الجامعة الوطنية
National University
Science & Technology للعلوم والتكنولوجيا
كلية عمان البحرية الدولية
International Maritime College Oman

ACADEMIC YEAR 2023 - 2024

Program	Semester	Term	Paper
FOUNDATION	2	2	MAIN 1

MODULE NAME:	**PURE MATHEMATICS**		
MODULE CODE:	**FMTH005**	**EXAM DATE:**	**22/07/2024**
INSTRUCTOR's NAME:	**Muhammad Kazam**	**DURATION:**	**2 hrs.**

Questions to be answered on:	**Allowed tools:**	**Number of pages**
✓ Space provided on the question paper	Pen, Pencil & Calculator	(Incl. cover page): **11**

Points of attention:

- For each question, the maximum earned points are mentioned between brackets at the end of each question.
- Write very clearly! Answers that are not readable are not marked and don't get points!
- Make sure your answers are written to the point.
- All answers must be written **in English**.
- Write all the answers **in blue or black pen only**.
- When finished, submit the question paper, together with the answer scripts and the signed cover page to the invigilator.
- Cheating / copying is not allowed and will result in failing the exam.

		FINAL MARKS
STUDENT NAME:		
STUDENT ID:		
CLASS:		**40**

Number of answer scripts:……..…….. **Invigilator:**……..……..…..

Student's signature: …… **Time of receipt:**……..…..

Question 1 [10 Marks]

Circle the correct option to fill in the blanks.

Example. 85 is a _____ digit number.			
a. 1	**b.** 2	**c.** 3	**d.** 4
1. $90° =$ _____ $rad.$			
a. $\frac{\pi}{2}$	**b.** $\frac{\pi}{3}$	**c.** $\frac{\pi}{4}$	**d.** $\frac{\pi}{5}$
2. A central angle subtended by an arc of length 14 cm in a circle of radius 9 cm is _____.			
a. $0.6°$	**b.** $1.67\ rad$	**c.** $89.1\ rad$	**d.** $89.1°$
3. The class mark for the group $(1-9)$ is _____.			
a. 1	**b.** 5	**c.** 9	**d.** 10
4. If a coin is tossed 3 times, then the number of elements in the sample space is _____.			
a. 1	**b.** 2	**c.** 4	**d.** 8
5. $f(x) = 2e^x$ is a _____ function.			
a. linear	**b.** quadratic	**c.** logarithmic	**d.** exponential
6. The domain of the function $f(x) = \sqrt{3x-12}$ is _____.			
a. $\mathbb{R}$	**b.** $\{x \mid x \leq 4\}$	**c.** $\{x \mid x \geq 4\}$	**d.** $\{x \mid x > 4\}$
7. The exponential form of $\ln x = 2$ is _____.			
a. $x^2 = 1$	**b.** $2^x = 1$	**c.** $e^2 = x$	**d.** $e^x = 2$
8. $\ln(\frac{x}{2y}) =$ _____.			
a. $\ln x - \ln 2 + \ln y$	**b.** $\ln x + \ln 2 - \ln y$	**c.** $\ln x + \ln 2 + \ln y$	**d.** $\ln x - \ln 2 - \ln y$
9. $f(x) = ax^2 + bx + c$ has a minimum value if _____.			
a. $a < 0$	**b.** $a > 0$	**c.** $a = 0$	**d.** $a \neq 0$
10. The range of the data 45, 32, 37, 46, 39, 36, 41, 48, 36 is _____.			
a. 16	**b.** 39	**c.** 46	**d.** 48

Question 2 [4 Marks]

A prime number is a number that is evenly divisible only by 1 and itself. The prime numbers less than 50 are listed below.

2 3 5 7 11 13 17 19 23 29 31 37 41 43 47

Choose one of these numbers at random.

a. Calculate the probability that the number is odd. **(1 mark)**

b. Calculate the probability that the number is less than 10. **(1 mark)**

c. Calculate the probability that the sum of the digits is even. **(2 marks)**

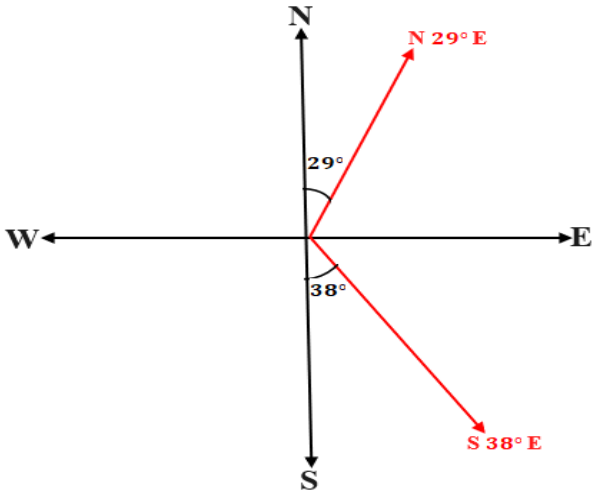
Question 3 [4 Marks]

Calculate the mean and median of the data given below.

42 38 39 45 47 41 44 41 37 42

Question 4 [3 Marks]

Two ships leave a port at the same time. One travels at 34 km/h in a direction $N\ 29°\ E$, and the other travels at 41 km/h in a direction $S\ 38°\ E$. How far apart are the two ships after 2 hours?



Question 5 [2 Marks]

Use the Laws of Logarithms to expand the expression given below.

$$\log_4\left(\frac{s^5}{7t^2}\right)$$

Question 6 [4 Marks]

Solve the equation given below.

$$2e^{12x} = 17$$

Question 7 [3 Marks]

Calculate the inverse of the function given below.

$$f(x) = \frac{1}{x+2}$$

Question 8 [2 Marks]

Prove that $(\boldsymbol{\sin x + \cos x})^{\mathbf{2}} = \mathbf{1} + \mathbf{2}\,\boldsymbol{\sin x \cos x}$.

Question 9 [8 Marks]

A quadratic function f is given below.

$$f(x) = x^2 - 2x + 3$$

a. Calculate the axis of symmetry and vertex of f. **(3 marks)**

b. Sketch a graph of f. **(5 marks)**

Formula Sheet

$(A+B)(A-B)=A^2-B^2$	$(A+B)^2=A^2+2AB+B^2$
$(A-B)^2=A^2-2AB+B^2$	$(A+B)^3=A^3+3A^2B+3AB^2+B^3$
$(A-B)^3=A^3-3A^2B+3AB^2-B^3$	$A^3+B^3=(A+B)(A^2-AB+B^2)$
$A^3-B^3=(A-B)(A^2+AB+B^2)$	
Quadratic formula	$x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$
Law of Sines	$\dfrac{a}{\sin A}=\dfrac{b}{\sin B}=\dfrac{c}{\sin C}$
Law of Cosines	$a^2=b^2+c^2-2bc\,cosA$ $b^2=a^2+c^2-2ac\,cosB$ $c^2=a^2+b^2-2ab\,cosC$
Varinace	$s^2=\dfrac{1}{n-1}\left[\sum X^2-\dfrac{(\sum X)^2}{n}\right]$

Reference:

Stewart, J., Redlin, L. and Watson, S. (2017) *Precalculus Mathematics for Calculus*. 7th edn. Cengage.