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	1	MAIN

MODULE NAME:	**PURE MATHEMATICS**		
MODULE CODE:	**FMTH005**	**EXAM DATE:**	**29/04/2024**
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
i. The length of the arc that subtends a central angle of measure 40° in a circle of radius 12 m is _____.			
a $480\ m$	**b** $48\ m$	**c** $4.8\ m$	**d** $8.38\ m$
ii. $\frac{\sec x}{\csc x} =$ _____			
a. $\cot x$	**b.** $\tan x$	**c.** $\cos x$	**d.** 1
iii. If the largest value is 49 and the smallest value is 6, for the frequency distribution with 5 classes, the class width will be _____.			
a. 10	**b.** 9	**c.** 8	**d.** 8.6
iv. The median for 3, 5, 0, 1, 6 is _____.			
a. 0	**b.** 3	**c.** 5	**d.** 6
v. The range of the data 45, 32, 37, 46, 39, 36, 41, 48, 36 is _____.			
a. 16	**b.** 39	**c.** 46	**d.** 48
vi. If a die is rolled 2 times, then the number of elements in the sample space is _____.			
a. 1	**b.** 4	**c.** 6	**d.** 36
vii. If an event is certain to occur, its probability will be _____.			
a. 0	**b.** $\frac{1}{2}$	**c.** $\frac{1}{3}$	**d.** 1
viii. 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.** $\{x \mid x > 4\}$
ix. The logarithmic form of $a^x = b$ is _____.			
a. $\log_x b = a$	**b.** $\log_x a = b$	**c.** $\log_a b = x$	**d.** $\log_a x = b$
x. $\log_a(a^2 \cdot a^3) =$ _____			
a. $\log_a a^2 \cdot \log_a a^3$	**b.** $\frac{\log_a a^2}{\log_a a^3}$	**c.** $\log_a a^{-1}$	**d.** 5

Question 2 [4 Marks]

Samples of a cast aluminum part are classified on the basis of surface finish in microinches and length measurements. The results are summarized as follows:

		Length	
		Excellent	Average
Surface Finish	Excellent	80	2
	Average	10	8

Let A denote the event that a sample has excellent surface finish, and let B denote the event that a sample has excellent length. Determine the probabilities for the events given below.

a. $P(A')$ **(1 mark)**

b. $P(A \cap B)$ **(1 mark)**

c. $P(A \cup B')$ **(2 marks)**

Question 3 [4 Marks]

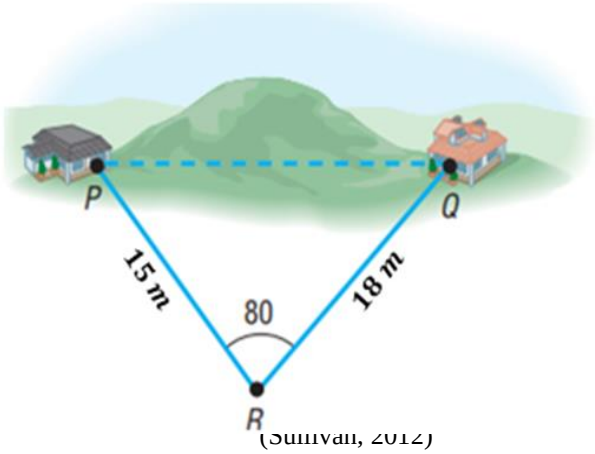
A sample of prices in $ for home theater models with a DVD player is shown below in the table.

Models with DVD Player	Price
Hisense A62K	450
Sony Bravia KDX75K	300
Samsung QA65Q60	500
LG NANO776RA	400
TCL C745	400

Compute the standard deviation for the sample data.

Question 4 [4 Marks]

Two homes are located on opposite sides of a small hill as shown in the figure. To measure the distance between them, a surveyor walks a distance of 15 m from house P to point R, uses a transit to measure $\angle PRQ$, which is found to be 80°, and then walks to house Q, a distance of 18 m. Calculate the distance between the houses.



(Sullivan, 2012)

Question 5 [4 Marks]

Solve the following equations.

a. $4 - \log(3 - x) = 3$ **(1.5 marks)**

b. $2(5 + 3^{x+1}) = 100$ **(2.5 marks)**

Question 6 [3 Marks]

Prove that $\frac{\cos\theta}{1-\sin\theta} = \sec\theta + \tan\theta$.

Question 7 [4 Marks]

Calculate the functions $\boldsymbol{fog}$ and $\boldsymbol{gof}$.

$f(x) = x^2 - 4$ and $g(x) = 2x + 3$

Question 8 [7 Marks]

A quadratic function f is given below.

$f(x) = -3x^2 + 6x + 1$

a. Find the axis of symmetry and vertex of f. **(2 marks)**

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

Formula Sheet

Quadratic formula	$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$
Law of Sines	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
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	$s^2 = \frac{1}{n-1}\left[\sum X^2 - \frac{(\sum X)^2}{n}\right]$

Reference:

Sullivan, M. (2012) *Algebra & Trigonometry*. 9th edn. Boston: Pearson.