 marks)**

(a) Use the formula for sin (A + B) to show that sin 2A = 2sin A cos A.   (2 marks)

(b) Use the formula in (a) to solve the x in the trigonometric equation:

   cos x. + sin 2x = 0 for $0 \leq x \leq 360°$.   (3 marks)

(c) Use the formula in (a) to solve for x in the trigonometric equation:
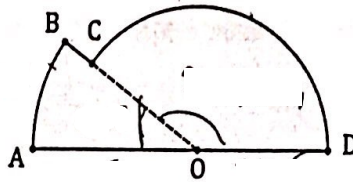
   sin 2x – sin x = 0 for $0 \leq x \leq 2\pi$.   (3 marks)

Question 7
(5 marks)

Shape $ABCDOA$ below consists of sector AOB of circle centre O joined to sector COD of a different circle, also centre O. AD is a straight line of length 62 cm, arc AB is 18 cm long and $\angle AOB = 0.48$ radians.

(a)   Determine the length OA.   (2 marks)

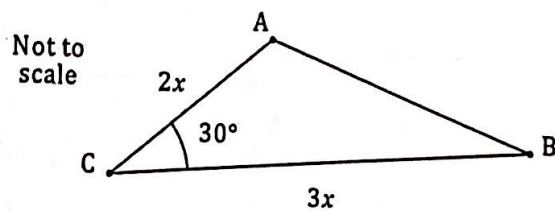(b)   Determine the area of the shape.   (3 marks)

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Question 8   **(8 marks)**

(a)   Determine the area of triangle PQR when $\angle PQR = 26°$, $\angle PRQ = 122°$ and $PQ = 57$ cm.

(4 marks)

The area of triangle ABC is 96 cm², $\angle ACB = 30°$ and $2BC = 3AC$ as shown in the diagram. Determine the length of AB.
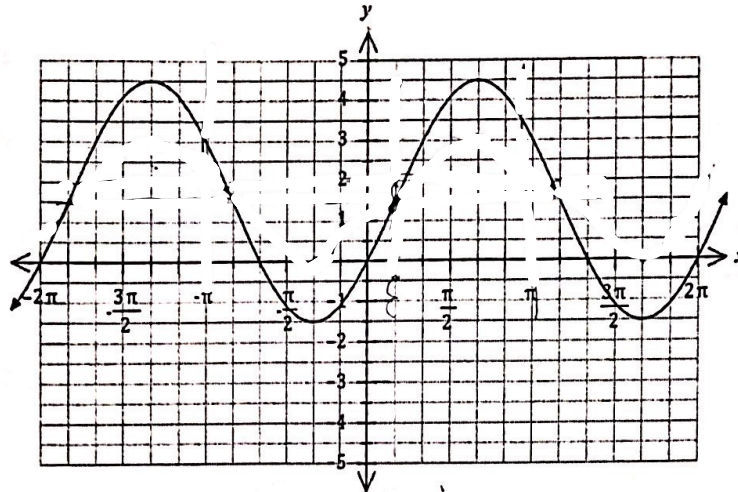
(4 marks)

Not to scale

Question 9 (8 marks)

The graph of $y = a + b\sin(x - c)$ is drawn below, where a, b and c are positive constants.

(a) Determine the value of a, the value of b and the value of c, where $c < \pi$. (3 marks)

(b) On the same axes, draw the graph of $y = a + \dfrac{b}{2}\sin(x + c)$. (3 marks)

(c) Solve $b\sin(x - c) = \dfrac{b}{2}\sin(x + c)$ for $-\pi \leq x \leq \pi$. (2 marks)

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Question 10 (6 marks)

A thin pole stands vertically in the middle of a level playing ground. From point A on the ground, the angle of elevation to the top of the pole, T, is 18º.

From point B, also on the ground but 5.35 metres further from the foot of the pole than A, the angle of elevation to the top of the pole is 15º.

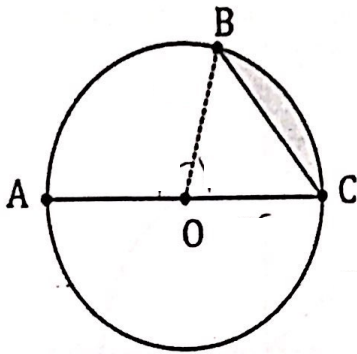(a) Draw a diagram to represent this information. (1 marks)

(b) Showing use of trigonometry, determine the height of the post. (5 marks)

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Question 11 (8 marks)

(a) The circle shown has centre O and diameter AC of length 50 cm. Determine the shaded area given that $2 \times \angle AOB = 3 \times \angle BOC$. (4 marks)
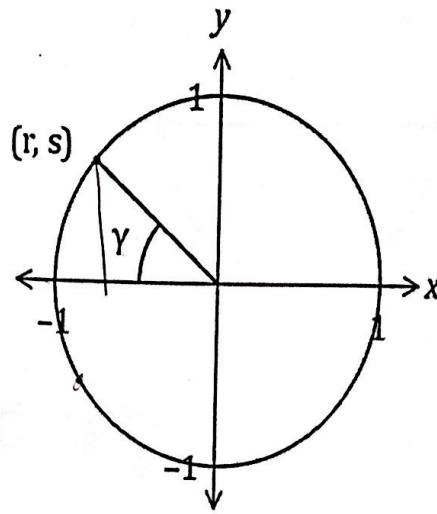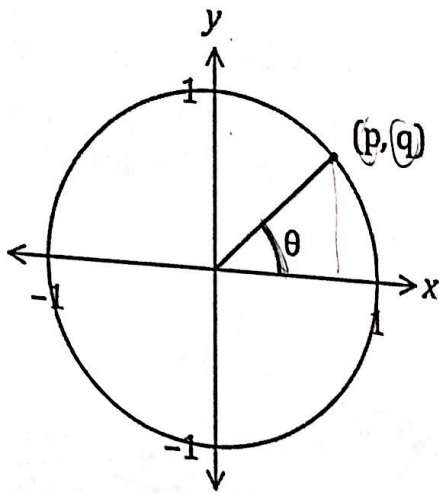

(b) A sector of a circle has a perimeter of 112 cm and an area of 735 cm^2. Determine the radius of the circle. (4 marks)

Question 12

(7 marks)

Consider the points with coordinates (p, q) and (r, s) that lie in the first and second quadrants respectively of the unit circles shown below, where θ and γ are acute angles.

Determine the following in terms of p, q, r and s, simplifying your answers where possible.

(a) $\tan \theta$.

(1 mark)

(b) $\sin (180 - \theta)$

(1 mark)

(c) $\cos \gamma$.

(1 mark)

(d) $\sin (\pi + \gamma)$

(1 mark)

(e) $\cos (\gamma - \theta)$

(3 marks)

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Question 13 (7 marks)

An obtuse angled triangle ABC has a = 36 cm, c = 52 cm and area of 748 cm².

(a) Sketch a triangle to show this information. (1 mark)

(b) Determine the size of $\angle B$. (2 marks)

(c) Show that b ≈ 79 cm. (2 marks)

(d) Show that $\angle C$ ≈ 32°. (2 marks)

End of section two

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