# UNIVERSITI KUALA LUMPUR
# MATHEMATICS CENTRAL COMMITTEE

## FINAL EXAMINATION
## OCTOBER 2025 SEMESTER

| | |
|---|---|
| **COURSE CODE** | **: WQD10103** |
| **COURSE NAME** | **: TECHNICAL MATHEMATICS 1** |
| **PROGRAMME NAME** (FOR MPU: PROGRAMME LEVEL) | **: DIPLOMA OF ENGINEERING TECHNOLOGY (NAVAL ARCHITECTURE AND SHIPBUILDING)** |
| **DATE** | **: 26 JANUARY 2026** |
| **TIME** | **: 09:00 AM – 11:30 AM** |
| **DURATION** | **: 2 HOURS AND 30 MINUTES** |

## INSTRUCTIONS TO CANDIDATES

1. Please **CAREFULLY** read the instructions given in the question paper.
2. This question paper has information printed on both sides of the paper.
3. This question paper consists of **TWO (2)** sections.
4. Answer **ALL** questions in Section A and **TWO (2)** questions in Section B.
5. Please write your answers on the answer booklet provided.
6. Answer all questions in English language **ONLY**.
7. Formula sheet is appended for your reference.

**THERE ARE 7 PAGES OF QUESTIONS, EXCLUDING THESE COVER PAGES.**

**SECTION A (Total: 60 marks)**

**INSTRUCTION: Answer ALL questions.**
**Please use the answer booklet provided.**

**Question 1**

(a) Determine the value of $x$ for $5(x-3)=2(x+4)-3x+6$.

(5 marks)

(b) Solve the equation $3x^2-5x+4=0$ by using quadratic formula.

(5 marks)

**Question 2**

(a) Solve the following simultaneous equations by using substitution method,

$$x=11-2y$$
$$2x-3y=-8$$

(5 marks)

(b) Given matrices, $A=\begin{pmatrix}2 & 1 & 3\\ -1 & -2 & 0\\ 4 & 3 & 1\end{pmatrix}$ and $B=\begin{pmatrix}5 & 1 & 2\\ 3 & 2 & -1\\ 2 & 3 & 0\end{pmatrix}$. Determine:

i. $3A$

(2 marks)

ii. $B^T$

(1 mark)

iii. $3A-B^T$.

(2 marks)

**Question 3**

(a) Figure 1 shows a triangle $PQR$.

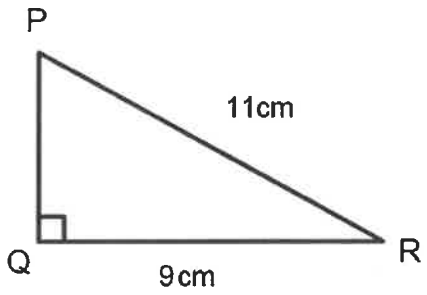


Figure 1

Calculate:

i. the length of the unknown side, $PQ$.

(2 marks)

ii. the perimeter of the triangle.

(2 marks)

iii. the area of the triangle.

(2 marks)

(b) Figure 2 shows a circle with radius $25\,cm$.

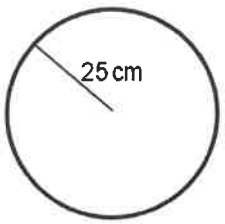


Figure 2

Determine:

i. the circumference,

(2 marks)

ii. the area of the circle.

(2 marks)

**Question 4**

(a) Convert 245° to radian.

(2 marks)

(b) Calculate the central angle, $\theta$ that subtends by the arc of length $100\,cm$ on a circle with diameter $50\,cm$.

(4 marks)

(c) Determine the area of the shaded sector in Figure 3.

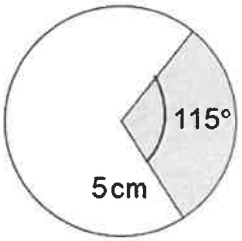


Figure 3

(4 marks)

**Question 5**

(a) Calculate the modulus, $r$ and the argument, $\theta$ of $Z = -5 - 12i$.

(4 marks)

(b) Given $z_1 = 3 - 7i$ and $z_2 = 4 - 9i$.

i. Solve $M = z_2 - z_1$ and $R = -3z_1$.

(4 marks)

ii. Sketch $M$ and $R$ in Argand diagram.

(2 marks)

**Question 6**

Given $R = 5 - 2i$, $S = -4 + 3i$ and $T = 7 + 9i$. Determine:

(a) $3S - 4\overline{T}$

(5 marks)

(b) $\dfrac{R}{T}$

(5 marks)

**SECTION B (Total: 40 marks)**

**INSTRUCTION: Answer TWO (2) questions only.**
**Please use the answer booklet provided.**

**Question 1**

(a) Figure 4 shows a girl playing two kites, each with different lengths of string. The kites' string makes an angle of 40° and 65° respectively.

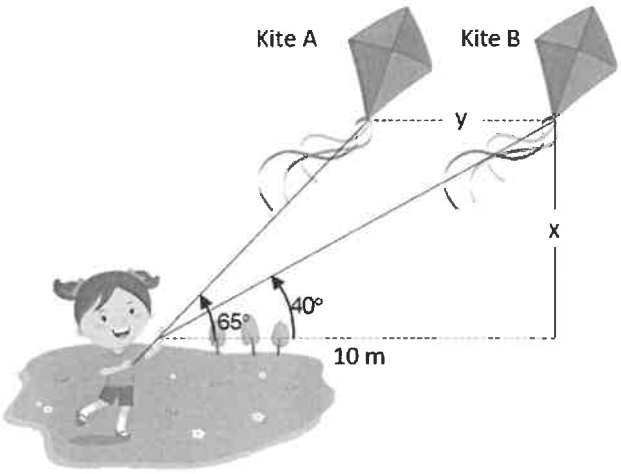


Figure 4

Determine:

i. the height of both kites from the girl, $x$.

(3 marks)

ii. the distance between two kites, $y$.

(7 marks)

(b) Given the complex number, $Z = 5 - 7i$. Express $Z$ in:

i. trigonometric form.

(7 marks)

ii. exponential form.

(3 marks)

**Question 2**

(a) Figure 5 shows a triangle $ABC$ with sides $a = 30\ cm$, $b = 25\ cm$ and $c = 10\ cm$. Calculate the angles $A, B$ and $C$ to the nearest degree.

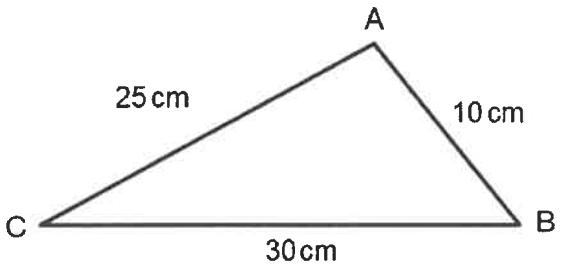


Figure 5

(10 marks)

(b) Given $U = 5(\cos 47° + i \sin 47°)$ and $V = 7(\cos 83° + i \sin 83°)$. Determine:

i. $UV$

(3 marks)

ii. $\frac{V}{U}$

(3 marks)

iii. $U^3$. Provide your answer in algebraic form.

(4 marks)

**Question 3**

(a) A boat is approaching a cliff with a lighthouse on top as shown in Figure 6. The cliff is 100 meters high and the lighthouse is 20 meters tall. The angle of elevation from the boat to the top of the lighthouse is $35°$.

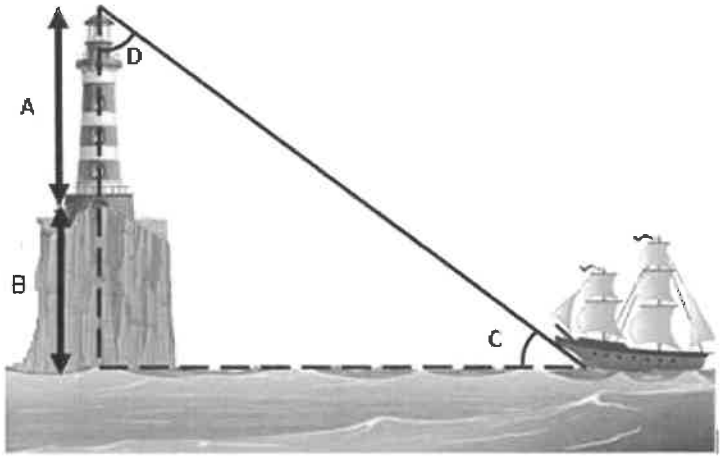


Figure 6

i. Identify the values of *A*, *B*, *C* and *D*.

(2 marks)

ii. Calculate the distance of the boat to the base of the cliff.

(4 marks)

iii. Calculate the angle of elevation from the boat to the top of the cliff, *B*.

(4 marks)

(b) Given the complex number, $V = 5e^{3.8i}$.

i. State the modulus, $r$ and the argument, $\theta$ of $V$.

(2 marks)

ii. Convert $\theta$ from radian to degree.

(2 marks)

iii. Express $V$ in trigonometric and algebraic form.

(6 marks)

**END OF EXAMINATION PAPER**

**FORMULA SHEET**

# ALGEBRA

| QUADRATIC FORMULA |
|---|
| $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ |

# TRIGONOMETRY 1

| | |
|---|---|
| Area of Triangle $= \dfrac{1}{2}bh$ | |
| Area of Trapezoidal $= \dfrac{1}{2}h(a+b)$ | |
| $\theta$ in radian<br>Arc of length, $S = r\theta$ | Area of sector, $A = \dfrac{1}{2}r^2\theta$ |
| **LAW OF SINE** | **LAW OF COSINE** |
| $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$ | $a^2 = b^2 + c^2 - 2bc\cos A$ |
| | $b^2 = a^2 + c^2 - 2ac\cos B$ |
| | $c^2 = a^2 + b^2 - 2ab\cos C$ |

# COMPLEX NUMBER

| | |
|---|---|
| $r = \sqrt{a^2 + b^2}$ | |
| $\theta = \tan^{-1}\left\lvert\dfrac{b}{a}\right\rvert$ | |
| **ALGEBRAIC FORM** | $Z = a + bi$ |
| **TRIGONOMETRIC FORM** | $Z = r(\cos\theta + i\sin\theta)$ |
| **POLAR FORM** | $Z = r\angle\theta$ |
| **EXPONENTIAL FORM** | $Z = re^{i\theta}$, $\theta$ in radian |
| **DE MOIVRE'S THEOREM** | $Z^n = r^n(\cos n\theta + i\sin n\theta)$<br>$Z^n = r^n\angle n\theta$<br>$Z^n = r^n e^{i(n\theta)}$ |