KITH AND KIN INTERNATIONAL COLLEGE

7/11 Kaoli Olusanya Street, Owode Ibeshe, Ikorodu, Lagos State.

FIRST TERM EXAMINATION 2025/2026 ACADEMIC SESSION

NAME					
SUBJECT	FURTHER MATHEMATICS	CLASS	SS 1	DURATION	2½ HOUR

THEORY

(70 Marks)

INSTRUCTIONS

1. **Write your name in the space provided at the top of this question.**
2. **This paper is divided into two Parts: I and II.**
3. **Answer 10 questions; all in Part I, and 2 questions from Part II.**

PART I

Attempt **all** questions in this part. All questions carry equal marks [***40marks***]

1. A binary operation * is define on the set R, of real number by m*n= m+n+2. Find the :
   i) Identity element
   ii) Inverse element under operation * **WAEC 2016/1**

2. i) $\boldsymbol{\mathcal{U}} = \{1,2,3,4,5,6,7,8,9,10\}$
   $\boldsymbol{P} = \{1,3,4,6,10\}$
   And $\boldsymbol{Q} = \{2,3,6,9\}$
   Show that: $(\boldsymbol{P} \cup \boldsymbol{Q})' = \boldsymbol{P}' \cap \boldsymbol{Q}'$ **WAEC 2001/4**
   ii) Solve $\mathbf{2}^{(2y+1)} - \mathbf{5}(\mathbf{2}^{y}) + \mathbf{2} = \mathbf{0}$ **WAEC 2022/2**
3. i) Given that $\boldsymbol{log_3 x} - \mathbf{3}\boldsymbol{log_x 3} + \mathbf{2} = \mathbf{0}$, find the value of $\boldsymbol{x}$. **WAEC 2018/2**
   ii) If $\mathbf{2}^{\mathbf{2x}-\mathbf{3y}} = \mathbf{32}$ and $\boldsymbol{log_y x} = \mathbf{2}$, find the values of $\boldsymbol{x}$ and $\boldsymbol{y}$. ***WAEC* 2006/2**

4. A binary operation $*$ is defined on the set of rational numbers by

$$\boldsymbol{m} * \boldsymbol{n} = \frac{\boldsymbol{m}^2 - \boldsymbol{n}^2}{\mathbf{2}\boldsymbol{mn}}, \boldsymbol{m} \neq \mathbf{0} \; \boldsymbol{and} \; \boldsymbol{n} \neq \mathbf{0}$$

   (a) Find $-\mathbf{3} * \mathbf{2}$
   (b) Show whether or not $*$ is associative. ***WAEC* 2014/2**

5. i) Simplify $\frac{\sqrt{75}-3}{\sqrt{3}+1}$, leaving your answer in the form $\boldsymbol{a} + \boldsymbol{b}\sqrt{\boldsymbol{c}}$, where $\boldsymbol{a}$, $\boldsymbol{b}$ and $\boldsymbol{c}$ are rational numbers. ***WAEC* 2006/9**

   ii) The table shows the distribution of ages of workers in a company.

Age (in years)	17- 21	22 – 26	27- 31	32 - 36	37- 41	42 - 46	47 - 51	52 – 56
No. of workers	12	24	30	37	45	25	10	7

   Using an assumed mean of 39, calculate the mean. **WAEC 2007/14**

PART II

Answer only two [2] questions only in this part. [60marks]

6. In a school of 300 students, 110 offered French, 110 Hausa language, 180 History, 40 French and Hausa, 50 Hausa and History, 60 French and History while 30 did not offer any of the three subjects.
(a) Draw a Venn diagram to represent the data.
(b) Use your diagram in (a) to find the number of students who offered;
(i)all the three subjects.
(ii)History alone **WASSCE 2006/2 (10 marks)**

7. The table shows the distribution of the heights of a group of people.

Height/m	0.4 – 0.5	0.6 – 0.9	1.0 – 1.2	1.3 – 1.4	1.5 – 1.7
Number of people	2	8	12	6	6

(a) Draw a histogram to illustrate the distribution.
(b) Using an assumed mean of 1.1 m, find, correct to one decimal place, the mean height of the group.
WAEC 2015/12 (10 marks)

8. (a) A binary operation * is defined on the set of real numbers R, by $\boldsymbol{p*q = p + q - \frac{pq}{2}}$, where $\boldsymbol{p,q \in R}$. Find the inverse of -1 under * given that the identity clement is zero. **WAEC 2018/10**
(b) Given that $\left(p + \frac{1}{2\sqrt{3}}\right)(1 - \sqrt{3})^2 = 3 - \sqrt{3}$ find the value of p **WAEC 2021/3 (10 marks)**

9. a) Express $\frac{7\sqrt{2}+3\sqrt{3}}{4\sqrt{2}-2\sqrt{2}}$ in the form p + q$\sqrt{r}$, where p, q, and r, are rational numbers. **WAEC 2016**

b) Evaluate, without using tables $\log_{10} 1.44 - \log_{10} 90 + \log_{10} 0.0625$

10. (a) Without using mathematical tables or calculator, evaluate $\dfrac{\frac{3}{2}log27 - 3log5\sqrt{5}}{log0.6}$

(b) If a binary operation $*$ is defined by $x * y = x + 2y$, find $2 * (3 * 4)$
WAEC 2016/9 (10 marks)

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FIRST TERM EXAMINATION 2024/2025 ACADEMIC SESSION

NAME					
SUBJECT	FURTHER MATHEMATICS	CLASS	SS 1	DURATION	1 ½ HOUR

OBJECTIVE TEST
(40 marks)

Answer all questions: ***Each*** question is followed by ***four*** options lettered A to D. Find out the correct option for ***each*** question and ***shade in pencil*** on your answer space which bears the same letter as the option you have chosen. Give only ***one*** answer to ***each*** question.

1. If Q = (all perfect squares less than 30) and P= (all odd numbers from 1 to 10).
Find $Q \cap P$.
A. $\{1, 4, 9, 16, 25\}$
B. $\emptyset$
C. $\{1, 3, 4, 5, 7, 9, 16, 25\}$
D. $\{1, 9\}$

2. Given that P and Q are two non-empty subsets of the universal set, u.
Find P ∩ (Q ∪ Q′)
A. P′
B. P
C. Q
D. Q′

3. If P = { x: $1 \leq x \leq 6$} and Q = { x: $2 < x < 10$, and x is perfect square}, where, find P ∩ Q.
A. 8
B. 4
C. 3
D. 2

4. Which of the following sets is equivalent to $(P \cup Q) \cap (P \cup Q')$?
A. P
B. $P \cap Q$
C. $P \cup Q$
D. $\emptyset'$

5. Simplify $\frac{\sqrt{3}+\sqrt{48}}{\sqrt{6}}$
A. $3\sqrt{2}$
B. $5\sqrt{2}$
C. $\frac{5\sqrt{2}}{2}$
D. $\frac{3\sqrt{2}}{2}$

6. Which of the following operations is **not** commutative?
A. a * b = a – b + ab
B. a * b = 1/a + 1/b
C. a * b = a + b – ab
D. a * b = 2a + 2b + ab.

7. Given that p * q = $p^2 + q^2 + pq$ and p * (p + 1) = 61, find the value of p?
A. 3 or 7
B. -3 or 4
C. -4 or 5
D. -5 or 4

8. A binary operation * is defined on the set R of real numbers by $x*y = \sqrt{x + y - \frac{xy}{4}}$. Find the value of 4*3.
A. 1

B. 2
C. 8
D. 16

9. A binary operation Δ is defined on the set of real numbers, R, by a Δ b $= \frac{a-b}{\sqrt{ab}}$ where a $\neq 0$, b $\neq 0$. Evaluate $-3\ \Delta\ -1$
A. $-4\sqrt{3}$
B. $-\frac{2}{3}\sqrt{3}$
C. $-\frac{3}{4}\sqrt{3}$
D. $\frac{3}{4}\sqrt{3}$

10. Solve: $3^{2x} - 4(3^x) + 3 = 0$
A. x = 0 or 3
B. x = 0 or 1
C. x = 1 or 2
D. x = 1 or 3

11. Given that $\frac{1}{8^{2-3y}} = 2^{y+2}$, find y
A. $\frac{1}{5}$
B. 1
C. $\frac{7}{8}$
D. $1\frac{1}{5}$

12. If $log_3 a + 2 = 3log_3 b$. Express a in terms of b.
A. $a = ab^3$
B. $a = \frac{b^3}{9}$
C. $a = b^3 - 3$
D. $a = b^3 - 9$

13. Simplify $\frac{log_5 8}{log_5 \sqrt{8}}$
A. -2
B. $-\frac{1}{2}$
C. $\frac{1}{2}$
D. 2.

14. Solve the exponential equation; $2^{2x} - 6(2^x) + 8 = 0$.
A. -1 or 2
B. 1 or 2
C. -2 or 1
D. -1 or -2.

15. Simplify $log_3(x - y) = 1$ and $log_3(2x + y) = 2$, find the value of x.
A. 1
B. 2
C. 3
D. 4

16. Simplify $\frac{\sqrt{3}}{\sqrt{3}-1} + \frac{\sqrt{3}}{\sqrt{3}+1}$
A. $\frac{1}{2}$
B. $\frac{\sqrt{3}}{2}$
C. 3
D. $2\sqrt{3}$

17. If $\frac{5}{\sqrt{2}} - \frac{\sqrt{8}}{8} = m\sqrt{2}$, where m is a constant, find m.
A. $\frac{9}{2}$
B. 2
C. $\frac{7}{4}$
D. $\frac{5}{2}$

18. Solve the equation $2^7 = 8^{5-x}$.
A. $\frac{5}{8}$
B. $\frac{8}{3}$
C. $\frac{3}{2}$
D. $\frac{15}{4}$

19. Simplify $\left(\frac{16}{81}\right)^{\frac{1}{4}} \div \left(\frac{9}{16}\right)^{-\frac{1}{2}}$
A. -2
B. 2
C. $\frac{1}{2}$
D. $-\frac{1}{2}$

20. Rationalize $\frac{1}{\sqrt{2}+1}$
A. $\sqrt{2} - 1$
B. $1 - \sqrt{2}$

C. $\frac{\sqrt{2}-1}{2}$

D. $\frac{1-\sqrt{2}}{2}$

21. Simplify $\frac{\sqrt{3}+\sqrt{48}}{\sqrt{6}}$

A. $3\sqrt{2}$

B. $5\sqrt{2}$

C. $5\frac{\sqrt{2}}{2}$

D. $2\sqrt{3}$

22. Simplify $\frac{128}{\sqrt{32}-2\sqrt{2}}$.

A. $4\sqrt{2}$

B. $32\sqrt{2}$

C. 3

D. 4

23. If $3^{2x} = 27$, what is x?

A. 1

B. 1.5

C. 4.5

D. 1

24. Simplify $0.027^{-\frac{1}{3}}$

A. $3\frac{1}{3}$

B. 3

C. $\frac{3}{10}$

D. $\frac{1}{9}$

25. A binary operation $*$ is defined on the set R, of real numbers by a*b = $\frac{ab}{4}$. Find the value of $\sqrt{2} * \sqrt{6}$

A. $\sqrt{3}$

B. $\frac{3\sqrt{2}}{4}$

C. $\frac{\sqrt{3}}{2}$

D. $\frac{\sqrt{2}}{2}$

26. Without using tables, evaluate:
$(343)^{1/3} \times (0.4)^{-1} \times (25)^{-1/2}$

A. $\frac{16}{25}$

B. $\frac{10}{25}$

C. $\frac{4}{25}$

D. $\frac{14}{25}$

27. If $log_y \frac{1}{8} = 3$, find the value of y.

A. -2

B. $-\frac{1}{2}$

C. $\frac{1}{2}$

D. 2

28. Solve $\left(\frac{1}{9}\right)^{x+2} = 243^{x-2}$

A. $x = \frac{7}{6}$

B. $x = \frac{6}{7}$

C. $x = -\frac{7}{6}$

D. $x = -\frac{6}{7}$

29. If $log_a x = p$, express x in term of a and p

A. $x = u + p$

B. $x = \frac{a}{p}$

C. $x = p^a$

D. $x = a^p$

30. Evaluate:
$log_{10}\left(\frac{1}{3}+\frac{1}{4}\right) + 2log_{10}2 + log_{10}\frac{3}{7}$

A. -3

B. 0

C. $\frac{5}{6}$

D. 1

31. Simplify $\frac{1-2\sqrt{5}}{2+3\sqrt{2}}$

A. $14\left(2\sqrt{2}+6\sqrt{5}-4\sqrt{10}\right)$

B. $\frac{1}{4}\left(2-3\sqrt{2}-4\sqrt{5}-6\sqrt{10}\right)$

C. $\frac{1}{14}\left(3\sqrt{2}+4\sqrt{5}-6\sqrt{10}-2\right)$

D. $14\left(2+3\sqrt{2}-6\sqrt{5}+4\sqrt{10}\right)$

32. If $\frac{1}{5^y} = 25(5^{4-2y})$

A. 4

B. 2

C. -4

D. -5

33. Simplify $8^n \times 2^{2n} \div 4^{3n}$.
   A. 2^{1-n}
   B. 2^n
   C. 2^{n+1}
   D. 2^{-n}

34. Given that;
   $(\sqrt{3} - 5\sqrt{2})(\sqrt{3} + \sqrt{2}) = p + q\sqrt{6}$,
   find q.
   A. -4
   B. -1
   C. 4
   D. 7.

35. Given that, $log_2 y^3 = log_5 125$. Find the value of y.
   A. 3
   B. 2
   C. 5
   D. 6

8x=10

36. Evaluate: $\frac{27^{1/3}}{16^{1/4}}$
   A. 6/8
   B. 5/4
   C. 4/7
   D. 3/2

37. Solve $9^{2x+1} = 81^{3x-2}$
   A. $-\frac{5}{4}$
   B. $-\frac{2}{3}$
   C. $\frac{5}{4}$
   D. $\frac{3}{2}$

Age (years)	10 – 14	15 – 19	20 – 24	25 – 29	30 – 34
Frequency	6	8	14	10	12

The table shows the distribution of ages of members of a cultural troupe. Use this information to answer questions 39 and 40.

38. What is the class-mark of the median? class?
   A. 19
   B. 22
   C. 24
   D. 32

39. In which group is the upper quartile?
   A. $(15 - 19)$
   B. $(20 - 24)$
   C. $(25 - 29)$
   D. $(30 - 34)$

40. Find the mean of the distribution
   A. 23.4
   B. 23.6
   C. 24.3
   D. 24.6

4x+2=12x-8