301 S. H. S. C. E.
May 2013
MATHEMATICS 1 & 2
Objective and Essay Tests
3 hours

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Index Number: 111002024

THE WEST AFRICAN EXAMINATIONS COUNCIL

Senior High School Certificate Examination

MATHEMATICS

May 2013

3 hours

Do **not** *open this booklet until you are told to do so. While you are waiting, read and observe the following instructions carefully. Write your* **name** *and* **identification number** *in the space provided above.*

This paper consists of **two** *parts: Papers* **1** *and* **2**. *Answer Paper* **1** *on your Objective Test Answer Sheet and Paper* **2** *in your Answer Booklet. Paper* **1** *will last for* 1½ *hours after which the answer sheet will be collected. Do* **not** *start Paper* **2** *until you are told to do so. Paper* **2** *will last for* **1½ hours**.

PAPER 1

OBJECTIVE TEST

[40 marks]

1½ hours

1. Use **2B** pencil throughout.
2. On the objective answer sheet supplied, provide the following details **correctly**:
   (a) Supply the information required in the spaces marked *CENTER NAME, CENTER No, SCHOOL NAME* and *SCHOOL No.*
   (b) In the space marked *STUDENT'S NAME,* write your **surname** followed by your **other names.** write your *IDENTIFICATION NUMBER* in the space marked *STUDENT No.*
   (c) In the spaces marked *SUBJECT and GRADE*, write MATHEMATICS AND 12TH in that order.
   (d) In the box marked *IDENTIFICATION NUMBER*, provide your **identification number** vertically in the spaces on the left-hand side and shade each numbered space in line with each digit. This identification number must be the same as the one indicated on your Admission Slip. Repeat the process with the correct information for the box marked *YEAR OF FIRST ENTRY*.
   (e) In the box marked *Subject Code*, write the digits 301 vertically in the spaces on the left-hand side. **Shade** the corresponding numbered spaces as you did for your identification number.
3. An example is given below. This is for a male candidate whose name is Sagbeh Bondoe FANIA. His identification number is 101123456, his first entry is in 2013 and he is offering **Mathematics**.

THE WEST AFRICAN EXAMINATIONS COUNCIL-LIBERIA

PRINT IN BLOCK LETTERS

TOE-BROWNE ACADEMY (CENTER NAME)	500104 (CENTER No.)
WYNNA GAYVOLOR HIGH SCHOOL (SCHOOL NAME)	101123 (SCHOOL No.)
FANIA, Sagbeh Bondoe (STUDENT NAME)	456 (STUDENT No.)
MATHEMATICS (SUBJECT)	12TH (GRADE)

IDENTIFICATION NUMBER: 1 0 1 1 2 3 4 5 6

YEAR OF FIRST ENTRY: 2 0 1 3

SUBJECT CODE: 3 0 1

For Supervisors only. If a candidate is absent shade this space. ☐

Shade the space marked M (for Male) or F (for Female) In this box — M ■ F ☐

PAPER 1 1½ hours
OBJECTIVE TEST
[40 marks]

Answer **all** *questions.*

Paper 1 consists of ***fifty*** *questions. Each question is followed by* ***four*** *options lettered* ***A*** *to* ***D****.*
Choose the correct option for each question and shade in ***pencil*** *on your answer sheet the answer space which bears the same letter as the option you have chosen. Give only* ***one*** *answer to a question.*

An example is given below.

If one inch equals 2.54 cm, how many centimeters tall is a 76 inch man?

A. 20.28 cm
B. 29.92 cm
C. 193.04 cm
D. 300.04 cm

The correct answer is **193.04**, *which is lettered* **C**, *and therefore answer space* **C** *would be shaded.*

[A] [B] [■] [D]

Think carefully before you shade the answer spaces; erase completely any answers you wish to change.

Do all rough work on this question paper. Now answer the following questions:

1. What is the **best** estimate of the fraction

$$\frac{68.4\times123\times0.45}{7.19\times11.82}\ ?$$

A. 500
B. 300
C. 50
D. 30

2. A man paid \$31.60 sales tax when he purchased a new mower for \$395. What is the rate of sales?

A. 6%
B. $6\frac{1}{2}\%$
C. 7%
D. 8%

3. When the length of a rectangle is divided by 3 and the width is doubled, the area of the new rectangle is the area of the original one multiplied by

A. 1/6.
B. 2/3.
C. 3/2.
D. 5/2.

4. The expression $|5x-7|\leq 8$ is equivalent to

A. $-8\leq 5x-7\leq 8$.
B. $5x-7\geq 8$.
C. $5x-7\leq 8$.
D. $5x-7\leq 8$ or $5x-7\geq 8$.

5. Given the expression, $s^2=\pi r^2$, make r the subject.

A. $r=\frac{s}{\pi}$

B. $r=\sqrt{\frac{s}{\pi}}$

C. $r=\frac{s}{\sqrt{\pi}}$

D. $r=\frac{\pi}{s}$

6. If $x = \dfrac{1-\dfrac{1}{1-\dfrac{1}{3}}}{}$, solve for x.

A. 3/2
B. 2/3
C. −1/2
D. −3/2

7. Given that $A = \begin{vmatrix} 5 & 1 \\ -2 & -1 \end{vmatrix}$, find the determinant of A.

A. −3
B. −7
C. 3
D. 10

8. The fraction $\dfrac{12}{3-\sqrt{5}}$ equals _____.

A. $3+\sqrt{5}$
B. $\dfrac{3-\sqrt{5}}{4}$
C. $9-3\sqrt{5}$
D. $9+3\sqrt{5}$

9. If d, e, and f are consecutive integers, which of the following expressions is false?

A. $d + f$ is even
B. $d \times e \times f$ or def is even
C. $e + f$ is odd
D. $e \times f$ or ef is odd

10. Find $f(g(1))$ when $g(x) = \sqrt{2-x}$ and $f(x) = \dfrac{x}{2x-1}$

A. −1
B. 0
C. 1/2
D. 1

11. An artist plans to have the length of each wire in his mobile vary directly with the weight it supports. If a 10 cm wire holds a 36-g weight, how many centimeters of wire would hold a 54-g weight?

A. 9
B. 12
C. 15
D. 18

12. What is the value of a when $\dfrac{1-3i}{1-i}$ is expressed in the form $a + bi$?

A. 2
B. 1
C. −½
D. −2

13. If operation ⊕ is defined as: $a \oplus b = a^2b - ab^2$, find the value of $5 \oplus (-2)$.

A. 70
B. 30
C. −30
D. −70

14. Given $\dfrac{x}{y} = \dfrac{2}{3}$ and $\dfrac{y}{z} = \dfrac{3}{4}$, find $\dfrac{x}{z}$.

A. $\frac{1}{2}y$
B. $\frac{8}{9}$
C. $\frac{1}{2}$
D. $\frac{8}{9}y$

15. Simplify: $\sqrt{27} + \sqrt{48}$

A. $7\sqrt{3}$
B. $7\sqrt{6}$
C. $5\sqrt{3}$
D. $5\sqrt{6}$

16. If $4x + 3yi = (6 - 4i)^2$ then $x + y$ equals
A. −21.
B. −16
C. −11
D. −10

17. Simplify: $\sqrt{\frac{9x^3y^5}{8x}}$
A. $\frac{3x^2y^2\sqrt{2y}}{4}$
B. $\frac{3x^2y^2\sqrt{2y}}{8}$
C. $\frac{3xy^2\sqrt{2y}}{4}$
D. $\frac{3xy^2\sqrt{2y}}{8}$

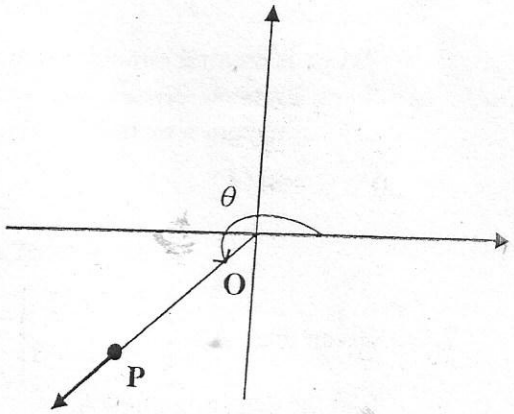
18 If $f(x) = 5x^4 - 3x^3 - x^2 + 2x + 5$, find $f(-1) - f(1)$.
A. 0
B. 1
C. 2
D. 3

19. In the formula $A = \frac{4}{3}\pi r^3$, if r is doubled, then A will be
A. multiplied by 4.
B. increased by 8.
C. increased by 4.
D. multiplied by 8.

20. If $x^2 + y^2 - 8x + 6y = 0$ is the equation of a circle with center at C and radius r, then its center and radius are
A. $C(4, -3)$ and $r = 25$.
B. $C(4, -3)$ and $r = 5$.
C. $C(-4, 3)$ and $r = 25$.
D. $C(-4, 3)$ and $r = 5$.

21. The demand (D) for a product is given by $D = 9{,}240 - 7p$, and the supply (S) of this product is given by $S = 15p$, where p is the price of the product, in dollars. If $D = S$, find p.
A. 205
B. 420
C. 616
D. 715

22. In the figure below, $\overrightarrow{OP}$ passes through the point $(-1, -1)$. What could be the measure of angle θ?



A. 125°
B. 150°
C. 195°
D. 225°

23. Which number **cannot** be the value of a probability of any event?
A. 0.01
B. 0.05
C. 1.00
D. 1.05

24. What is the sum of the series $\sum_{j=6}^{10} (3j - 2)$?
A. 82
B. 110
C. 120
D. 135

25. If $\cos A = 0.8$, and $0 < A < 90$, what is the value of $\tan A$?
A. 0.20
B. 0.50
C. 0.60
D. 0.75

26. Solve for x given $0.003x + 0.4 = 2.05$.
A. 670
B. 550
C. 650
D. 530

27. Find the area of a triangle with sides 8, 8, and 6 using Heron's formula.

A. $2\sqrt{55}$

B. $3\sqrt{55}$

C. $4\sqrt{55}$

D. $5\sqrt{55}$

28. Determine the slope **m** of the line through points (5, –7) and (–3, 9).

A. –3

B. –2

C. 2

D. 3

29. The data below represent scores earned by students in a chemistry laboratory. What is the median score?

10, 7, 5, 5, 6, 8, 9, 10, 5

A. 8

B. 7

C. 6

D. 5

30. In his will, Uncle Subah left $5000.00 to be shared between his two nephews, Sumo and Mulbah. Sumo's share is to be $500.00 less than Mulbah's share. How much should Mulbah receive?

A. $2,000.00

B. $2,250.00

C. $2,550.50

D. $2,750.00

31. Evaluate the function $f(x) = \dfrac{2x^2 - 7x}{5x - 3}$ when $x = -2$.

A. –22/13

B. –6/7

C. 6/13

D. 22/13

32. Solve for x in the expression $\dfrac{3x}{2a} + b = 3b$.

A. $4ab/3$

B. $3ab/4$

C. $3ab/2$

D. $2ab/3$

33. Factorize completely: $x^2 - 2x + 1 - a^2$.

A. $(x - a + 1)(x - a - 1)$

B. $(x + a + 1)(x - a - 1)$

C. $(x + a - 1)(x - a + 1)$

D. $(x + a - 1)(x - a - 1)$

34. Add 54_{eight} and 67_{eight} giving the answer in base eight.

A. 113

B. 123

C. 143

D. 153

35. If $\log_3 0.\overline{3} = x$, find x.

A. 11

B. 1

C. –1

D. –11

36. The stopping distance of a car after the brakes have been applied varies directly as the square of the speed v. If a car traveling 60mph can stop at 200ft., how fast can a car travel and still be able to stop at 72ft when the brakes are applied?

A. 10 mph

B. 12 mph

C. 25 mph

D. 36 mph

37. What is the **smallest** number by which $3 \times 3 \times 7$ can be multiplied to make a perfect square?

A. 7

B. 4

C. 3

D. 2

38. If $x + \dfrac{1}{x} = 3$, then $x^2 + \dfrac{1}{x^2} =$

A. 3

B. 5

C. 7

D. 9

39. What is the fourth proportional to a^3, ab, and $5a^2b$?

A. $5b$

B. $5b^2$

C. $5a^4$

D. $5a^6b^2$

Turn over

40. A man borrowed \$800.00 and agreed to pay back \$960.00 in 5 years. What was his rate of interest?
A. 2.4%
B. 4.0%
C. 16.67%
D. 24%

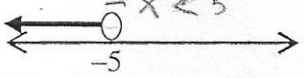
41. Flomo sold his computer for \$2,700.00 and made 10% loss. What was his loss?
A. \$243.00
B. \$270.00
C. \$300.00
D. \$400.00

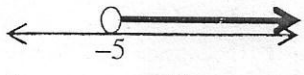
42. Given that x varies directly as the square of m, and $x = 40$ when $m = 5$. Find x when $m = 4$.
A. 10
B. 25.6
C. 32
D. 62.5

43. Simplify: $\{7 - [3 + 2(1 - (5 - 3)) - 4] + 2\}$
A. –12
B. –10
C. 10
D. 12

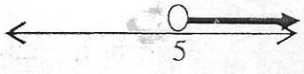
44. Musa is hired by Sarah to sell used shoes and he is paid on a commission basis. If he sells \$7,500.00 worth of shoes and receives 15% commission, what would be the net proceed?
A. \$1,125.00
B. \$5,375.00
C. \$6,375.00
D. \$8,625.00

45. Find the value of k so that when $x^3 + kx^2 - 4x + (3 - k)$ is divided by $x - 2$, the remainder is zero.
A. –1
B. –3
C. 1
D. 3

46. Find the graph of the solution set of $2x - 7 < 5x + 8$.
A.


B.


C.


D.


47. Find the last term of the sequence $a, a + 4, a + 8, a + 12, \ldots$, to 15 terms.
A. $a + 46$
B. $a + 56$
C. $a + 66$
D. $2a + 56$

48. Find the equation of the line passing through the point (2, –5) with slope equal to zero.
A. $y = -5$
B. $y = 5$
C. $2x - 5y = 0$
D. $5x + 2y = 0$

49. How many different sets of 4 students can be chosen out of 17 qualified students to represent a school in a mathematics contest?
A. 2,380
B. 5,712
C. 23,800
D. 57,120

50. Using 45° and 30°, find the value of cos 15° without using calculator.
A. $\frac{\sqrt{6} + \sqrt{2}}{4}$
B. $\frac{\sqrt{6} + \sqrt{2}}{2}$
C. $\frac{\sqrt{6} - \sqrt{2}}{4}$
D. $\frac{\sqrt{6} - \sqrt{2}}{2}$

STOP!

END OF OBJECTIVE TEST

DO NOT TURN OVER THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

YOU WILL BE SEVERELY PENALIZED IF YOU ARE FOUND LOOKING AT THE NEXT PAGE BEFORE YOU ARE TOLD TO DO SO.

PAPER 2
ESSAY
[60 marks] 1½ hours

Paper 2 consists of **two** *sections,* **A & B.** *Section* **A** *has* **four** *compulsory questions and section* **B** *has* **three** *questions for which you are required to answer any* **two.**
Write your answers in **ink** *(blue or black)* **only.**
For **each** *question, all necessary details of working including diagrams must be shown with the answer.*
The use of silent, cordless, non-programmable calculators is allowed:
Credit will be given for clarity of expression and orderly presentation of material.

SECTION A
COMPULSORY
[36 marks]

Answer **all** *the questions in this section.*

1. (*a*) If $x{:}y = 9{:}1$, evaluate $\frac{11x + y}{x + y}$.

   (*b*) Solve for a in the equation $\frac{1}{3 - a} - \frac{1}{3} + \frac{4}{2a - 5} = 0.$

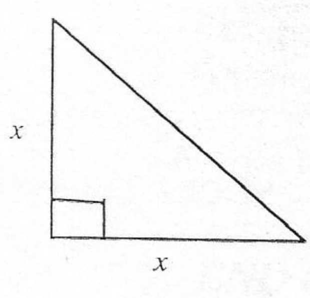
2. (*a*) Find the values of x and y if $x^2 - y^2 = 15$ and $x - y = 3$.

   (*b*) If x varies inversely as the square of y, and $x = 4$ when $y = \frac{1}{2}$, what is y when x is 5

3. (*a*) A fair die is thrown. Find the probability of getting
   (i) a four;
   (ii) an even number; and
   (iii) a number less than five.

   (*b*) The ages of four members of a family are consecutive odd integers. If the average of their ages is 40, find the age of the youngest.

4. The perimeter of an isosceles triangle shown in the diagram below is $(4 + 2\sqrt{2})$cm.
   (i) Calculate the measure of its hypotenuse.
   (ii) Find the value of x.



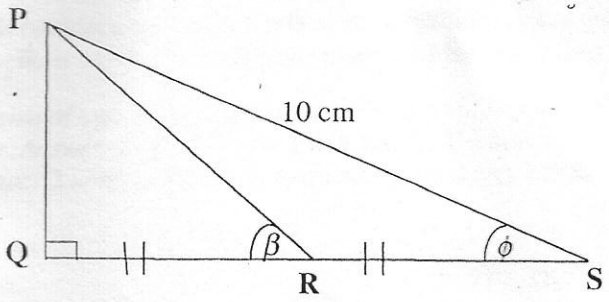
SECTION B
[24 marks]

Answer any **two** *questions in this section.*

5. In the diagram below, $\overline{QS}$ is a straight line, $\overline{PS} = 10$cm and $\overline{QR} = \overline{RS}$. Given that $sin\emptyset = \frac{3}{5}$ find

(*a*) $\overline{RS}$;

(*b*) $\sin \beta$.

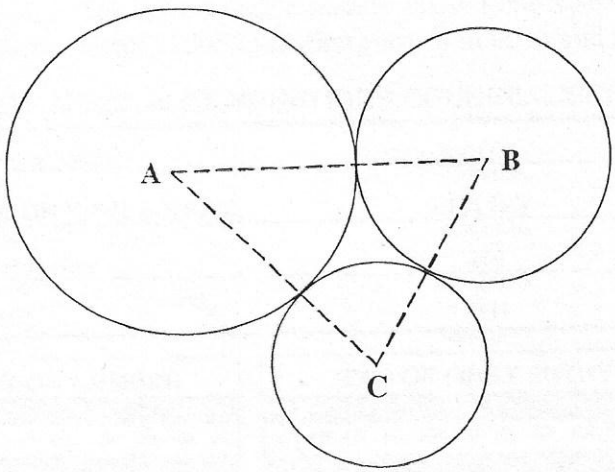


6. Siakor has a box with a volume of 48 cubic inches. The sides of the box are in the ratio 3:2:1 and form a rectangle. Calculate the

(*a*) lengths of the three sides;

(*b*) surface area of the box.

7. The diagram below shows three circles which touch each other externally. If the centers of the circles at points *A*, *B*, and *C* form a triangle with sides of length 9 cm, 7 cm and 6 cm, calculate the radii of the circles.



END OF PAPER