FURTHER MATHEMATICS PAPER 1
0775

GOVERNMENT BILINGUAL HIGH SCHOOL YAOUNDE

MOCK GCE

APRIL 2021 ADVANCED LEVEL

Centre Number	
Centre Name	
Candidate Identification No.	
Candidate Name	

Mobile phones are NOT allowed in the examination room.

MULTIPLE CHOICE QUESTION PAPER

One and a half hours

INSTRUCTIONS TO CANDIDATES

Read the following instructions carefully before you start answering the questions in this paper. Make sure you have a soft HB pencil and an eraser for this examination.

1. USE A SOFT HB PENCIL THROUGHOUT THE EXAMINATION.
2. DO NOT OPEN THIS BOOKLET UNTIL YOU ARE TOLD TO DO SO

Before the examination begins:

3. Check that this booklet is headed **Advanced Level – 0775 Further Mathematics 1.**
4. Fill in the information required in the spaces above.
5. Fill in the information required in the spaces provided on the answer sheet using your HB pencil.
6. Answer **ALL the 50** questions in this examination. All questions carry equal marks.
7. Calculators are allowed.
8. Each question has FOUR suggested answers: A, B, C, and D. Decide which answer is appropriate.
9. Mark only one answer for each question. If mark more than one answer, you will score a zero for that question. If you change your mind about an answer, erase the first mark carefully, then mark your new answer.
10. Avoid spending too much time on any one question. If you find a question difficult, move on to the next question. You can come back to this question later.
11. Do all rough work in this booklet using the blank spaces in the question booklet.
12. At the end of the examination, the invigilator shall collect the answer sheet first and then the question booklet. **DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.**

TURN OVER

1. $\int_0^x \cosh 4x dx =$

A $\frac{1}{4}\sinh 4x + k$

B $-\frac{1}{4}\sinh 4x + k$

C $-\frac{1}{4}\sinh 4x$

D $\frac{1}{4}\sinh 4x$

2. The angle between $\mathbf{i}$ and $\mathbf{i} - \mathbf{k}$ is

A 90^0

B 60^0

C 45^0

D 30^0

3. The invariant point of the transformation $w = \dfrac{z - i}{1 + i}$ is

A -1

B $-i$

C i

D 1

4. The integrating factor of the differential equation

$x\dfrac{dy}{dx} + 2y = \sin x$ is

A $2x$

B x^2

C e^{2x}

D e^{x^2}

5. The point of the polar curve $r = \sin\theta$ at which the tangent is perpendicular to the initial line is

A $(0, 0)$

B $(\frac{1}{2}, \frac{\pi}{6})$

C $(\frac{\sqrt{2}}{2}, \frac{\pi}{4})$

D $(\frac{\sqrt{3}}{2}, \frac{\pi}{3})$

6. Given that the set $\{1, -1, i, -i\}$ under multiplication in $\mathbb{C}$ is a group, then the inverse of i is

A 1

B -1

C i

D $-i$

7. If the period of a compound pendulum is $\dfrac{\pi}{2}\sqrt{\dfrac{a}{g}}$, then the length of the equivalent simple pendulum is

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

B $\frac{1}{4}a$

C $\frac{1}{8}a$

D $\frac{1}{16}a$

8. The converse of the statement $p \Rightarrow q$ is

A $\sim p \Rightarrow q$

B $q \Rightarrow p$

C $\sim q \Rightarrow p$

D $\sim q \Rightarrow \sim p$

9. The work done by a force $\mathbf{F}$ in displacing a particle by $\mathbf{d}$ is

A $\mathbf{F} \cdot \mathbf{d}$

B $\mathbf{F} \times \mathbf{d}$

D $|\mathbf{F} \times \mathbf{d}|$

10. One of the solutions of the linear congruence $2x + 5 \equiv 2(\text{mod } 7)$ is

A 3

B 4

C 5

D 9

11. The value of $[4.9] + [-2.1]$ where $[x]$ denotes the greatest integer function is

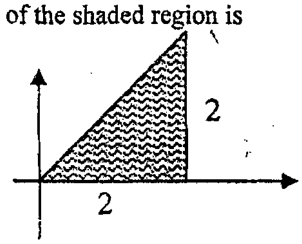
A 3

B 2.8

C 2

D 1

12. By using a Theorem of Pappus or otherwise, the distance from the $x-$ axis of the centroid of the shaded region is



A $\frac{2}{3}\pi$

B $\frac{4}{3}\pi$

C $\frac{8}{3}\pi$

D $\frac{16}{3}\pi$

13. The first three terms that approximate the expansion of $\ln(4 + 2x)$ in ascending powers of x is

A $\frac{1}{2}x - \frac{1}{8}x^2 - \frac{1}{24}x^3$

B $\frac{1}{2}x + \frac{1}{8}x^2 + \frac{1}{24}x^3$

C $\ln 4 - \frac{1}{2}x - \frac{1}{8}x^2$

D $\ln 4 + \frac{1}{2}x - \frac{1}{8}x^2$

14. If X is a random variable such that $E(X) = 3$, then $E(2X - 1) =$

A 5

B 6

C 11

D 12

15. A particle moving with velocity $(\mathbf{i} - \mathbf{j})\text{ms}^{-1}$ receives an impulse, I, which changes its velocity to $(\mathbf{j} + \mathbf{k})\text{ms}^{-1}$. The value of I is

A $(\mathbf{i} - 2\mathbf{j} + \mathbf{k})$Ns

B $(-\mathbf{i} - 2\mathbf{j} - \mathbf{k})$Ns

C $(\mathbf{i} + \mathbf{k})$Ns

D $(\mathbf{i} + 2\mathbf{j} + \mathbf{k})$Ns

16. The eccentricity, e, of a rectangular hyperbola is

A $e = 0$

B $0 < e < 1$

C $e = 1$

D $e = \sqrt{2}$

17. A reduction formula for $I_n = \int_1^e x(\ln x)^n dx,\ n \geq 1$, is

A $2I_n = e^2 - I_{n-1}$

B $2I_n = e^2 - nI_{n-1}$

C $I_n = e^2 - I_{n-1}$

D $I_n = e^2 - nI_{n-1}$

18. A particle P moves with constant angular speed w on the curve with polar equation $r = ae^{\theta}$. The transverse component of the velocity of P is

C $\quad \omega e^{\theta}$

D $\quad ae^{\theta}$

19. Given that $\frac{dy}{dx}+3y=0$ and that $y=2$ when $x=0$, the quadratic approximation for y is

A $\quad 2+6x-18x^2$

B $\quad 2-6x+18x^2$

C $\quad 2+6x-9x^2$

D $\quad 2-6x+9x^2$

20. $\cosh(\ln 4)=$

A $\quad \frac{17}{4}$

B $\quad \frac{15}{4}$

C $\quad \frac{17}{8}$

D $\quad \frac{15}{8}$

21. $\frac{2x^3}{(x-1)^2}\equiv px+q+\frac{r}{x-1}+\frac{s}{(x-1)^2}$, $p,q,r,s\in\mathbb{R}$. The values of p and q respectively are

A $\quad$ 2, 4

B $\quad$ 2, -4

C $\quad$ 2, 8

D $\quad$ 2, -8

22. The number of divisors (factors) of 252 is

A $\quad$ 16

B $\quad$ 17

C $\quad$ 18

D $\quad$ 19

23. The period of the damped harmonic motion defined by $\frac{d^2x}{dt^2}+4\frac{dx}{dt}+8x=0$, is

A $\quad \frac{1}{2}\pi$

B $\quad \pi$

C $\quad 2\pi$

D $\quad 4\pi$

24. Two asymptotes to the curve $y=\frac{x^3+1}{x^2+x}$ are

A $\quad x=-1, y=x+1$

B $\quad x=-1, y=x-1$

C $\quad x=1, y=x-1$

D $\quad x=-1, y=x-1$

25. The cofactor of 3 in the matrix T, $T=\begin{pmatrix}9&3&5\\-1&7&4\\6&0&2\end{pmatrix}$ is

A $\quad$ --26

B $\quad$ −12

C $\quad$ 12

D $\quad$ 26

26. Which one of the following series is convergent

A $\quad \sum_{r=1}^{\infty} r(\frac{3}{r}+2)$

B $\quad \sum_{r=0}^{\infty}\frac{1}{2^{-r}}$

C $\quad \sum_{r=1}^{\infty}\frac{1}{5^r+1}$

D $\quad \sum_{r=1}^{\infty}(-1)^{r+1}$

27. Given that the truth value of statement p is True (T) and the truth value of statement q is False (F), which one of the compound statements below has truth value T.

A $\quad p\vee q$

B $\quad p\vee \sim q$

C $\quad p\Rightarrow q$

D $\quad p\Leftrightarrow q$

28. If ae^{-4x} is a particular integral of the differential equation $\frac{d^2y}{dx^2}+\frac{dy}{dx}-2y=5e^{-4x}$ then the value of a is

A $\quad 2$

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

C $\quad -\frac{1}{2}$

D $\quad -2$

29. Which one of the polar curves is symmetric about the initial line?

A $\quad r=a(1+\cos\theta)$

B $\quad r=a\sin\theta$

C $\quad r=a\sin 3\theta$

D $\quad r=a(1+2\sin\theta)$

30. The value of k for which the function $f(x)$, is continuous at $x=0$, where $f(x)=\begin{cases}\frac{\sin 3x}{x}, & x<0\\ \frac{x^2+k}{1-k}, & x\geq 0\end{cases}$, is

A $\quad \frac{3}{4}$

B $\quad \frac{4}{3}$

C $\quad \frac{1}{2}$

D $\quad \frac{3}{2}$

31. Using Simpson's rule with 3 ordinates, $\int_0^2 4^x\,dx=$

A $\quad \frac{25}{3}$

B $\quad 11$

C $\quad \frac{25}{2}$

D $\quad \frac{33}{2}$

32. Which one of the following is a suitable substitution to evaluate $\int\frac{dx}{\sqrt{3+4x^2}}$.

A $\quad 2x=\sqrt{3}\tan u$

B $\quad 2x=\sqrt{3}\sinh u$

C $\quad 2x=\sqrt{3}\cosh u$

D $\quad 2x=\sqrt{3}\tanh u$

33. If the Cartesian coordinates of points O, P, Q, and R are $(0,0,0)$, $(2,0,1)$, $(3,1,2)$ and $(-1,3,0)$ respectively, then the volume of the tetrahedron $OPQR$ is

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

B $\quad \frac{2}{3}$

C $\quad 2$

D $\quad 4$

34. If $f(x)=\begin{cases}k(3-x), & x=0,1,2\\ 0, & \text{elsewhere}\end{cases}$

1. $\int_0^x \cosh 4x dx =$

A $\frac{1}{4}\sinh 4x + k$

B $-\frac{1}{4}\sinh 4x + k$

C $-\frac{1}{4}\sinh 4x$

D $\frac{1}{4}\sinh 4x$

2. The angle between $\mathbf{i}$ and $\mathbf{i} - \mathbf{k}$ is

A 90^0

B 60^0

C 45^0

D 30^0

3. The invariant point of the transformation $w = \frac{z-i}{1+i}$ is

A -1

B $-i$

C i

D 1

4. The integrating factor of the differential equation

$x\frac{dy}{dx} + 2y = \sin x$ is

A $2x$

B x^2

C e^{2x}

D e^{x^2}

5. The point of the polar curve $r = \sin\theta$ at which the tangent is perpendicular to the initial line is

A $(0, 0)$

B $(\frac{1}{2}, \frac{\pi}{6})$

C $(\frac{\sqrt{2}}{2}, \frac{\pi}{4})$

D $(\frac{\sqrt{3}}{2}, \frac{\pi}{3})$

6. Given that the set $\{1, -1, i, -i\}$ under multiplication in $\mathbb{C}$ is a group, then the inverse of i is

A 1

B -1

C i

D $-i$

7. If the period of a compound pendulum is $\frac{\pi}{2}\sqrt{\frac{a}{g}}$, then the length of the equivalent simple pendulum is

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

B $\frac{1}{4}a$

C $\frac{1}{8}a$

D $\frac{1}{16}a$

8. The converse of the statement $p \Rightarrow q$ is

A $\sim p \Rightarrow q$

B $q \Rightarrow p$

C $\sim q \Rightarrow p$

D $\sim q \Rightarrow \sim p$

9. The work done by a force $\mathbf{F}$ in displacing a particle by $\mathbf{d}$ is

A $\mathbf{F} \cdot \mathbf{d}$

B $\mathbf{F} \times \mathbf{d}$

D $|\mathbf{F} \times \mathbf{d}|$

10. One of the solutions of the linear congruence $2x + 5 \equiv 2 (\text{mod } 7)$ is

A 3

B 4

C 5

D 9

11. The value of $[4.9] + [-2.1]$ where $[x]$ denotes the greatest integer function is

A 3

B 2.8

C 2

D 1

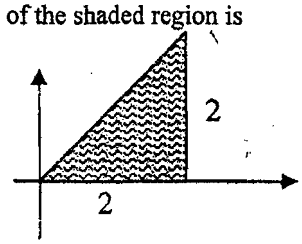
12. By using a Theorem of Pappus or otherwise, the distance from the $x-$ axis of the centroid of the shaded region is

A $\frac{2}{3}\pi$

B $\frac{4}{3}\pi$

C $\frac{8}{3}\pi$

D $\frac{16}{3}\pi$



13. The first three terms that approximate the expansion of $\ln(4 + 2x)$ in ascending powers of x is

A $\frac{1}{2}x - \frac{1}{8}x^2 - \frac{1}{24}x^3$

B $\frac{1}{2}x + \frac{1}{8}x^2 + \frac{1}{24}x^3$

C $\ln 4 - \frac{1}{2}x - \frac{1}{8}x^2$

D $\ln 4 + \frac{1}{2}x - \frac{1}{8}x^2$

14. If X is a random variable such that $E(X) = 3$, then $E(2X - 1) =$

A 5

B 6

C 11

D 12

15. A particle moving with velocity $(\mathbf{i} - \mathbf{j})\text{ms}^{-1}$ receives an impulse, I, which changes its velocity to $(\mathbf{j} + \mathbf{k})\text{ms}^{-1}$. The value of I is

A $(\mathbf{i} - 2\mathbf{j} + \mathbf{k})$Ns

B $(-\mathbf{i} - 2\mathbf{j} - \mathbf{k})$Ns

C $(\mathbf{i} + \mathbf{k})$Ns

D $(\mathbf{i} + 2\mathbf{j} + \mathbf{k})$Ns

16. The eccentricity, e, of a rectangular hyperbola is

A $e = 0$

B $0 < e < 1$

C $e = 1$

D $e = \sqrt{2}$

17. A reduction formula for $I_n = \int_1^e x(\ln x)^n dx$, $n \geq 1$, is

A $2I_n = e^2 - I_{n-1}$

B $2I_n = e^2 - nI_{n-1}$

C $I_n = e^2 - I_{n-1}$

D $I_n = e^2 - nI_{n-1}$

18. A particle P moves with constant angular speed w on the curve with polar equation $r = ae^{\theta}$. The transverse component of the velocity of P is

is a probability mass function of X, then the value of k is

A $-\frac{1}{6}$

B 0

C $\frac{1}{6}$

D 6

...iven that the structure $(\{a,b,c,d,e,f\},\otimes)$ is a group with identity element e. Which one of the following structures is a subgroup?

A $(\{a,b\},\otimes)$

B $(\{a,b,c,e\},\otimes)$

C $(\{a,c,f\},\otimes)$

D $(\{a,d,e\},\otimes)$

36. Given the complex number $z = \cos\theta + i\sin\theta$, the expression for $z^4 + z^2 - z^{-2} + z^{-4}$ is

A $2i\cos 4\theta + 2i\sin 2\theta$

B $2i\cos 4\theta + 2\sin 2\theta$

C $2\cos 4\theta + 2i\sin 2\theta$

D $2\cos 4\theta + 2\sin 2\theta$

37. The second non-zero terms in the Maclaurin's series expansion of $\sinh 3x$ is

A $27x^3$

B $-27x^3$

C $\frac{9}{2}x^3$

D $-\frac{9}{2}x^3$

38. The Cartesian equation of the midpoint M of $P(4t, \frac{1}{t})$ and $Q(t, \frac{4}{t})$ as t varies is

A $xy = 1$

B $xy = 16$

C $xy = 25$

D $4xy = 25$

39. Which one of the following equations has no solution in $\mathbb{Z}$?

A $2x + 3y = 9$

B $8x + 6y = 26$

C $6x + 9y = 14$

D $15x + 20y = 50$

40. The complex transformation $z \to w$ given by $w = 3z^*$ where z^* is the conjugate of z represents

A A reflection in the real axis

B A reflection in the imaginary axis

C A rotation through 180^0

D A clockwise rotation through 90^0

41. The cumulative distribution function $F(x)$ of a discrete random variable X is given in the table below. $E(X) =$

x	1	2	3
$F(x)$	$\frac{1}{6}$	$\frac{5}{6}$	1

A $\frac{11}{6}$ B 2 C $\frac{13}{6}$ D 5

42. The moment of inertia of a solid sphere of mass m and radius a about a tangent of the sphere is

A $\frac{2}{5}ma^2$

C ma^2

D $\frac{7}{5}ma^2$

43. If $x < 0$, then $|x| - x|x| =$

A $x - x^2$

B $-x + x^2$

C $-x - x^2$

D $x + x^2$

44. The argument of the complex number $z = 1 - e^{\frac{1}{3}i\pi}$ is

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

B $\frac{1}{6}\pi$

C $-\frac{1}{6}\pi$

D $-\frac{1}{3}\pi$

45. A force $\mathbf{F} = (4\mathbf{i} - \mathbf{j} + 2\mathbf{k})$N acts through the point with position vector $(-\mathbf{i} + 2\mathbf{j} + 3\mathbf{k})$m . The vector moment of $\mathbf{F}$ about the origin in Nm is

A $\mathbf{i} + 2\mathbf{j} - \mathbf{k}$

B $7\mathbf{i} + 14\mathbf{j} - 7\mathbf{k}$

C $3\mathbf{i} + 2\mathbf{j} - 5\mathbf{k}$

D $10\mathbf{i} + 16\mathbf{j} - 12\mathbf{k}$

46. Which one of the following in NOT true for definite integrals

A $\int_a^b f(x)dx = \int_a^b f(t)dt$

B ~~$\int_a^b f(x)dx = -\int_b^a f(t)dt$~~

C $\int_a^b f(x)dx = \int_a^m f(x)dx + \int_m^b f(x)dx$

D $\int_{-a}^{a} f(x)dx = 0$

47. Which one of the following is true of Normal distributions

A The distribution is discrete

B The mean is zero

C The distribution is symmetric about the mean

D The mean is less than the standard deviation

48. A particle P of mass 8m falls in a medium in which the resistance to motion is one quarter of its weight. The equation of motion of P is

A $3g = 4\frac{dv}{dt}$ C $g = 4\frac{dv}{dt}$

B $-3g = 4\frac{dv}{dt}$ D $-g = 4\frac{dv}{dt}$

49. The mean value of $\frac{1}{x}$ for $\frac{1}{2} \le x \le 1$ is

A $2\ln 2$ B $\ln 2$ C $-\ln 2$ D $-2\ln 2$

50. Which one of the pairs of vectors below are a basis for $\mathbb{R}^2$

A $\begin{pmatrix}1\\1\end{pmatrix}$ and $\begin{pmatrix}2\\2\end{pmatrix}$

B $\begin{pmatrix}1\\0\end{pmatrix}$ and $\begin{pmatrix}0\\2\end{pmatrix}$

C $\begin{pmatrix}0\\0\end{pmatrix}$ and $\begin{pmatrix}2\\-4\end{pmatrix}$

D $\begin{pmatrix}1\\0\end{pmatrix}$ and $\begin{pmatrix}-1\\0\end{pmatrix}$