CENTER FOR TESTING & EVALUATION

UNIVERSITY OF LIBERIA
MONROVIA, LIBERIA
P.O. BOX 9020

2001/2002

UL ENTRANCE & PLACEMENT EXAMINATION

MATHEMATICS QUESTION BOOKLET

CENTER FOR TESTING & EVALUATION

UNIVERSITY OF LIBERIA
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UL ENTRANCE & PLACEMENT EXAMINATION NOVEMBER 30, 2001

Time: 2 HOURS **MATHEMATICS**

GENERAL INFORMATION

SEVEN SUBJECT AREAS IN MATHEMATICS ARE TESTED ON THIS EXAMINATION. THEY CONSIST OF ARITHMETIC, ALGEBRA, ELEMENTARY ANALYTIC GEOMETRY, ELEMENTARY PLANE GEOMETRY, TRIGONOMETRY, ELEMENTARY PROBABILITY AND ELEMENTARY STATISTICS.

DIRECTIONS:

THE MATHEMATICS PORTION OF THIS EXAMINATION CONSISTS OF TWO PARTS. PART I HAS 30 MULTIPLE CHOICE QUESTIONS. FOR THIS PART (I.E., PART I), INDICATE YOUR ANSWERS IN THE ANSWER BOOKLET BY DARKENING THE SPACE WHICH CORRESPONDS TO THE ANSWER OBTAINED.

PART II COMPRISES 10 PROBLEMS FOR WHICH ALL SOLUTIONS MUST BE WRITTEN IN THE **ANSWER BOOKLET.**

PART I: MULTIPLE CHOICE

(2 points for each correct answer)

SECTION A: ARITHMETIC **(10 points)**

*DIRECTIONS: Indicate your answers in the **Answer Booklet** by darkening the space which corresponds to the answer obtained.*

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1. ADD: 1.206 + 2.3 + 70.15 + 9.05 =

A) 82.76 B) 82.706 C) 83.707 D) 19.706

E) None of these

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2. Blamo , Wenneh and Clinton are to divide n coins among themselves. If Wenneh receives twice as many coins as Clinton and if Blamo receives twice as many coins as Wenneh, then how many coins does Clinton receive, in terms of n?

A) n/2 B) n/3 C) n/4 D) n/7 E) n/6

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3. Two numbers have the ratio 4: 3. Their sum is 70, find the numbers.

A) 60 and 10 B) 30 and 40 C) 50 and 20

D) 40 and 30 E) None of these

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4. Divide: 93.058 by 0.46

A) 201.87 B) 203.45 C) 202.3 D) 204.22 E) None of these

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5. Make R the subject of the equation : $I = E/(r + R)$

A) $R = (E - Ir) / I$ B) $R = (Ir - E)/ I$ C) $R = E/ (I - r)$

D) $R = E / (I - r)$ E) none of these

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SECTION B: **ALGEBRA (10 points)**

DIRECTIONS: *Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

6. Mary is five times as old as Sarah. In five years, Mary will be twice as old as Sarah. Which one of these equations is the most appropriate for solving this age problem ?

A) $5(5x + 5) = 3(x + 5)$ B) $5x = x + 5$
C) $5x + 5 = 3(x + 5)$ D) $5x + 5 = 3x + 5$
E) None of these

7. If $\text{Log}_{10} 2 = 0.301$, what is $\text{Log}_{10} 8$?

A) 0.923 B) 3.903 C) 2.301 D) 0.903 E) None of these

8. The University of Liberia will admit 2,700 freshmen during Ist Semester, 2001. If this intake will show an increase of 35% over the 2000 admission, what was the intake for 2000 ?

A) 1755 B) 945 C) 2000 D) 1500
E) none of these

9. Factor completely: $12 a x^3 y + 28 x^2 y^3$

A) $40ax^5y^5$ B) $4ax^2y^2(3x + 7y)$ C) $4x^2y^2(3ax + 7y)$
D) $2x^2y^2(6ax + 14y)$ E) None of these

10. Determine the solution set for : $x^2 - 7x + 12 = 0$

A) $x = -3$ or 4 B) $x = 3$ or 4 C) $x = -3$ or -4
D) $x = 3$ or 4
E) None of these

SECTION C:ELEMENTARY ANALYTIC GEOMETRY **(10 points)**

DIRECTIONS: *Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

11. Find the slope of the line segment connecting these two points : (2,3) and (5, 6).
A) 9/7 B) 2 C) -1 D) 1 E) None of these

12. Find the slope of the line segment connecting these two points :
(a, b) and **(b, a)**.
A) 1 B) -1 C) 0 D) b/a E) None of these

13. Find the distance between these two points : **(a, -b)** and **(b, -a)**.
A) 0 B) 1 C) $(a + b)\sqrt{2}$ D) $(b-a)\sqrt{2}$
E) None of these

14. Consider this equation of a Circle : $(x- 3)^2 + (y - 4)^2 = 25$. Find the measure of the radius of this circle.
A) 4 units B) 7 units C) 5 units D) 3 units
E) None of these

15. Express by an equation the fact that the distance from (x, y) to (2,3) is twice the distance from (x , y) to (3, 4).
A) $(x + 2)^2 + (y + 3)^2 = 2[(x + 3)^2 + (y + 4)^2]$
B) $(2 - x)^2 + (3 - y)^2 = 4[(3 - x)^2 + (4 - y)^2]$
C) $(2 - x)^2 + (3 - y)^2 = 2$
D) $2\sqrt{(x^2 - y^2)} = 74$
E) None of these

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SECTION D: ELEMENTARY PLANE GEOMETRY (8 points)

DIRECTIONS: *Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

16. If two parallel lines are cut by a transversal, then the corresponding angles formed are:
A) equal B) supplementary C) adjacent D) parallel
E) None of these.

17. How many sides has a regular polygon if one angle is 140^0 ?
A) 6 B) 8 C) 9 D) 7 E) None of these

18. The supplement of an angle is twice as large as the angle. Find the measure of the angle.
A) 30^0 B) 60^0 C) 90^0 D) 180^0 E) None of these

19. The complement of an angle is four times as large as the angle. Find the measure of the angle.
A) 72^0 B) 20^0 C) 180^0 D) 15^0 E) None of these

SECTION E: TRIGONOMETRY (8 points)

DIRECTIONS: *Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

20. Convert 150^0 to radian measure.
A) $5\pi/6$ B) $\pi/4$ C) $3\pi/4$ D) $\pi/2$ E) None of these

21. Convert $\pi/3$ to degree measure.
A) 30^0 B) 45^0 C) 60^0 D) 90^0 E) None of these

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22. Find the value of $\cos 30^0 + \sin 45^0$.
A) ½ B) $(\sqrt{3} + \sqrt{2})/2$ C) $\sqrt{5}/2$ D) $\sqrt{6}/2$
E) None of these

23. Let θ be a positive angle of a point T(U, V), not the origin and if $r = \sqrt{(u^2 + v^2)}$, then what trigonometric function would be described by this equation, v/r?
A) Sin θ B) Cosθ C) tangentθ D) Cotangentθ
E) None of these

SECTION F: **ELEMENTARY PROBABILITY (8 points)**
DIRECTIONS: *Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

24. Let P(A) = P(B) = 12/36 and P(A∩ B) = 4/36, find P(A∪ B).
A) 3/9 B) 1/9 C) 5/9 D) 2/9 E) None of these.

25. A die is rolled twice. Find the probability that the sum of the numbers that appear on the die is 9.
A) 1/6 B) 1/36 C) 1/9 D) 1/4 E) None of these

26. There are four empty seats in a row. In how many ways could three persons be seated in the four seats ?
A) 4 ways B) 24 ways C) 9 ways D) 14 ways E) None of these

27. A coin is tossed twice. What is the probability that at least one head occurs ?
A) 3/4 B) 5/4 C) ½ D) 1/4 E) None of these

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S: **ELEMENTARY STATISTICS** **(6 points)**

*Indicate your answers in the **ANSWER BOOKLET** by darkening the space which corresponds to the answer obtained.*

28. Two coins are tossed. What is the probability that the two coins will have two heads?
A) 3/4 B) ½ C) 1/4 D) 2/3
E) None of these

29. Compute the arithmetic mean for the following scores : 92, 86, 84, 89 and 84.
A) 8 B) 84 C) 87 D) 86 E) None of these

30. From four Grand Gedehians and three Nimbaians, find the number of committees of three that can be formed consisting of two Grand Gedehians and one Nimbaian.
A) 16 B) 18 C) 20 D) 14 E) None of these

PART II **ESSAY** **(4 marks for each item)**

DIRECTIONS: *In this section you are required to show all calculations from 31 - 40. Use the space provided in the **ANSWER BOOKLET TO SHOW ALL ESSENTIAL WORK FOR FULL MARK.***

31. Consider the following list of scores: 6 , 4, 2, 5 , and 3.
Find the a) Mean b) Variance and c) Standard Deviation

32. Show that the left hand side of this trigonometric function is equal to the right hand side : $\frac{1 + \text{Cos } x}{\text{Sin } x} + \frac{\text{Sin } x}{1 + \text{Cos } x} = 2\text{Cosec } x$

33. Find the first three terms of this expansion and simplify: $(x + y)^5$

Prove that " If one side of a triangle is extended, then the exterior angle formed equals the sum of the two remote angles.

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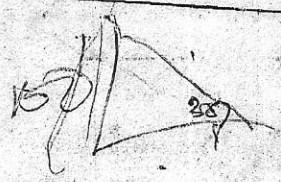
35. Identify and find the center of the given equation below:

$$\frac{(x-1)^2}{9} + \frac{(y-2)^2}{25} = 1$$

36. A guide wire makes a 37^0 angle with the ground at a point 100 meters from the foot of an electric pole. How long is the wire from each point?
[Note : Sin 37^0 = 0.618; Cos 37^0 = 0.7986, and Tan 37^0 = 0.7536]

37. Show that : $\sin 2x\,(\tan x + \cot x) = 2$



38. If $\log_7(2) = x$ and $\log_7(3) = y$, Evaluate $\log_7(18)$.

39. Two dice are tossed: a) Construct a sample space showing this experiment.
b) Compute the probability that the numbers appearing on both die are equal.

40. Given : $\triangle ABC$ with angles A, B, and C.
Prove : $\angle A + \angle B + \angle C = 180^0$.

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