

The Open University of Sri Lanka
 B.Sc in Information Technology Degree Programme
 Applied Mathematics - Level 03
 ADE3430 Foundational Mathematics
 Final Examination 2026/2027
 Duration: Three hours



Date: 17.06.2026

Time: 9:30 a.m. - 12:30 p.m.

INSTRUCTIONS TO CANDIDATES

- This paper consists of **TWO** sections, Section A and Section B.
- Section A is **COMPULSORY**. There are **TEN** questions in this section. Answer **ALL** of them.
- Section B consists of **SIX** questions. Answer **FOUR** of them.

SECTION A

Answer all questions (i) - (x)

- (i) Solve the following inequality and represent the solution on a number line.

$$2(2x + 3) - 10 < 6(x - 2)$$

- (ii) Simplify $\frac{1}{4} [\ln 24 + \ln 21 + 2 \ln 5 - \ln 7]$.

- (iii) Evaluate the following.

$$\sum_{n=1}^{10} (2n - 4)$$

- (iv) Given

$$A = \begin{pmatrix} 2 & -1 \\ 0 & 3 \end{pmatrix}, \quad B = \begin{pmatrix} 1 & 2 \\ 3 & 0 \end{pmatrix}$$

Find AB .

- (v) Using the formula for $\sin(A - B)$, compute $\sin 15^\circ$.
- (vi) The straight line l passes through the points $A(5, 4)$ and $B(0, 13)$. Determine the equation of the straight line l .

(vii) Differentiate

$$y = e^{5x+8}.$$

(viii) Compute the integral

$$\int (x^2 - 4x + \cos x) dx.$$

(ix) Classify each of the following variables as either qualitative or quantitative.

- (a) Number of books a student owns
- (b) Eye color of students
- (c) Height of a person
- (d) Marital status
- (e) Time taken to complete an examination

(x) A bag contains 2 red balls and 3 blue balls. One ball is selected at random and then replaced in the bag. A second ball is then selected at random. Draw a tree diagram to represent all possible outcomes of this experiment.

SECTION B

Answer **FOUR** questions **ONLY**

1. i. Solve the simultaneous equations

$$4x + 7y = 6$$

$$3x - 2y = 19$$

- ii. Let

$$f(x) = 2x^3 - 3x^2 - 39x + 20$$

- a. Use the Factor Theorem and show that $(x + 4)$ is a factor of $f(x)$.
- b. Find the other factors of $f(x)$.

- iii. The functions f and g are defined for $x \in \mathbb{R}$ by

$$f : x \mapsto 2x^2 - 1$$

$$g : x \mapsto x + 3$$

- a. State the range of f .
 - b. Define the composite function $f \circ g$.
- iv. A committee of 6 is to be chosen from 8 men and 10 women. Find the number of ways in which the committee can be formed, if
- a. The committee consists of 4 men and 2 women.
 - b. The committee consists of more men than women.

2. i. In a circle of radius $6m$, the length of arc sector is $10m$, what is the area of the sector.
- ii. a. Prove the identity

$$\frac{1}{\sec x - \tan x} + \frac{1}{\sec x + \tan x} \equiv 2 \sec x$$

- b. If $\cos \theta = \frac{4}{5}$, evaluate

$$2 \sin^2 \theta + \tan^2 \theta - \sec \theta$$

- iii. Show that points

$$A(-2, 0), \quad B(2, 0), \quad C(0, 2\sqrt{3})$$

are the coordinates of an equilateral triangle.

- iv. A circle has its center at the point $(3, 2)$ and radius 5 units. Show that the equation of the circle can be written as

$$x^2 + y^2 - 6x - 4y - 12 = 0$$

3. i. Evaluate the following limits

a.

$$\lim_{x \rightarrow 1} \frac{x^2 - x + 3}{3x + 1}$$

b.

$$\lim_{x \rightarrow \infty} \frac{5x^2 - 2}{x^2 + 1}$$

- ii. Differentiate the following with respect to x

a.

$$y = \cos(x^3 - 4x^2 + 5)$$

b.

$$y = e^{5x+8} \cos(x^3 + 5)$$

- iii. Find the second derivative of the function

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

at $x = 1$.

- iv. Consider the following quadratic function

$$f(x) = x^2 + 4x$$

- a. Find the minimum or the maximum points of the above function.
- b. Sketch the graph of f .

4. i. Integrate the following

a.

$$\int \frac{3x^2 + 4x + 2}{x^3 + 2x^2 + 2x} dx$$

b.

$$\int x(x^2 + 1)^2 dx$$

ii. Integrate the following definite integrals

a.

$$\int_1^3 (x^3 - 4x + 2) dx$$

b.

$$\int_0^1 4x(2x^2 + 5)^4 dx$$

iii. Find the area of the region bounded by the curve

$$y = 1 - x + x^2$$

from $x = -1$ and $x = 2$.

5. i. Statistics of toys produced per day by a certain producer last year are given below

Class Interval	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80
Frequency	12	8	15	5	25	12	15	8

a. Construct a suitable histogram to represent the number of persons within each class interval.

b. Draw the frequency polygon using the histogram.

c. What is the modal class?

ii. The data below shows the energy levels, in kilocalories, of 10 different snack foods.

440, 520, 480, 560, 615, 550, 620, 680, 545, 490

a. Calculate the mean energy level of these snack foods.

b. Calculate the variation.

c. Calculate the standard deviation.

Cont.

6. i. 60 students who can work in Sinhalese and Tamil languages participate for a workshop on ethnic harmony. They can work at least in one language. Number of students who are proficient in two languages is 18. In addition, 22 students can work only in Sinhala.
- Include the above information in the Venn diagram.
 - Find the number of students who can work only in Tamil.
 - Find the number of students who can work only in one language.
- ii. The number of spots turning up when a six-sided die is tossed is observed. Consider the following events:

A : The number observed is 3, 4 or 5

B : The number observed is greater than 3

C : The number observed is less than 3

D : The number observed is 3

- Define a sample space for this random experiment, and assign probabilities to outcomes.
- Find $P(A)$, $P(B)$, $P(C)$ and $P(D)$.
- Find $P(\bar{A})$.
- Find $P(A \cap B)$.
- Find $P(A \cup B)$.
- Are events B and C mutually exclusive?

————— End of the paper —————