

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.

- Use **HB pencil** throughout.
- If you have got a blank answer sheet, complete its top section as follows.
 - In the space marked *Name*, write in capital letters your **surname** followed by your **other names**.
 - In the spaces marked *Examination, Year, Subject* and *Paper*, write 'WASSCE', '2011 NOV.', 'FURTHER MATHEMATICS/MATHEMATICS (ELECTIVE)' and '1', respectively.
 - 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.
 - 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.
 - In the box marked *Sex*, shade the space marked **M** if you are **male**, or **F** if you are **female**.
- 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.
- 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 CHUKWUMA ADEKUNLE Examination: WASSCE Year: 2011 NOV.
Surname Other Names

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
0	0 1 2 3 4 5 6 7 8 9
2	0 1 2 3 4 5 6 7 8 9
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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: <input type="checkbox"/> M <input type="checkbox"/> F

INSTRUCTIONS TO CANDIDATES

- Use grade **HB pencil** throughout.
- Answer each question by choosing one letter and shading it like this: [A] [B] [C]
- Erase completely any answers you wish to change.
- Leave extra spaces blank if the answer spaces provided are more than you need.
- 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. $\frac{1}{4}$

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

- 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 $f: x \rightarrow x^2 - 1$ and $g: x \rightarrow 3x + 1$, 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.

<i>Marks</i>	1 – 5	6 – 10	11 – 15	16 – 20	21 – 25	26 – 30
<i>Frequency</i>	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 $\mathbf{r} = (ai - 5j)$ and $\mathbf{n} = (3i + 12j)$ 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 $g = 10 \text{ ms}^{-2}$]

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, $(10 \text{ N}, 150^\circ)$ and $(8 \text{ N}, 330^\circ)$, 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 \vec{VW} and \vec{XY} are two vectors such that $\vec{VW} = 4\vec{XY}$, then
- A. V, W, X, Y are vertices of a parallelogram.
- B. $\vec{VW} = 4\vec{YX}$.
- C. \vec{VW} is perpendicular to \vec{WY} .
- D. \vec{VW} is parallel to \vec{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. $(\frac{1}{3}, -\frac{11}{3})$

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

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

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

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