

SULIT



**KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI**

**BAHAGIAN PEPERIKSAAN DAN PENILAIAN
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI
KEMENTERIAN PENDIDIKAN TINGGI**

JABATAN MATEMATIK, SAINS DAN KOMPUTER

PEPERIKSAAN AKHIR

SESI I : 2024/2025

DBM10143 : CALCULUS AND ALGEBRA

TARIKH : 06 DISEMBER 2024

MASA : 8.30 PAGI – 10.30 PAGI (2 JAM)

Kertas ini mengandungi **LAPAN (8)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

JANGAN BUKA KERTAS SOALAN INI SEHINGGA DIARAHKAN

(CLO yang tertera hanya sebagai rujukan)

SULIT

INSTRUCTION:

This section consists of **FOUR (4)** questions. Answer **ALL** questions.

ARAHAN:

*Bahagian ini mengandungi **EMPAT (4)** soalan. Jawab **SEMUA** soalan.*

QUESTION 1**SOALAN 1**

- | | |
|------|---|
| CLO1 | <p>(a) Convert the following numbering systems into hexadecimal number system.
 <i>Tukarkan sistem nombor berikut kepada sistem nombor asas enam belas.</i></p> <p>i. 2077_8</p> <p style="text-align: right;">[5 marks]
[5 markah]</p> <p>ii. 1011101101_2</p> <p style="text-align: right;">[5 marks]
[5 markah]</p> |
| CLO1 | <p>(b) Identify the following values in binary arithmetic operations.
 <i>Kenal pasti nilai yang berikut dalam operasi aritmetik asas dua.</i></p> <p>i. $(111111_2 - 1011_2) + (1011001_2 - 111000_2)$</p> <p style="text-align: right;">[5 marks]
[5 markah]</p> <p>ii. $(1010010_2 + 1010_2) \times 101_2$</p> <p style="text-align: right;">[5 marks]
[5 markah]</p> <p>iii. $(11011_2 \times 11_2) - (11011_2 + 11_2)$</p> <p style="text-align: right;">[5 marks]
[5 markah]</p> |

QUESTION 2

SOALAN 2

CLO1

- (a) Figure 2(a) shows a circle with center O. Identify the values for the following:
Rajah 2(a) menunjukkan sebuah bulatan berpusat O. Kenal pasti nilai bagi yang berikut:

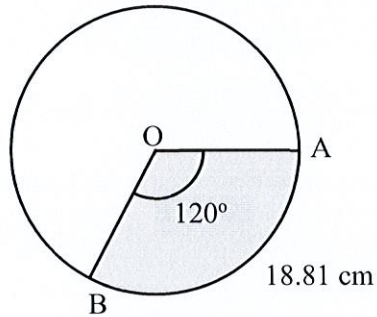


Figure 2(a) / Rajah 2(a)

- i. Length OA if arc length of AB is 18.81 cm.
Panjang OA jika panjang lengkok AB adalah 18.81 cm.

[5 marks]

[5 markah]

- ii. The circumference of the circle.
Lilitan bulatan.

[2 marks]

[2 markah]

CLO1

- (b) Based on the Figure 2(b), identify the values for the following:
Berdasarkan Rajah 2(b), kenal pasti nilai bagi yang berikut:

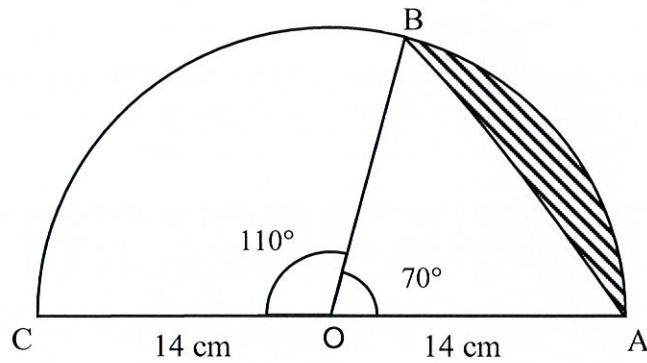


Figure 2(b) / Rajah 2(b)

- i. The arc length of the BC

Panjang lengkok BC

[4 marks]

[4 markah]

- ii. Area of segment OAB

Luas kawasan segmen OAB

[4 marks]

[4 markah]

CLO1

- (c) i. Figure 2 (c)(i) shows a cone with a radius of 7 cm. Identify the height of the cone if the volume is 667.06 cm^3 .

Rajah 2 (c)(i) menunjukkan sebuah kon dengan jejari 7 cm. Kenal pasti ketinggian kon jika isipadu kon ialah 667.06 cm^3 .

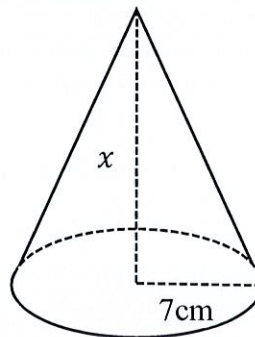


Figure 2(c)(i) / Rajah 2(c)(i)

[3 marks]

[3 markah]

- ii. A ball with radius of 5 cm is located in a cylinder container filled with water as shown in Figure 2(c)(ii). Identify the volume of water that remains in the container once the ball is taken out.

Sebiji bola dengan radius 5 cm terletak di dalam bekas silinder yang berisi air seperti yang ditunjukkan dalam Rajah 2(c)(ii). Kenal pasti isipadu air yang tinggal di dalam bekas sebaik sahaja bola dikeluarkan.

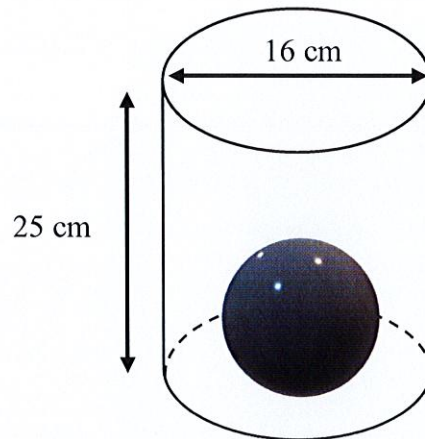


Figure 2(c)(ii) / Rajah 2(c)(ii)

[7 marks]

[7 markah]

QUESTION 3

SOALAN 3

CLO1

- (a) Given two vectors, $\vec{A}$ and $\vec{B}$ with components $\vec{A} = 12i + 6j$ and $\vec{B} = -2i + 5j$. Express the values for the following:

Diberi dua vektor, $\vec{A}$ dan $\vec{B}$ dengan komponen $\vec{A} = 12i + 6j$ dan $\vec{B} = -2i + 5j$. Nyatakan nilai yang berikut:

i. $-2\vec{A} + 4\vec{B}$

[3 marks]

[3 markah]

ii. $\overrightarrow{AB}$

[3 marks]

[3 markah]

iii. $\hat{B}$

[4 marks]

[4 markah]

CLO1

- (b) Given two vectors, $\vec{M} = 2i + 3j + 5k$ and $\vec{N} = i - 2j + 4k$. Express:

Diberi dua vektor, $\vec{M} = 2i + 3j + 5k$ dan $\vec{N} = i - 2j + 4k$. Nyatakan:

- i. Angle between vectors $\vec{M}$ and $\vec{N}$.

Sudut di antara vektor $\vec{M}$ dan $\vec{N}$.

[9 marks]

[9 markah]

- ii. Area of the triangle formed by two vectors $\vec{M}$ and $\vec{N}$.

Luas segitiga yang dibentuk oleh dua vektor $\vec{M}$ dan $\vec{N}$.

[6 marks]

[6 markah]

QUESTION 4**SOALAN 4**

CLO1

(a) Express the derivative for each of the following function:

Nyatakan pembezaan bagi setiap fungsi yang berikut:

i. $y = x^3 + \frac{5x^2}{2} + 24$

[2 marks]

[2 markah]

ii. $y = (4x - 7)^{-4}$

[3 marks]

[3 markah]

iii. $y = \frac{x+2}{x^2-2}$

[5 marks]

[5 markah]

CLO1

(b) Express the following indefinite integrals:

Nyatakan kamiran tak tentu bagi yang berikut:

i. $\int -2x + 8x^5 + 3 \, dx$

[3 marks]

[3 markah]

ii. $\int \sqrt{x} - 6x^2 \, dx$

[3 marks]

[3 markah]

iii. $\int \frac{-3}{(-2x+8)^4} \, dx$

[4 marks]

[4 markah]

CLO1

(c) Identify the value of $\int_{-1}^1 x^5 + 7x^2 dx$.*Kenal pasti nilai bagi $\int_{-1}^1 x^5 + 7x^2 dx$.*

[5 marks]

[5 markah]

SOALAN TAMAT

FORMULA SHEET FOR DBM10143: CALCULUS AND ALGEBRA

VECTOR & SCALAR

1. **Magnitude Vector;** $|\vec{A}| = \sqrt{a^2 + b^2 + c^2}$

2. **Unit Vector;** $\hat{u} = \frac{\vec{u}}{|\vec{u}|}$

3. **Cos θ** $= \frac{\vec{A} \cdot \vec{B}}{|\vec{A}| |\vec{B}|}$

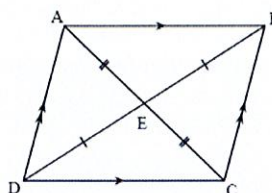
4. **Scalar Product;**

$$\vec{A} \cdot \vec{B} = a_1 a_2 + b_1 b_2 + c_1 c_2$$

5. **Vector Product;**

$$\vec{A} \times \vec{B} = \begin{vmatrix} i & j & k \\ a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{vmatrix}$$

*Formula number 6 & 7, refers to the same diagram



6. **Area of parallelogram ABCD;**

$$A = |\vec{AB} \times \vec{BC}|$$

7. **Area of triangle ABC;**

$$A = \frac{1}{2} |\vec{AB} \times \vec{BC}|$$

GEOMETRY

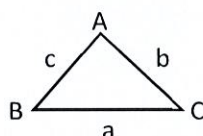
Radian to Degree

$$\theta = \text{value in radian} \times \frac{180^\circ}{\pi}$$

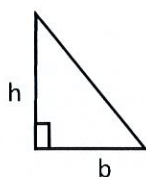
Degree to Radian

$$\theta = \text{value in degree} \times \frac{\pi}{180^\circ}$$

Formula of triangle



$$\text{Area of triangle} = \frac{1}{2} ab \sin c$$



$$\text{Area of right angle triangle} = \frac{1}{2} bh$$

Circumference

$$\text{circumference} = 2\pi r$$

Arc Length

$$s = r\theta \quad (\theta \text{ in radian})$$

Area of Circle

$$A = \pi r^2$$

Area of Sector

$$A = \frac{1}{2} r^2 \theta \quad (\theta \text{ in radian})$$

Area of Segment

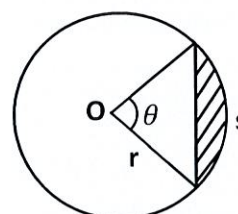
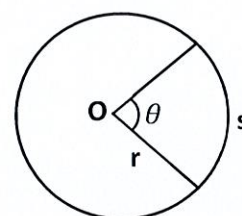
$$A = \frac{1}{2} r^2 (\theta_1 - \sin \theta_2)$$

or

$$A = \frac{1}{2} r^2 \theta_1 - \frac{1}{2} r^2 \sin \theta_2$$

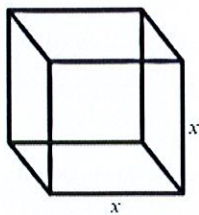
θ_1 must be in radian

θ_2 must be in degree



Surface area and Volume

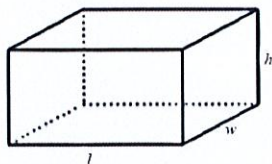
Cube



$$A = 6x^2$$

$$V = x^3$$

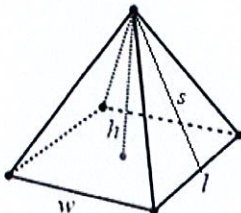
Cuboid



$$A = 2(wh + lw + lh)$$

$$V = lwh$$

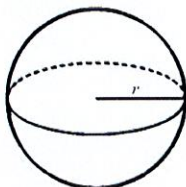
Pyramid



$$A = wl + ls + ws$$

$$V = \frac{1}{3} \times wl \times h$$

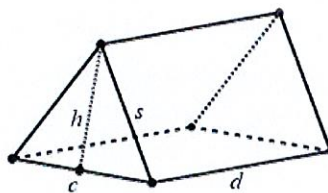
Sphere



$$A = 4\pi r^2$$

$$V = \frac{4}{3}\pi r^3$$

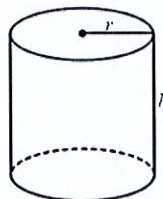
Prism



$$A = ch + cd + 2sd$$

$$V = \frac{1}{2} \times ch \times d$$

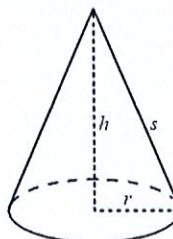
Cylinder



$$A = 2\pi rh + 2\pi r^2$$

$$V = \pi r^2 h$$

Cone



$$A = \pi rs + \pi r^2$$

$$V = \frac{1}{3}\pi r^2 h$$

DIFFERENTIATION

1.	$\frac{d}{dx}(k) = 0, k \text{ is constant}$	2.	$\frac{d}{dx}(ax^n) = anx^{n-1}$ [Power Rule]
3.	$\frac{d}{dx}(ax + b)^n = n(ax + b)^{n-1} \times \frac{d}{dx}(ax + b)$ [Composite Rule]		
4.	$\frac{d}{dx}(f(x) \pm g(x)) = f'(x) \pm g'(x)$	5.	$\frac{d}{dx}(uv) = u \frac{dv}{dx} + v \frac{du}{dx}$ [Product Rule]
6.	$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \frac{du}{dx} - u \frac{dv}{dx}}{v^2}$ [Quotient Rule]	7.	$\frac{dy}{dx} = \frac{du}{dx} \times \frac{dy}{du}$ [Chain Rule]

INTEGRATION

1.	$\int ax^n dx = \frac{ax^{n+1}}{n+1} + c; \{n \neq -1\}$	2.	$\int (ax + b)^n dx = \frac{(ax + b)^{n+1}}{(a)(n+1)} + c; \{n \neq -1\}$
3.	$\int k dx = kx + c, k \text{ is constant}$	4.	$\int_a^b f(x) dx = F(b) - F(a)$