

03003/2&1 BECE

June 2023

MATHEMATICS 2&1

Essay and Objective

2 hours

2&1

Name.....

Index Number.....

THE WEST AFRICAN EXAMINATIONS COUNCIL
GHANA

Basic Education Certificate Examination

June 2023

MATHEMATICS 2 & 1

Essay and Objective

2 hours

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

This booklet consists of two papers. Answer Paper 2 which comes first, in your answer booklet and Paper 1 on your Objective Test answer sheet. Paper 2 will last **1** hour after which the answer booklet will be collected. Do **not** start Paper 1 until you are told to do so. Paper 1 will last **1** hour.

The use of calculators is **not** allowed.

Essay

Answer **four** questions **only**.

All questions carry equal marks.

All working must be clearly shown. Marks will **not** be awarded for correct answers without corresponding working.

1. (a) Given the sets $A = \{\text{multiples of 3 less than 12}\}$, $B = \{\text{integers between 4 and 8}\}$ and $C = \{4, 5, 7\}$, find:
- $A \cap B$;
 - $(A \cup B) \cap C$;
 - $(A \cap B) \cup C$.
- (b) Simplify: $1\frac{3}{4} - 2\frac{5}{6} - 1\frac{9}{10} + 4\frac{7}{8}$.
2. (a) Simplify: $15(4 - 6) \times 49 \div 7$.
- (b) Expand and simplify: $b(12a - 3) - (a - b)(3 + b)$.
- (c) Akosua walked for 3 hours at the rate of $1\frac{1}{2}$ km per hour from her village to Paamu to take a bus to Quamu. If the bus travelling at $15\frac{1}{2}$ km per hour takes 2 hours to travel from Paamu to Quamu,
- what is the distance from Akosua's village to Quamu?
 - how long would it take a man, riding a bicycle at 5 km per hour, to travel from Akosua's village to Quamu?
3. (a) (i) Express $8 \times 32 \times 4 \times 2$ in the form 2^m .
- (ii) Using your answer in (a)(i), state the value of m .
- (b) (i) Factorize the expression $\pi n^2 k - \frac{1}{4} \pi n^2 Q$.
- (ii) Use your answer in (b)(i) to find the value of the expression when $\pi = \frac{22}{7}$, $n = 2$, $k = 19$ and $Q = 20$.
- (c) Gifty and Justina shared an amount of GH¢ 418.00. If Gifty had 20% more than Justina, how much did Justina receive?
4. (a) If $4m - 2(3 + 2m) + m(2m + 4) = 0$, find the values of m .
- (b) At a political rally, there were 240 women, 200 men, 160 boys and 120 girls.
- Draw a pie chart to illustrate the information.
 - What percentage of the people at the rally were females?

5. Madam Esi used $\frac{1}{4}$ and $\frac{2}{3}$ of her x acres of land to cultivate mangoes and oranges respectively.
- Express, in term of x , the number of acres of the land she used to cultivate:
 - mangoes;
 - oranges.
 - If madam Esi used 20 more acres of land to cultivate oranges than mangoes, find the value of x .
 - How many acres of land was used to cultivate mangoes?
 - Calculate, correct to the nearest whole number, the percentage of the land that was not used.
6. (a) Using a scale of 2 cm to 2 units on both axes, draw on a graph sheet two perpendicular axes, Ox and Oy , for the interval $-10 \leq x \leq 10$ and $-10 \leq y \leq 10$.
- (b) On the same graph sheet, draw:
- a quadrilateral $ABCD$ with vertices $A(2, 4)$, $B(2, 8)$, $C(8, 8)$ and $D(8, 4)$;
 - the image $A_1B_1C_1D_1$ of $ABCD$ under a translation by vector $\begin{pmatrix} -5 \\ -2 \end{pmatrix}$, where $A \rightarrow A_1$, $B \rightarrow B_1$, $C \rightarrow C_1$ and $D \rightarrow D_1$;
 - the image $A_2B_2C_2D_2$ of $ABCD$ under a reflection in the y -axis, where $A \rightarrow A_2$, $B \rightarrow B_2$, $C \rightarrow C_2$ and $D \rightarrow D_2$.
- (c) (i) What type of quadrilateral is $ABCD$?
- (ii) Find the gradient of $\overline{A_2B_1}$.

END OF ESSAY TEST

Answer all questions.

Each question is followed by four options lettered A to D. Find 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 each question. An example is given below.

If $3n + 2 = 8$, find the value of n .

- A. 10
- B. 6
- C. 3
- D. 2

The correct answer is 2, which is lettered D and therefore answer space D would be shaded.

A B C 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. Simplify: $(x - 1)^2 - 1$.

- A. $x^2 - 2x$
- B. $x^2 - 2x + 1$
- C. $x^2 - 2x - 1$
- D. $x^2 + 2x$

2. Which of the following is **not** an integer?

- A. 1
- B. -5
- C. 0.5
- D. 0

3. A quadrilateral with one pair of opposite sides parallel is called a

- A. trapezium.
- B. kite.
- C. square.
- D. rectangle.

4. Factorize $2pq + 6p - 6q - 18$.

- A. $2(p - 3)(q - 3)$
- B. $2(p - 3)(q + 3)$
- C. $2(p + 3)(q - 3)$
- D. $2(p + 3)(q + 3)$

5. Find the vector which translates the point (2, 6) to (5, 4).

A. $\begin{pmatrix} 3 \\ -2 \end{pmatrix}$

B. $\begin{pmatrix} 7 \\ 10 \end{pmatrix}$

C. $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$

D. $\begin{pmatrix} -1 \\ 4 \end{pmatrix}$

6. Find the image of the point $S(-2, 2)$ when it is reflected in the y -axis.

A. (2, 2)

B. (2, -2)

C. (-2, 2)

D. (-2, -2)

7. Which of the following is an **even** prime number?

A. 1

B. 8

C. 4

D. 2

8. Tony shared $\frac{2}{3}$ of his plot of land equally among his three sons. What fraction of the plot did **each** get?

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

B. $\frac{5}{9}$

C. $\frac{2}{9}$

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

9. Kobby is 5 years older than his brother. If Kobby is 13 years old, how old is his brother?
- 8 years
 - 10 years
 - 18 years
 - 7 years

10. Simplify: $(1\frac{1}{2} - \frac{5}{6}) \times \frac{9}{10}$.

- $\frac{3}{20}$
- $\frac{1}{5}$
- $\frac{1}{10}$
- $\frac{3}{5}$

The stem and leaf plot shows the marks scored by students in a French test. Use the information to answer questions 11 to 13.

Stem	leaf
2	0 2 5 7 8
3	2 7 9
4	3 5 5 5
5	4 6 6 8
6	3 5 7
7	0 6

11. How many students took the test?
- 20
 - 22
 - 21
 - 27
12. Find the median mark.
- 54
 - 47
 - 76
 - 45
13. What is the modal mark?
- 45
 - 35
 - 76
 - 56

14. John walks for $22\frac{1}{2}$ minutes and runs for $7\frac{1}{2}$ minutes to school. What percentage of the total time does he spend walking?
- A. 75 %
B. 25 %
C. 30 %
D. 33 %
15. If $2n - 5 = \frac{1}{2}n$, find the value of n .
- A. $\frac{1}{3}$
B. $2\frac{1}{2}$
C. $3\frac{1}{3}$
D. $\frac{1}{2}$
16. Write 0.01723 in standard form.
- A. 0.01723×10^{-2}
B. 0.01723×10^2
C. 1.723×10^2
D. 1.723×10^{-2}
17. A straight line passes through the points $P(-5, -3)$ and $Q(-4, -7)$. Find the gradient of the line PQ .
- A. 4
B. -4
C. $-\frac{1}{4}$
D. $\frac{1}{4}$
18. A book was sold for GH¢ 48.00 at a profit of 20 %. Find the cost price.
- A. GH¢ 40.00
B. GH¢ 57.60
C. GH¢ 60.00
D. GH¢ 38.40
19. Araba and Ama share 20 oranges in such a way that Ama receives 12 oranges. Find the ratio of Araba's share to that of Ama.
- A. 3 : 2
B. 2 : 3
C. 2 : 5
D. 3 : 5

20. Convert 12.03 metres to centimetres.

- A. 0.1203 cm
- B. 120.3 cm
- C. 12030 cm
- D. 1203 cm

21. Find the rule for the mapping:

x	1	2	3	4	5
\downarrow	\downarrow	\downarrow	\downarrow	\downarrow	\downarrow
y	4	2	0	-2	-4

- A. $y = 2x + 2$
- B. $y = -2x + 2$
- C. $y = 4x$
- D. $y = -2x + 6$

22. Arrange the following numbers in ascending order: $\frac{9}{5}$, 1.88, $\frac{15}{8}$.

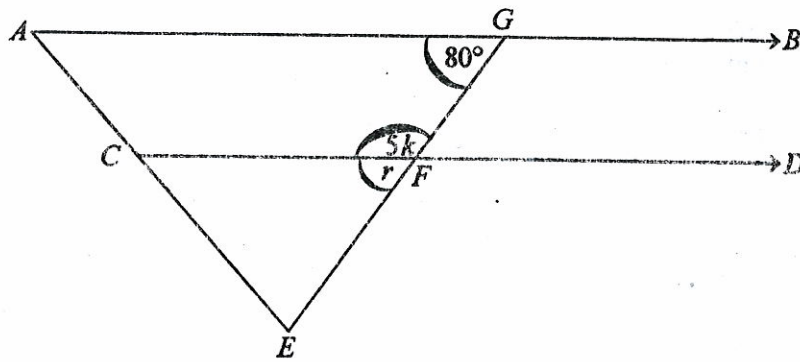
- A. $\frac{9}{5}$, $\frac{15}{8}$, 1.88
- B. $\frac{15}{8}$, 1.88, $\frac{9}{5}$
- C. 1.88, $\frac{9}{5}$, $\frac{15}{8}$
- D. $\frac{9}{5}$, 1.88, $\frac{15}{8}$

23. Cement and sand were mixed in the ratio 2 : 5. How many kilograms of cement was contained in the 35 kg of the mixture?

- A. 7 kg
- B. 88 kg
- C. 14 kg
- D. 10 kg

24. A bag contains 20 oranges of which 6 are bad. Find the probability of picking a good orange from the bag.

- A. $\frac{1}{20}$
- B. $\frac{1}{6}$
- C. $\frac{3}{10}$
- D. $\frac{7}{10}$



NOT DRAWN TO SCALE

In the diagram, AB is parallel to CD . Angle AGE is 80° , angle $CFG = 5k$ and angle $CFE = r$.
Use the information to answer questions 25 and 26.

25. Find the value of k .

- A. 16°
- B. 20°
- C. 80°
- D. 160°

26. What is the value of r ?

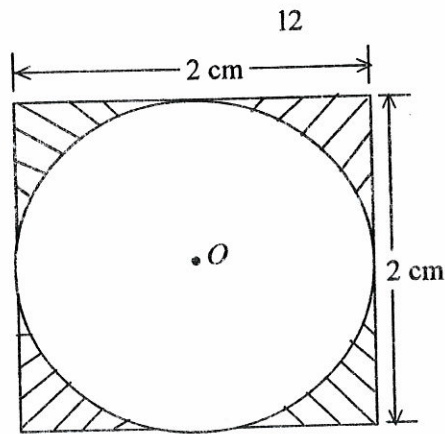
- A. 160°
- B. 80°
- C. 20°
- D. 16°

27. Solve: $3(x - 2) - \frac{x}{3} + 6 > 0$.

- A. $x < 0$
- B. $x > 0$
- C. $x > \frac{1}{8}$
- D. $x > 3$

28. Expand $(x - 2)(x + 4)$.

- A. $x^2 - x - 8$
- B. $x^2 + 2x - 8$
- C. $x^2 - 4x - 8$
- D. $x^2 + 2x + 8$



NOT DRAWN TO SCALE

The diagram is a square of side 2 cm in which is inscribed a circle with centre O . Use the information to answer questions 29 and 30.

29. Find the area of the circle. [Take $\pi = \frac{22}{7}$]
- A. 3.14 cm^2
 B. 4.00 cm^2
 C. 6.28 cm^2
 D. 12.56 cm^2
30. Find the area of the shaded portion.
- A. 0.86 cm^2
 B. 3.00 cm^2
 C. 6.28 cm^2
 D. 12.56 cm^2
31. If $n(E) = 15$, $n(F) = 20$ and $n(E \cap F) = 6$, find $n(E \cup F)$.
- A. 21
 B. 29
 C. 26
 D. 35
32. What is the value of $3x^2 + 2x - 7$ when $x = -3$?
- A. 14
 B. -40
 C. -33
 D. 26
33. The height of a cylinder is 5 cm and the radius is 7 cm. Find the volume of the cylinder. [Take $\pi = \frac{22}{7}$]
- A. 700 cm^3
 B. 154 cm^3
 C. 770 cm^3
 D. 110 cm^3

34. Given that 1 kilometre = $\frac{5}{8}$ mile, what is 240 miles in kilometres?
- A. 384 km
B. 190 km
C. 150 km
D. 390 km
35. If $\mathbf{q} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$ and $\mathbf{r} = \begin{pmatrix} 3 \\ -2 \end{pmatrix}$ find $\mathbf{q} - \mathbf{r}$.
- A. $\begin{pmatrix} -5 \\ 5 \end{pmatrix}$
B. $\begin{pmatrix} 5 \\ 5 \end{pmatrix}$
C. $\begin{pmatrix} -1 \\ 1 \end{pmatrix}$
D. $\begin{pmatrix} 1 \\ 1 \end{pmatrix}$
36. What is the actual bearing of $S 25^\circ E$?
- A. 035°
B. 065°
C. 115°
D. 155°
37. Find the simple interest on GH¢ 350.00 for 4 years at 5 % per annum.
- A. GH¢ 140.00
B. GH¢ 20.00
C. GH¢ 70.00
D. GH¢ 35.00
38. A man can take 12 hours to do a piece of work. How long will it take 6 men working at the same rate to do the work?
- A. 6 hours
B. 3 hours
C. 2 hours
D. 72 hours

39. Simplify: $\frac{5^7 \times 5^{-4}}{5^3}$.

- A. 0
- B. 25
- C. 1
- D. 5

40. Given that $m = \frac{b}{2} - t$, make t the subject.

A. $t = \frac{b - 2m}{2}$

B. $t = \frac{2m - b}{2}$

C. $t = \frac{2b - m}{2}$

D. $t = \frac{b + 2m}{2}$

END OF PAPER