P4011 Nov.
WASSCE 2011
FURTHER MATHEMATICS/ MATHEMATICS (ELECTIVE) 1
Objective Test
$1\frac{1}{2}$ hours

1

Name:.....

Index Number:.....

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination

November 2011 FURTHER MATHEMATICS/MATHEMATICS (ELECTIVE) 1 $1\frac{1}{2}$ hours

OBJECTIVE TEST

[50 marks]

Do **not** *open this booklet until you are told to do so. While you are waiting, write your* **name** *and* **index number** *in the spaces provided at the top right-hand corner of this booklet and thereafter, read the following instructions carefully.*

1. Use **HB pencil** throughout.
2. If you have got a blank answer sheet, complete its top section as follows.
   (a) In the space marked *Name,* write in capital letters your **surname** followed by your **other names.**
   (b) In the spaces marked *Examination, Year, Subject* and *Paper,* write **'WASSCE', '2011 NOV.', 'FURTHER MATHEMATICS/MATHEMATICS (ELECTIVE)'** and **'1'**, respectively.
   (c) In the box marked *Index Number,* write your **index number** vertically in the spaces on the left-hand side. There are numbered spaces in line with each digit. Shade carefully the space with the same number as each digit.
   (d) In the box marked *Subject Code,* write the digits **401112** in the spaces on the left-hand side. Shade the corresponding numbered spaces in the same way as for your index number.
   (e) In the box marked *Sex,* shade the space marked **M** if you are **male,** or **F** if you are **female.**
3. If you have got a pre-printed answer sheet, check that the details are correctly printed, as described in **2** above. In the boxes marked *Index Number, Paper Code* and *Sex,* **reshade** each of the shaded spaces.
4. An example is given below. This is for a ***male*** candidate, whose ***name*** is **Chukwuma Adekunle CIROMA**, whose *index number* is **5251102068** and who is offering **Further Mathematics/ Mathematics (Elective) 1**.

THE WEST AFRICAN EXAMINATIONS COUNCIL

PRINT IN BLOCK LETTERS

Name: CIROMA (Surname) CHUKWUMA ADEKUNLE (Other Names) Examination: WASSCE Year: 2011 NOV.

Subject: FURTHER MATHEMATICS/MATHEMATICS [ELECTIVE] Paper: 1

INDEX NUMBER

5	0 1 2 3 4 **5** 6 7 8 9
2	0 1 **2** 3 4 5 6 7 8 9
5	0 1 2 3 4 **5** 6 7 8 9
1	0 **1** 2 3 4 5 6 7 8 9
1	0 **1** 2 3 4 5 6 7 8 9
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2	0 1 **2** 3 4 5 6 7 8 9
0	**0** 1 2 3 4 5 6 7 8 9
6	0 1 2 3 4 5 **6** 7 8 9
8	0 1 2 3 4 5 6 7 **8** 9

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

PAPER CODE

4	0 1 2 3 **4** 5 6 7 8 9
0	**0** 1 2 3 4 5 6 7 8 9
1	0 **1** 2 3 4 5 6 7 8 9
1	0 **1** 2 3 4 5 6 7 8 9
1	0 **1** 2 3 4 5 6 7 8 9
2	0 1 **2** 3 4 5 6 7 8 9

SEX

Indicate your sex by shading the space marked M (for Male) or F (for Female) in this box: M **■** F ☐

INSTRUCTIONS TO CANDIDATES

1. Use grade **HB pencil** throughout.
2. Answer each question by choosing one letter and shading it like this: [A] [B] [C] [■]
3. Erase completely any answers you wish to change.
4. Leave extra spaces blank if the answer spaces provided are more than you need.
5. Do not make any markings across the heavy black marks at the right-hand edge of your answer sheet.

4. If $\frac{1}{x^2 - 2x - 3} \equiv \frac{P}{x + 1} + \frac{Q}{x - 3}$, find the value of $(P + 2Q)$.

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

B. $-\frac{1}{4}$

C. 0

D. $\frac{1}{4}$

5. The 3rd, 4th and 5th terms of an exponential sequence are x, y and z respectively. Which of the following statements is **true**?

A. $3x = 20yz$

B. $x^2 = yz$

C. $y^2 = xz$

D. $z^2 = xy$

6. If $\cos \theta = x$, $0^\circ < \theta < 90^\circ$, find the value of $\tan^2 \theta$.

A. $\frac{\sqrt{1 - x^2}}{x}$

B. $\sqrt{1 - x^2}$

C. $\frac{1}{x^2} - 1$

D. $\frac{1 - x^2}{x}$

4. If $\frac{1}{x^2 - 2x - 3} \equiv \frac{P}{x + 1} + \frac{Q}{x - 3}$, find the value of $(P + 2Q)$.

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

B. $-\frac{1}{4}$

C. 0

D. $\frac{1}{4}$

5. The 3rd, 4th and 5th terms of an exponential sequence are x, y and z respectively. Which of the following statements is **true**?

A. $3x = 20yz$

B. $x^2 = yz$

C. $y^2 = xz$

D. $z^2 = xy$

6. If $\cos \theta = x$, $0^o < \theta < 90^o$, find the value of $\tan^2 \theta$.

A. $\frac{\sqrt{1 - x^2}}{x}$

B. $\sqrt{1 - x^2}$

C. $\frac{1}{x^2} - 1$

D. $\frac{1 - x^2}{x}$

7. Solve for x: $3^{5x-\frac{1}{2}} - 1 = 0$

A. -0.5

B. 0.1

C. 0.5

D. 2.5

8. Given that $\mathbf{M} = \begin{pmatrix} 0 & 2 \\ 2 & 1 \end{pmatrix}$ and $\mathbf{N} = \begin{pmatrix} 0 & 2 \\ 2 & -1 \end{pmatrix}$, find $(2\mathbf{M} - \mathbf{N})$.

A. $\begin{pmatrix} 0 & 2 \\ 2 & -3 \end{pmatrix}$

B. $\begin{pmatrix} 0 & 2 \\ 2 & -1 \end{pmatrix}$

C. $\begin{pmatrix} 0 & 2 \\ 2 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 0 & 2 \\ 2 & 3 \end{pmatrix}$

9. If $f: x \to x^2 - 1$ and $g: x \to 3x + 1$, find $f \circ g(x)$ when $x = 2$.

A. 3

B. 6

C. 10

D. 48

13. If α and β are the roots of $2x^2 - x - 2 = 0$, find the value of $\left(\frac{1}{2\alpha} + \frac{1}{2\beta}\right)$.

A. -1

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

C. $-\frac{1}{3}$

D. $-\frac{1}{4}$

14. If the coefficient of x^2 in the expansion of $(1 + 3x)^n$ is 324, find the value of n.

A. 6

B. 7

C. 8

D. 9

15. Solve: $x^2 > x$.

A. $x < 0$

B. $x > 0$

C. $0 < x < 1$

D. $x < 0$ or $x > 1$

16. If the mean of the numbers 5, 8, x, 12, $(x + 5)$ and 10 is 10, find x.

A. 6

B. 8

C. 10

D. 60

17. How many five-digit **even** numbers **greater than** 50,000 can be formed from the set $S = \{1, 2, 3, 4, 5\}$ if repetition is **not** allowed?

A. 5

B. 12

C. 24

D. 120

The table shows the marks obtained by 100 pupils in a test.

Marks	1 – 5	6 – 10	11 – 15	16 – 20	21 – 25	26 – 30
Frequency	5	12	8	48	17	10

Use this information to answer Questions **18** *and* **19**.

18. What is the upper class boundary of the class containing the 40th percentile?

A. 13

B. 15.5

C. 18

D. 20.5

19. Find the probability that a pupil selected at random had a mark of **at most** 15.

A. 0.08

B. 0.17

C. 0.25

D. 0.75

20. If $\mathbf{r} = (a\boldsymbol{i} - 5\boldsymbol{j})$ and $\mathbf{n} = (3\boldsymbol{i} + 12\boldsymbol{j})$ are perpendicular, find the value of a.

A. -20

B. -15

C. 3

D. 20

21. Calculate the mean deviation of 1, 2, 3 and 4.

A. 0.5

B. 1.0

C. 1.5

D. 2.0

22. The position vectors of P and Q are $\begin{pmatrix}1\\5\end{pmatrix}$ and $\begin{pmatrix}4\\8\end{pmatrix}$ respectively. If R is the midpoint of $\overrightarrow{OQ}$ where O is the origin, find $\overrightarrow{PR}$.

A. $\begin{pmatrix}4\\8\end{pmatrix}$

B. $\begin{pmatrix}3\\3\end{pmatrix}$

C. $\begin{pmatrix}1\\-1\end{pmatrix}$

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

23. A beam of mass 0.5 *kg* has two forces 10 *N* and 15 *N* hung at its ends. Find the force that will be required to keep the beam in equilibrium. [Take $g = 10\ ms^{-2}$]

A. 25 *N*

B. 25.5 *N*

C. 30 *N*

D. 30.5 *N*

A body of mass 25 *kg* and moving with a velocity 15 ms^{-1} collides with another body of mass 15 *kg* and moving with a velocity of 5 ms^{-1} in the opposite direction.

Use this information to answer Questions **24** *and* **25**.

24. What is the momentum after collision?

A. 300 $kg\ ms^{-1}$

B. 350 $kg\ ms^{-1}$

C. 400 $kg\ ms^{-1}$

D. 450 $kg\ ms^{-1}$

25. If the two bodies moved together for 5 seconds after impact, what will be the retardation that will bring them to stop?

A. $1.5\ ms^{-2}$

B. $2.5\ ms^{-2}$

C. $3.4\ ms^{-2}$

D. $4.3\ ms^{-2}$

26. Two forces, (10 N, 150°) and (8 N, 330°), act at a point. Find the magnitude of the resultant of their horizontal components.

A. 1 N

B. 3 N

C. 4 N

D. 5 N

27. If $\overrightarrow{VW}$ and $\overrightarrow{XY}$ are two vectors such that $\overrightarrow{VW} = 4\overrightarrow{XY}$, then

A. V, W, X, Y are vertices of a parallelogram.

B. $\overrightarrow{VW} = 4\overrightarrow{YX}$.

C. $\overrightarrow{VW}$ is perpendicular to $\overrightarrow{WY}$.

D. $\overrightarrow{VW}$ is parallel to $\overrightarrow{XY}$.

28. A die is tossed twice. What is the probability of obtaining a total of 6?

A. $\frac{1}{12}$

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

C. $\frac{5}{36}$

D. $\frac{11}{36}$

29. If $\begin{pmatrix} 2 & 4 \\ 3 & z \end{pmatrix} + \begin{pmatrix} x & y \\ 3 & 4 \end{pmatrix} = \begin{pmatrix} 4 & -4 \\ w & 0 \end{pmatrix}$, find (w, x, y, z).

A. $(6, -2, -8, -4)$

B. $(6, 2, -8, -4)$

C. $(6, 2, -8, 4)$

D. $(6, 4, -4, 0)$

30. Evaluate $\int_0^1 \frac{3 - 3x^2}{x + 1} dx$.

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

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

C. 3

D. $4\frac{1}{2}$

31. Which of the following is a point of intersection of the curve $y = 3x^2 + 15x + 5$ and the line $y = 5x + 2$?

A. $(-3, -13)$

B. $(-3, 13)$

C. $\left(\frac{1}{3}, -\frac{11}{3}\right)$

D. $\left(\frac{1}{3}, \frac{11}{3}\right)$

32. A body is thrown vertically upwards with a velocity of 60 ms^{-1}. Neglecting air resistance, calculate the maximum height reached. [Take $g = 10\ ms^{-2}$]

A. $6\sqrt{5}\ m$

B. $36\ m$

C. $180\ m$

D. $360\ m$

33. Find the equation of the normal to the curve $y = 3x^3 - 5x^2$ at the point where $x = 1$.

A. $x - y - 3 = 0$

B. $x - y + 1 = 0$

C. $x - y + 3 = 0$

D. $x + y + 1 = 0$

34. Given that $\sin(\alpha \pm \beta) = \sin\alpha\cos\beta \pm \cos\alpha\sin\beta$, evaluate $\sin(30^\circ + \theta) + \sin(30^\circ - \theta)$.

A. $\sin\theta$

B. $\cos\theta$

C. $\sqrt{3}\sin\theta$

D. $\sqrt{3}\cos\theta$

35. In a class of 25 students, 6 study Mathematics, 14 study Biology and 3 study both subjects. What is the probability that a student selected at random does **not** study any of the two subjects?

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

B. $\frac{8}{25}$

C. $\frac{1}{5}$

D. $\frac{3}{25}$

36. Find the equation of the line which passes through the midpoint of the line joining the points (1, 2) and (2, –3) and perpendicular to the line $3x + 2y - 5 = 0$.

A. $4x - 6y - 12 = 0$

B. $4x - 6y - 9 = 0$

C. $4x + 6y - 12 = 0$

D. $4x + 6y - 9 = 0$

37. A bullet of mass 200 g is fired with a velocity 200 ms^{-1} into a stationary wooden block of mass 760 g. Find the common velocity with which the bullet and the block move, if the bullet got stuck in the wood.

A. 41.67 ms^{-1}

B. 45.13 ms^{-1}

C. 51.28 ms^{-1}

D. 52.60 ms^{-1}

38. Which of the following can be used to estimate the mode and the median of a distribution?

A. Ogive

B. Bar chart

C. Histogram

D. Pie chart

39. If ${}^{10}C_4 = {}^{10}C_{n-1}$, find the value of n.

A. 6

B. 7

C. 8

D. 9

40. Find the minimum value of $x^2 + 2x - 6$.

A. -7

B. -6

C. -5

D. -4