



UNIVERSITY OF EDUCATION, WINNEBA
INSTITUTE FOR TEACHER EDUCATION AND
CONTINUING PROFESSIONAL DEVELOPMENT
(ITECPD)



END-OF-FIRST-SEMESTER EXAMINATIONS. MAY/JUNE, 2023

LEVEL 100

COURSE CODE: EGM114

COURSE TITLE: INTRODUCTION TO LEARNING AND APPLYING NUMBER
AND ALGEBRA

TIME ALLOWED: 2 HOURS, 15 MINUTES.

STUDENT'S INDEX NUMBER:

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GENERAL INSTRUCTIONS:

- This paper is made up of ONE SECTION.
- The Section is made up of six essay type questions.
- Answer any FOUR questions into your answer booklet.
- Each question carries equal marks. You are expected to start each question on a new page.
- You are expected to handover your answer booklet to the invigilator before you leave the examination hall.

Instruction: Answer any four (4) of the questions in the answer booklet provided.

1. (a) Define the following terms and provide an example each.

(i) Irrational numbers

[2 Marks]

(ii) Additive inverse

[2 Marks]

(iii) Unit set

[2 Marks]

(iv) Power set

[2 Marks]

(v) One-to-one mapping

[2 Marks]

(b) Given that $f: x \rightarrow \frac{4x-4}{x+5}$ on the domain $\{-2, -1, 0, 1, 2\}$. Find:

(i) the value of x for which $f(x)$ is undefined

[2 Marks]

(ii) the images of the set, $\{-2, 0, 1\}$

[4 Marks]

(iii) whether or not, the function, $f(x)$ is one-to-one

[4 Marks]

(c) Given that $U = \{2, 3, 5, 7\}$, $P = \{2, 5, 7\}$, $Q' = \{2, 3, 5\}$, find:

(i) $P' \cup Q'$

(ii) $(P \cap Q)'$

(iii) the relationship between $P' \cup Q'$ and $(P \cap Q)'$

2. (a) A mother is three times as old as her daughter. Nine years ago, the mother was four times as old as her daughter. Find their ages. [4 Marks]

(b) Represent the following statements on the same Venn diagram:

(i) Every physics student studies Mathematics

(ii) No Mathematics student studies History

(iii) Kwame studies both Mathematics and Physics

(iv) Mensah studies History

(v) Quaye studies Mathematics but not Physics

[10 Marks]

(c) At a certain college, there are 7 men to every 5 women. If there are 420 more men than women, what is the total enrolment in the college? [7 Marks]

(d) Solve for the value(s) of x in $2x^2 - x - 1 = 0$ [4 Marks]

3. (a) A number is divided into two parts such that one part is ten more than the other part. If two parts are in the ratio 5:3 respectively, find the number in each part. [7 Marks]

(b) Write $0.31\bar{6}$ as a rational number in the form $\frac{a}{b}$ where a and b are real numbers such that $b \neq 0$ [5 Marks]

(c) A set of furniture costing GH¢2,400.00 was sold for GH¢3,000.00. Find the profit percent. [4 Marks]

(d) In a class, the number of students who study French and History is 40. Twenty students study both subjects. The number who study French only is ten more than those who study History only. At least one student studies one the

(i) How many students study French only?

(ii) How many students study History only?

[9 Marks]

4. (a) If $U = \{\text{Real Numbers}\}$, illustrate the following: $A = \{x \in \mathbb{R} \mid -5 < x \leq 3\}$ and $B = \{x \in \mathbb{R} \mid 1 \leq x < 8\}$ on a number line and show the following on the same number line:

(i) $P = A \cap B$

(ii) $Q = A \cup B$

(iii) $W = A' \cap B$

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(iv) For each of the sets P, Q, W , write down the truth set to describe the members of each set. [11 Marks]

(b) A woman goes for shopping to buy pens and pencils for her son. Instead of buying 3 pens and 3 pencils at a cost of GH¢62.00, she mistakenly bought 4 pens and 3 pencils at a cost of GH¢68.00. Take x cedis and y cedis to be the unit cost of pens and pencil respectively.

(i) Write down two equations involving x and y [2 Marks]

(ii) Find the cost of a pen and a pencil [4 Marks]

(c) Factorise the following:

(i) $a(b + c) - b - c$ [2 Marks]

(ii) $(m + 5)(x + 3) + m + 5(x - 10)$ [2 Marks]

(iii) $15x^{2n} + 9x^{n+1} - 3x^n$ [2 Marks]

(iv) $x^2 + 9x - 2x - 18$ [2 Marks]

5. (a) Simplify $80 \leq \frac{78+x}{2} \leq 88$ [4 Marks]

(b) A and B are subsets of a Universal set, U and $n(A) = 20, n(B) = 15$ and $n(A \cup B) = 27$. Find $n(A \cap B)$ [4 Marks]

(c) The hire purchase price of a set of furniture is GH¢900,000.00 of which 25% of GH¢900,000.00 is paid as down payment for the furniture. If the rest is spread over 12 equal monthly instalments, find:

(i) the amount deposited as down payment [2 Marks]

(ii) the remainder to be paid [2 Marks]

(iii) the amount of each instalment [1 Mark]

(d) Simplify the following:

(i) $4 \div 7 \pmod{5}$ [2 Marks]

(ii) $-10 + 4 \pmod{4}$ [3 Marks]

(e) The operation Δ is given by $a\Delta b = ab + 2$ in modulo 5

(i) Draw table for Δ on the set, $\{1, 2, 3, 5\}$ [4 Marks]

(ii) Using the table in (i), evaluate $(2\Delta 3)\Delta(3\Delta 2)$ [3 Marks]

6 (a) Due to economic hardship, the government of Ghana has imposed a 30% haircut policy on banking investments. The banks however are prepared to pay a simple interest of 18% per annum after the "haircut" on investments. Assuming an investor invested GH¢85,000.00 for 4 years in a bank, calculate his total amount after the 4-year period. [7 Marks]

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(b) Two functions f and g are given by $f(x) = \frac{3}{2x-1}$ and $g(x) = 5x + 1$. Find:

(i) the largest possible domain of f and g

[3 Marks]

(ii) range of f

[3 Marks]

(iii) $g \circ f(x)$

[3 Marks]

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