PC4011
WASSCE 2022
FURTHER MATHEMATICS/
MATHEMATICS (ELECTIVE)1
Objective Test
1½ hours

1

Name...

Index Number...

THE WEST AFRICAN EXAMINATIONS COUNCIL

West African Senior School Certificate Examination
for Private Candidates

PC 2022   FURTHER MATHEMATICS/ MATHEMATICS (ELECTIVE) 1   1½ hours

OBJECTIVE TEST

[40 marks]

*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 **index number** in the spaces provided above.*

*Answer **all** the questions on your Objective Test answer sheet.*

1.   Use **2B** pencil throughout.

2.   On the pre-printed answer sheet, check that the following details are **correctly** printed:

   (*a*)   In the space marked *Name*, check your **surname** followed by your **other names**.

   (*b*)   In the spaces marked *Examination,Year, Subject* and *Paper*, check 'WASSCE', 'PC 2022', 'FURTHER MATHEMATICS/ MATHEMATICS (ELECTIVE)', and '1' in that order.

   (*c*)   In the box marked *Index Number,* your **index number** has been printed vertically in the spaces on the left-hand side, and each numbered space has been shaded in line with each digit. **Reshade** each of the shaded spaces.

   (*d*)   In the box marked *Subject Code*, the digits 401112 are printed vertically in the spaces on the left-hand side. **Reshade** the corresponding numbered spaces as you did for your index number.

3.   An example is given below. This is for a female candidate whose *name* is Sherifa Ama BADU. Her *index number* is 7102143958 and she is offering *Further Mathematics/Mathematics(Elective)* 1

THE WEST AFRICAN EXAMINATIONS COUNCIL
ANSWER SHEET

PRINTED IN BLOCK LETTERS. Name:	BADU SHERIFA AMA	GHA

Examination: **WASSCE**   Year: **PC 2022**

Subject: **FURTHER   MATHS. / MATHS. (ELECTIVE)**   Paper: **1**

INSTRUCTIONS TO CANDIDATES
1. Use grade 2B pencil throughout.
2. Answer each question by choosing one letter and shading it like this: cAⁿ ■ cCⁿ cDⁿ cEⁿ
3. Erase completely any answer 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.

INDEX NUMBER		SUBJECT CODE	
7	c0ⁿ c1ⁿ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ ■ c8ⁿ c9ⁿ	4	c0ⁿ c1ⁿ c2ⁿ c3ⁿ ■ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
1	c0ⁿ ■ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ	0	■ c1ⁿ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
0	■ c1ⁿ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ	1	c0ⁿ ■ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
2	c0ⁿ c1ⁿ ■ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ	1	c0ⁿ ■ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
1	c0ⁿ ■ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ	1	c0ⁿ ■ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
4	c0ⁿ c1ⁿ c2ⁿ c3ⁿ ■ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ	2	c0ⁿ c1ⁿ ■ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ
3	c0ⁿ c1ⁿ c2ⁿ ■ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ c9ⁿ		
9	c0ⁿ c1ⁿ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ c8ⁿ ■		
5	c0ⁿ c1ⁿ c2ⁿ c3ⁿ c4ⁿ ■ c6ⁿ c7ⁿ c8ⁿ c9ⁿ		
8	c0ⁿ c1ⁿ c2ⁿ c3ⁿ c4ⁿ c5ⁿ c6ⁿ c7ⁿ ■ c9ⁿ		

For Supervisors only
If candidate is absent shade this space.   [   ]

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Answer **all** *the 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.*

The ages in years, of four boys are 10, 12, 14 and 16. What is the mean age of the boys?

A. 12 years

B. $12\frac{1}{2}$ years

C. 13 years

D. $13\frac{1}{2}$ years

The correct answer is 13 years which is lettered C, *and therefore answer space* C *would be shaded.*

[A]   [B]   [◼C◼]   [D]

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

Do **all** *rough work on this question paper.*

Now answer the following questions.

1. The binary operation * and Δ are defined on the set of real numbers, R, by $m * n = m^2 + n^2$ and $p \, \Delta \, q = \dfrac{p}{q}$, where $m, n, p, q \in R$.

   Evaluate $(6 * 7) \, \Delta \, (10 \, \Delta \, 2)$.

   A. 85

   B. 34

   C. 30

   D. 17

2. Express sin 105° in surd form (radicals).

   A. $\frac{1}{4}\left(\sqrt{3}+\sqrt{2}\right)$

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

   C. $\frac{1}{4}\left(\sqrt{2}+\sqrt{6}\right)$

   D. $\frac{1}{4}\left(\sqrt{2}-\sqrt{6}\right)$

3. Simplify: $(1 + 2\sqrt{3})^2 - (1 - 2\sqrt{3})^2$.

   A. $8\sqrt{3}$

   B. $4\sqrt{3}$

   C. $-4\sqrt{3}$

   D. $-8\sqrt{3}$

4. Find the remainder when $f(x) = x^3 - 4x^2 - 7x + 10$ is divided by $(x + 3)$.

   A. 32

   B. 20

   C. -20

   D. -32

5. Find the image of $(3, -5)$ under the transformation $p: (x, y) \to (x + 2y, -2x - 4y)$.

   A. $(-6, 20)$

   B. $(-7, 14)$

   C. $(6, 20)$

   D. $(7, -14)$

ggghhh

6. If $kx^2 - 12x + k = 0$ has equal roots, find the values of k.

   A. ± 9

   B. ± 6

   C. ± 3

   D. ± 2

7. Find the range of values of x for which $-x + 2 > 0$ and $-2x - 5 < 3$.

   A. $-4 < x < -2$

   B. $-4 < x < 2$

   C. $-2 < x < 4$

   D. $2 < x < 4$

8. If $\begin{vmatrix} x-2 & 3 \\ 4 & 5 \end{vmatrix} = 8$, find the value of x.

   A.   6

   B.   5

   C.   4

   D.   3

9. Given that $f : x \to \dfrac{x+p}{x-3}$, $x \neq 3$, where p is a constant and $f(5) = \dfrac{3}{2}$, find the value of p.

   A. -3

   B. -2

   C.   2

   D.   3

10. The midpoint of the line joining P(-7, 3) and Q(11, 15) is M(2, $3x$). Find the value of x.

    A.   12

    B.   9

    C.   6

    D.   3

11. Given that $y^2 = x^2 - 3x + 9$, find the value of $\dfrac{dy}{dx}$ at $(0, -3)$.

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

    B. $\dfrac{1}{4}$

    C. $-\dfrac{1}{4}$

    D. $-\dfrac{1}{2}$

12. Given that the lines $3x - 2y - 19 = 0$ and $5x + 7y + 20 = 0$ intersect at the point P, find the coordinates of P.

    A. $(-5, -3)$

    B. $(-5, 3)$

    C. $(3, -5)$

    D. $(3, 5)$

13. Given that $16^{\log_2 x} \div 4^{\log_2 y} = 1$, express y in terms of x.

    A. $y = \pm\sqrt{x}$

    B. $y = \pm x\sqrt{x}$

    C. $y = x^2$

    D. $y = x^3$

14. A sphere of mass 10 kg moving with velocity of 6.4 ms^{-1} collides with another sphere of mass 6 kg moving in the same direction with a velocity of u ms^{-1}. After collision, both spheres move with velocity of 7 ms^{-1}. Find the value of u.

    A.   9

    B.   8

    C.   7

    D.   6

Turn Over

15. A body whose weight is 100 N is placed on a smooth plane inclined at $60°$ to the horizontal. Calculate the acceleration of the body along the plane. [Take $g = 10\ ms^{-2}$]

A. $50\sqrt{3}\ ms^{-2}$

B. $50\sqrt{2}\ ms^{-2}$

C. $5\sqrt{3}\ ms^{-2}$

D. $5\sqrt{2}\ ms^{-2}$

16. Find the direction of the force $F = (-\sqrt{12}\,i - 2j)\ N$.

A. $120°$

B. $150°$

C. $210°$

D. $240°$

17. Differentiate $\dfrac{x^2}{(2x+1)}$ with respect to x.

A. $\dfrac{x+1}{(2x^2+1)^2}$

B. $\dfrac{1}{(2x^2+1)}$

C. $\dfrac{2x^2}{(2x+1)^2}$

D. $\dfrac{2x(x+1)}{(2x+1)^2}$

18. Consider the statements:
p: Charles is brilliant
q: Charles is regular in class
Which of the following represents $\sim q \Rightarrow \sim p$?

A. Charles is not brilliant implies he is not regular in class

B. Charles is not regular in class implies he is not brilliant

C. Charles is not brilliant and regular in class

D. Charles is regular in class and dull

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19. The table shows the distribution of marks obtained by students in a Physics test.

Marks	10-19	20-29	30-39	40-49	50-59	60-69
Frequency	4	6	12	4	8	6

Find the lower class boundary of the modal class.

A. 39.5

B. 38.5

C. 30.5

D. 29.5

20. Find the coordinates of the centre of the circle $2x^2 + 2y^2 - 6x + 8y = 15$.

A. $\left(\dfrac{3}{2}, 2\right)$

B. $\left(\dfrac{3}{2}, -2\right)$

C. $\left(-\dfrac{3}{2}, 2\right)$

D. $\left(-\dfrac{3}{2}, -2\right)$

21. If α and β are the roots of $4x^2 + x - 4 = 0$, evaluate $\dfrac{1}{\alpha^2} + \dfrac{1}{\beta^2}$.

A. $-\dfrac{33}{16}$

B. $-\dfrac{31}{16}$

C. $\dfrac{31}{16}$

D. $\dfrac{33}{16}$

22. Find the number of terms in the exponential sequence (G. P.): $\dfrac{1}{2}, \dfrac{1}{4}, \dfrac{1}{8}, ..., \dfrac{1}{512}$.

   A.   7

   B.   8

   C.   9

   D.   10

23. If $W = \{x : 2x + 1 \geq 5\}$ and $Y = \{x : 2x - 1 < 5\}$, where $x \in R$, find $(W \cap Y)$.

   A. $\{x : 2 \leq x \leq 3\}$

   B. $\{x : 2 \leq x < 3\}$

   C. $\{x : 2 < x \leq 3\}$

   D. $\{x : 2 < x < 3\}$

24. Find the coefficient of the fifth term in the Binomial expansion of $(2 - x)^6$ in ascending powers of x.

   A.   60

   B.   12

   C. -12

   D. -60

25. Given that $\sin x = \dfrac{4}{5}$, where $0° < x < 90°$, find the value of $\cos 2x$.

   A. $\dfrac{18}{25}$

   B. $\dfrac{7}{25}$

   C. $-\dfrac{7}{25}$

   D. $-\dfrac{18}{25}$

26. A ball is thrown vertically upwards with a velocity of $50 \ ms^{-1}$. Calculate the maximum height reached.   [Take $g = 10 \ ms^{-2}$]

   A. $100 \ m$

   B. $125 \ m$

   C. $150 \ m$

   D. $250 \ m$

27. Given that the sum of the first n terms of a sequence is $S_n = 2n^2 + 5$, find its nth term.

   A. $2n^2 - 4n + 7$

   B. $2 - 4n$

   C. $4n - 2$

   D. $4n + 2$

28. Find the area between the curve $y = 2x^2 - x$, the x-axis and the ordinates $x = 0$ and $x = 4$.

   A. $50\dfrac{2}{3}$ square units

   B. $34\dfrac{2}{3}$ square units

   C. $34\dfrac{1}{3}$ square units

   D. $50\dfrac{1}{3}$ square units

29. The probabilities that two athletes, X and Y, will win a gold medal in a competition are 0.65 and 0.75 respectively. Find the probability that **at least** one of them will win a gold medal.

   A.   0.7125

   B.   0.8825

   C.   0.9025

   D.   0.9125

30. If two functions f and g are defined by $f : x \rightarrow \sin x$ and $g : x \rightarrow \sqrt{1 - x^2}$, find $g \circ f(x)$.

   A. $\sin^2 x$

   B. $\cos x$

   C. $\sec x$

   D. $\tan x$

Turn Over

6

31. Given that forces $F_1 = \begin{pmatrix} 8 \\ -2 \end{pmatrix}$, $F_2 = \begin{pmatrix} 3 \\ 3 \end{pmatrix}$

and $F_3 = \begin{pmatrix} -1 \\ 4 \end{pmatrix}$, find the magnitude of the

resultant force.

A. 15 N

B. 13 N

C. $5\sqrt{5}\,N$

D. $4\sqrt{5}\,N$

ggghhh

32. If the coefficient of the 5th term in the binomial

expansion of $(1 + kx)^8$ in the ascending powers

of x is $\dfrac{35}{8}$, find the value of k.

A. -2

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

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

D. 2

33. Given that $\dfrac{1}{(x-2)(x^2+1)} \equiv \dfrac{k}{(x-2)} + \dfrac{mx+n}{(x^2+1)}$,

find the values of k, m and n.

A. $k = -\dfrac{1}{5}, m = \dfrac{1}{5}, n = \dfrac{2}{5}$

B. $k = -\dfrac{1}{5}, m = -\dfrac{1}{5}, n = -\dfrac{2}{5}$

C. $k = -\dfrac{1}{5}, m = \dfrac{1}{5}, n = -\dfrac{2}{5}$

D. $k = \dfrac{1}{5}, m = -\dfrac{1}{5}, n = -\dfrac{2}{5}$

34. The scores obtained by 10 students in a test are
3, 6, 7, 8, 2, 5, 9, 4, 1 and 10. If the mean is 5.5,
find the standard deviation.

A. 2.25

B. 2.87

C. 3.15

D. 3.59

35. If $\dfrac{2^{3n+4} + 8^{n+1}}{2^n \times 2^{n+1}} = \dfrac{3}{8}$, find the value of n.

A. -5

B. -2

C. 2

D. 5

36. In how many ways can 8 students be seated on a
bench, if only 3 seats are available?

A. 56

B. 120

C. 336

D. 840

37. Given that $x = -7i + 6j$, $y = 10i - 11j$ and

$p(x - y) = \dfrac{1}{2}\begin{pmatrix} 51 \\ -51 \end{pmatrix}$, find the value of p.

A. $\dfrac{3}{2}$

B. $\dfrac{2}{3}$

C. $-\dfrac{2}{3}$

D. $-\dfrac{3}{2}$

ggghhh

38. If $f^1(x) = x^3 - \dfrac{4}{x^5}$ and $f(1) = 4$, find $f(x)$.

A. $f(x) = \dfrac{x^4}{4} + \dfrac{1}{x^4} + \dfrac{11}{4}$

B. $f(x) = \dfrac{x^4}{4} + \dfrac{1}{x^4} - \dfrac{11}{4}$

C. $f(x) = \dfrac{x^4}{4} - \dfrac{1}{x^4} - \dfrac{11}{4}$

D. $f(x) = \dfrac{x^4}{4} - \dfrac{1}{x^4} + \dfrac{11}{4}$

39. In how many ways can **five** boys be chosen from a class of **twenty** boys, if the class prefect must be included?

A. 15504

B. 11128

C. 4845

D. 3876

40. A box contains 2 green and 3 blue identical cards. If 3 cards are selected at random from the box **without** replacement, find the probability that **at least** one must be green.

A. 0.6

B. 0.7

C. 0.8

D. 0.9

ggghhh

END OF PAPER

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