

**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 : 2025/2026**

**DBM10143: CALCULUS AND ALGEBRA**

**TARIKH : 27 NOVEMBER 2025**

**MASA : 11.30 PAGI – 1.30 PETANG (2 JAM)**

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Kertas ini mengandungi **SEMBILAN (9)** halaman bercetak.

Struktur (4 soalan)

Dokumen sokongan yang disertakan : Formula

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**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

(a) Convert the following number system into binary:

*Tukarkan sistem nombor berikut kepada asas dua:*

i.  $1753_8$

[5 marks]

[5 markah]

ii.  $A29_{16}$

[5 marks]

[5 markah]

CLO1

(b) Calculate the following using binary arithmetic operations:

*Hitung operasi berikut menggunakan operasi aritmetik asas dua:*

i.  $(110110_2 + 101101_2) - (100110_2 - 10010_2)$

[5 marks]

[5 markah]

ii.  $11_2 \times (11001_2 + 111_2)$

[5 marks]

[5 markah]

iii.  $1110_2 \times 11_2 - 1111_2$

[5 marks]

[5 markah]

## QUESTION 2

## SOALAN 2

CLO1

(a)

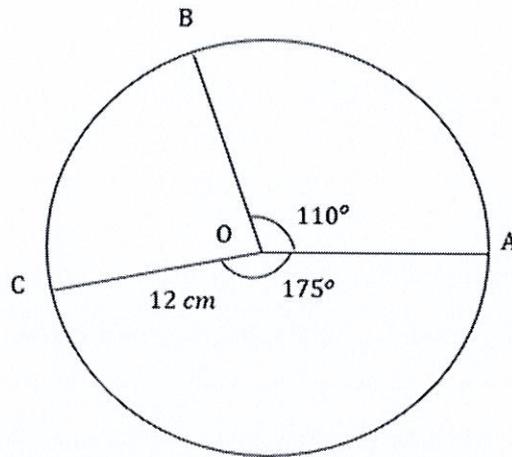


Figure 2(a) /Rajah 2(a)

Figure 2(a) shows a circle with center O. Calculate:

Rajah 2(a) menunjukkan bulatan dengan pusat bulatan O. Kirakan:

i. The length of arc AB.

*Panjang lengkok AB.*

[3 marks]

[3 markah]

ii. The area of sector BOC.

*Luas sector BOC.*

[4 marks]

[4 markah]

(b)

CLO1

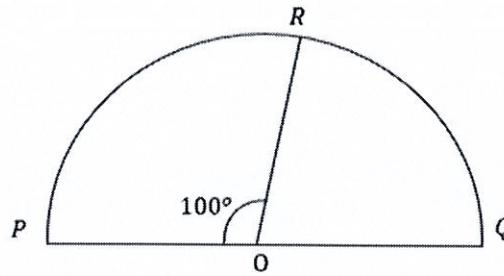
Figure 2(b)/ *Rajah 2(b)*

Figure 2(b) shows a semicircle with center O. Calculate:

*Rajah 2(b) menunjukkan semibulatan dengan pusat bulatan O. Kirakan:*

- i. The length of OQ, if given area of semicircle is  $39.28 \text{ cm}^2$ .  
*Panjang OQ, jika diberi luas semibulatan adalah  $39.28 \text{ cm}^2$ .*

[4 marks]

[4 markah]

- ii. The perimeter for the sector ROP.  
*Perimeter bagi sektor ROP.*

[4 marks]

[4 markah]

- i) A vertical cylindrical water tank has a radius of 3.5m is illustrated as in figure 2c (i). The volume of the tank is  $231 \text{ m}^3$ . Calculate the height of the tank.

*Sebuah tangki air berbentuk silinder tegak mempunyai jejari 3.5m seperti digambarkan dalam rajah 2c(i). Isipadu tangki tersebut ialah  $231 \text{ m}^3$ . Hitung ketinggian tangki itu tersebut.*

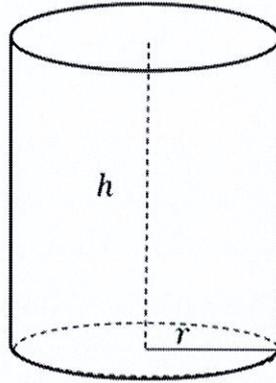


Figure 2c (i) / Rajah 2c (i)

[4 marks]

[4 markah]

CLO1

- ii. The figure 2 c(ii) below shows a building in the shape of a cube with side length is 6m. On top of it, there is a pyramid whose base has the same measurement as the top of the cube. Given, the height of the pyramid is 4m and its slant height is 5m. Calculate the total exterior surface area of the building that will be painted.

*Rajah 2 c(ii) di bawah menunjukkan sebuah bangunan berbentuk kubus dengan panjang sisi adalah 6m. Di atasnya terdapat sebuah piramid tegak yang tapaknya mempunyai ukuran yang sama dengan bumbung kubus tersebut. Diberi ketinggian piramid ialah 4m dan panjang sendengnya ialah 5m. Hitung jumlah luas permukaan luar bangunan yang akan dicat.*

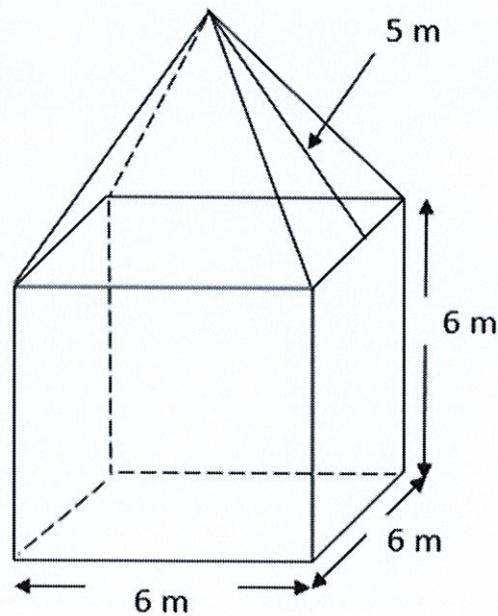


Figure 2c (ii) / Rajah 2c (ii)

[6 marks]  
[6 markah]

## QUESTION 3

## SOALAN 3

CLO1

- (a) Given two vectors,  $\vec{A}$  and  $\vec{B}$ , with components  $\vec{A} = -3\hat{i} - 7\hat{j}$  and  $\vec{B} = 5\hat{i} + 9\hat{j}$ .

Express the values for the following:

*Diberi dua vektor,  $\vec{A}$  and  $\vec{B}$ , dengan komponen  $\vec{A} = -3\hat{i} - 7\hat{j}$  dan  $\vec{B} = 5\hat{i} + 9\hat{j}$ .*

*Nyatakan nilai bagi yang berikut:*

i.  $-3\vec{A} - 2\vec{B}$

[3 marks]

[3 markah]

ii.  $|3\vec{B}|$

[3 marks]

[3 markah]

iii.  $\hat{A}$

[4 marks]

[4 markah]

CLO1

- (b) Given two vectors,  $\vec{R} = 3\hat{i} + 5\hat{j} + 8\hat{k}$  and  $\vec{S} = -5\hat{i} + 6\hat{j} - 9\hat{k}$ , calculate:

*Diberi dua vektor,  $\vec{R} = 3\hat{i} + 5\hat{j} + 8\hat{k}$  dan  $\vec{S} = -5\hat{i} + 6\hat{j} - 9\hat{k}$ , kirakan:*

- i. Angle between vector  $\vec{R}$  and vector  $\vec{S}$

*Sudut di antara vector  $\vec{R}$  dan vector  $\vec{S}$*

[9 marks]

[9 markah]

- ii. Area of the parallelogram form by two vectors  $\vec{R}$  and vector  $\vec{S}$

*Luas segiempat selari yang dibentuk oleh dua vector  $\vec{R}$  dan  $\vec{S}$*

[6 marks]

[6 markah]

**QUESTION 4****SOALAN 4**

CLO1 (a) Solve the derivative for each of the following functions:

*Selesaikan pembezaan bagi setiap fungsi yang berikut:*

i.  $y = 4(2x - 3)^{-2}$

[5 marks]

[5 markah]

ii.  $y = x(2x + 1)^2$

[5 marks]

[5 markah]

CLO1 (b) Solve the following integrals:

*Selesaikan pengamiran berikut:*

i.  $\int (x - 2)(x - 4)dx$

[5 marks]

[5 markah]

ii.  $\int \frac{-6}{(2x+9)^5} dx$

[5 marks]

[5 markah]

- CLO1 (c) Calculate the value of  $\int_{-1}^2 2x^2 + 7x dx$   
*Kirakan nilai bagi  $\int_{-1}^2 2x^2 + 7x dx$*

[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  $\theta$**  =  $\frac{\vec{A} \cdot \vec{B}}{|\vec{A}||\vec{B}|}$

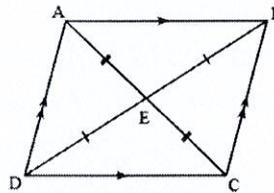
4. **Scalar Product;**

$$\vec{A} \cdot \vec{B} = a_1a_2 + b_1b_2 + c_1c_2$$

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**

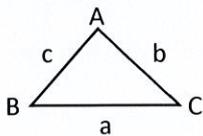
**Radian to Degree**

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

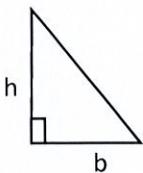
**Degree to Radian**

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

**Formula of triangle**



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



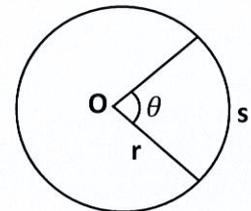
$$\text{Area of right angle triangle} = \frac{1}{2} bh$$

**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**

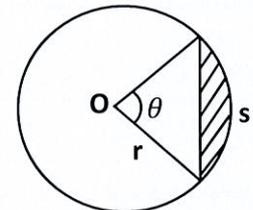
$$A = \frac{1}{2} r^2 (\theta_1 - \sin \theta_2)$$

or

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

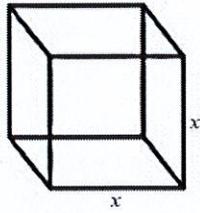
$\theta_1$  must be in radian

$\theta_2$  must be in degree



## Surface area and Volume

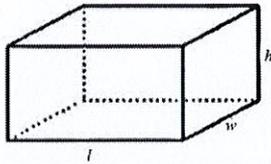
### **Cube**



$$A = 6x^2$$

$$V = x^3$$

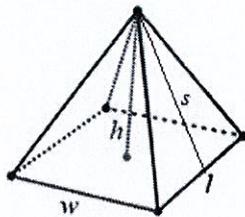
### **Cuboid**



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

$$V = lwh$$

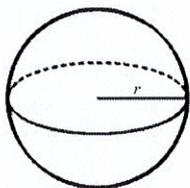
### **Pyramid**



$$A = wl + ls + ws$$

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

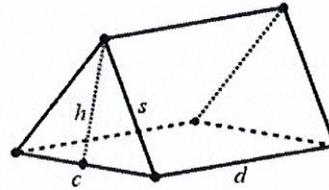
### **Sphere**



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

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

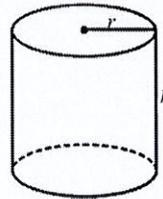
### **Prism**



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

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

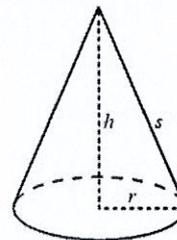
### **Cylinder**



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

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

### **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.	$\int_a^b f(x) dx = F(b) - F(a)$
5.	Along x-axis: $A = \int_a^b y dx$	6.	Along y-axis: $A = \int_a^b x dy$
7.	Volume x-axis: $\pi \int_a^b y^2 dx$	8.	Volume y-axis: $\pi \int_a^b x^2 dx$