GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

0770 Pure Maths With Statistics 1

JUNE 2023 **ADVANCED LEVEL**

Centre No.	
Centre Name	
Candidate Identification No	
Candidate Name	

Mobile phones are NOT allowed in the examination room.

MULTIPLE CHOICE QUESTIONS 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 question booklet is headed "**Advanced Level– 0770 Pure Maths With Statistics 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: **Candidate Number and Name, Centre Number and Name.** Take care that you do not crease or fold the answer sheet or make any marks on it other than those asked for in these instructions.
6. ***Answer All questions.***
7. **Formulae Booklets and calculators are allowed.**
8. Each question has FOUR suggested answers: **A, B, C** and **D**. Decide on which answer is correct. Find the number of the question on the Answer Sheet and draw a horizontal line across the letter to join the square brackets for the answer you have chosen.
   For example, if **C** is your correct answer, mark **C** as shown below:
   [A] [B] [~~C~~] [D]
9. Mark only one answer for each question. If you 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, where necessary, 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 after. DO NOT ATTEMPT TO LEAVE THE EXAMINATION HALL WITH IT.**

Turn Over

SECTION A: PURE MATHEMATICS

1. Given that $4^{3x+2} = 2^{6+2x}$, the value of x is

A $-\frac{1}{2}$
B 2
C $\frac{1}{2}$
D 1

---

2. Two functions f and g are defined on the set of real numbers $\mathbb{R}$ by
$f(x) = 2 - 3x$ and $g(x) = \frac{4x-1}{2}$,

$$g \circ f(-1) =$$

A $\frac{19}{3}$
B $\frac{19}{3}$
C $\frac{7}{2}$
D -3

---

3. Two statements p and q are logically equivalent if

A p and q are always false
B p and q are linked by a logic operator
C p and q have identical truth tables
D p is the converse of q

---

4. If $\frac{x-5}{1-x^2} \equiv \frac{M}{1+x} + \frac{N}{1-x}$, then

A $M = -3$ and $N = 2$

B $M = -3$ and $N = -2$

C $M = 3$ and $N = -2$

D $M = 3$ and $N = 2$.

---

5. The value of t for which the plane
$2x + 4y + tz = 9$ and the line
$\mathbf{r} = 2\mathbf{i} + 4\mathbf{j} + 9\mathbf{k} + \lambda(3\mathbf{i} - 5\mathbf{j} + 2\mathbf{k})$
are parallel is

A 7
B 6
C -3
D 2

---

6. The Cartesian equation of the curve with parametric equation
$x = 1 + \sin\theta$, $y = 2 - \cos\theta$ is

A $x^2 + y^2 + 2x + 4y + 4 = 0$
B $x^2 + y^2 - 2x - 4y + 4 = 0$
C $x^2 + y^2 - 2x - 4y - 4 = 0$
D $x^2 + y^2 - 2x + 4y - 4 = 0$

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7. The third term in the binomial expansion of $(1 - 4x)^{-6}$ is

A $-336x^2$
B $336x^3$
C $336x^2$
D $-336x^3$

---

8. The general solution of the differential equation
$(1 + x^2)\frac{dy}{dx} = 2$
is

A $y = 2\tan^{-1}x + A$
B $y = 2\tan^{-1}\frac{x}{2} + A$
C $y = \tan^{-1}2x + A$
D $y = \tan^{-1}\frac{x}{2} + A$

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9. All the asymptotes of the graph of the function

$$f(x) = \frac{5x^2+3}{(x+2)(x-1)} \text{ are}$$

A $x = -1, x = 2, y = -5$
B $x = -1, x = -2, y = 5$
C $x = 1, x = 2, y = -5$
D $x = 1, x = -2, y = 5$

---

10. The value of m for which

$$\begin{vmatrix} 3 & m & -1 \\ 1 & -1 & 3 \\ 2 & 0 & 2 \end{vmatrix} = -2 \text{ is}$$

A $\frac{2}{3}$
B $\frac{1}{3}$
C $\frac{3}{2}$
D $\frac{3}{4}$

---

11. The range of values of x for which $(3-x)(7+x) \leq 0$ is

A $x \leq -7$ or $x \geq 3$
B $x < -7$ or $x \geq 3$
C $x \leq -3$ or $x \geq 7$
D $-7 \leq x \leq 3$

12. A function f defined by
$f(x) = \begin{cases} 2x, & 0 \leq x \leq 2, \\ 3x^2 + 1, & 2 \leq x \leq 3, \end{cases}$
is periodic with period 3.
$f(9) =$

A 0
B 1
C 4
D 2

13. The remainder when $x^3 - 3x^2 - 4x - 12$ is divided by $x + 2$ is

A 16
B -24
C 24
D -16

14. The eighth term of a geometric progression is 256 and the first term is 2.
The common ratio is

A 7
B 128
C 2
D 18

15. The number of arrangements of the letters of the word *ARREARS* is

A 210
B 420
C 840
D 640

16. The Cartesian equation of the plane containing the point $\mathbf{i} + 3\mathbf{j} - 8\mathbf{k}$ and perpendicular to the line $\mathbf{r} = 3\mathbf{i} + 7\mathbf{j} - 2\mathbf{k} + t(5\mathbf{i} - \mathbf{j} - 4\mathbf{k})$ is

A $5x - y + 4z = 34$
B $5x + y - 4z = 34$
C $-5x + y - 4z = 34$
D $5x - y - 4z = 34$

17. Given the matrix $\begin{pmatrix} 2 & 1 & 5 \\ -1 & 2 & 3 \\ 4 & 1 & 7 \end{pmatrix}$, the cofactor of 7 is

A 3
B 4
C 5
D -3

18. $\log 24 - \frac{1}{2}\log 9 + \log 125 =$

A 3
B 2
C 10
D 4

19. Given that $\sin\theta = \frac{1}{2}$, the values of θ, where $0 < \theta < \pi$, are

A $\frac{\pi}{6}, \frac{5\pi}{6}$
B $\frac{\pi}{2}, \frac{2\pi}{3}$
C $\frac{\pi}{3}, \frac{2\pi}{3}$
D $\frac{\pi}{3}, \frac{3\pi}{4}$

20. The vector equations of 4 straight lines L_1, L_2, L_3, L_4 are given by :
$L_1 : \mathbf{r} = 3\mathbf{i} - 2\mathbf{j} + 4\mathbf{k} + \lambda_1(4\mathbf{i} + 2\mathbf{j} - 3\mathbf{k})$,
$L_2 : \mathbf{r} = \mathbf{i} + 3\mathbf{j} + \mathbf{k} + \lambda_2(8\mathbf{i} + 4\mathbf{j} - 6\mathbf{k})$,
$L_3 : \mathbf{r} = 2\mathbf{i} + 6\mathbf{j} + 2\mathbf{k} + \lambda_3(\mathbf{i} - 4\mathbf{j} + 4\mathbf{k})$,
$L_4 : \mathbf{r} = 4\mathbf{i} + 12\mathbf{j} + 4\mathbf{k} + \lambda_4(3\mathbf{i} - \mathbf{j} + \mathbf{k})$.
The parallel pair of lines is

A L_1 and L_2
B L_1 and L_4
C L_2 and L_4
D L_3 and L_4

21. A function f is defined by
$f(x) = \begin{cases} 4\beta + 4x & \text{if } x < 1, \\ 4x - \beta^2 - 4 & \text{if } x > 1. \end{cases}$
If f has a limit as $x \to 1$, the value of the constant β is

A 2
B 1
C 3
D -2

22. $\frac{2+i-i^4}{i+i^2+i^4}$

A $1-i$
B $1+i$
C $-1+i$
D $-1-i$

23. A relation R defined on a non-empty set S is called a partial order if R is

A Reflexive, Symmetric and Anti-symmetric
B Reflexive, Anti-symmetric and Transitive
C Reflexive, Symmetric and transitive
D Transitive, Symmetric and Anti-symmetric

24. $(\mathbf{i}+2\mathbf{j}+2\mathbf{k})\times(-2\mathbf{i}+3\mathbf{j}+\mathbf{k}) =$

A	$(-4\mathbf{i}-5\mathbf{j}-7\mathbf{k})$
B	$(-4\mathbf{i}+5\mathbf{j}+7\mathbf{k})$
C	$(-4\mathbf{i}-5\mathbf{j}+7\mathbf{k})$
D	$(-4\mathbf{i}+5\mathbf{j}-7\mathbf{k})$

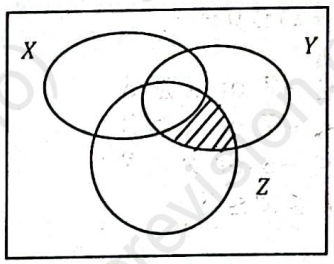
25. Given that $\sin\theta-\sqrt{3}\cos\theta = R\sin(\theta-\lambda)$, where $R>0$ and λ is an acute angle, R and λ are such that

A $R=2$ and $\lambda=90°$
B $R=\sqrt{10}$ and $\lambda=60°$
C $R=2$ and $\lambda=60°$
D $R=\sqrt{10}$ and $\lambda=45°$

26. The roots of the equation $2x^2-3x-1=0$ are α and β.
The equation whose roots are $2\alpha+1$ and $2\beta+1$ is

A $x^2+5x-2=0$
B $x^2+5x+2=0$
C $x^2-5x-2=0$
D $x^2-5x+2=0$

27.



The set represented by the shaded region is

A $X'\cap Y\cap Z$
B $Y\cap Z$
C $(Y\cap Z)\cup(X\cap Y\cap Z)$
D $(Y'\cap Z')-X$

28. The relationship between the logarithms of the variables x and y which are connected by $2y+10=ab^{(x-3)}$ is

A $\log(2y+10)=(x-3)\log b-\log a$
B $\log(2y+10)=(x-3)\log b+\log a$
C $\log(2y+10)=(x-3)(\log b+\log a)$
D $\log(2y+10)=(x-3)\log a-\log b$

29. The sum of the first n terms of an arithmetic progression is S_n, where $S_n=n(2n+3)$.
The n^{th} term of the progression is

A $6n+1$
B $2n+1$
C $4n-1$
D $4n+1$

30. The values of y corresponding to values of x in an experiment are given on the table below.

x	0	2	4	6	8	10
y	0.3	0.8	1.6	2.4	2.7	5.3

Using the trapezium rule,
the approximate value of $\int_0^{10} y\,dx$ is

A 19.2
B 11.3
C 12.1
D 18.8

31. The first approximation to the root of the equation $x^3-4=0$ is 1.5. Using the Newton-Raphson method, the second approximation to the root of the equation is

A 1.594
B 1.593
C 1.592
D 1.595

32. The greatest value of $5\sin\theta - 12\cos\theta + 20$ is

A 33
B 7
C 13
D -13

33. Given that $z = \sqrt{3} + i$, $\arg(z^6) =$

A $\frac{\pi}{3}$
B π
C $\frac{\pi}{6}$
D $\frac{5\pi}{6}$

34. $$\int 2x(3x^2 + 5)^7\, dx =$$

A $\frac{8}{3}(3x^2 + 5)^8 + C$
B $\frac{1}{24}(3x^2 + 5)^8 + C$
C $\frac{16x}{3}(3x^2 + 5)^8 + C$
D $\frac{x}{12}(3x^2 + 5)^8 + C$

35. If $f: \mathbb{R} \to \mathbb{R}$ is given by $f(x) = \sqrt{\frac{2}{x-2} - 3}$, the domain of f is

A $\mathbb{R} - \{2\}$
B $2 \leq x \leq \frac{8}{3}$
C $2 < x \leq \frac{8}{3}$
D $x < \frac{8}{3},\ x \neq 2$

SECTION B: STATISTICS

36. The median of the set of data
3, 4, 4, 6, 7, 8, 9, 3, 4, 7, 8, 9, 3, 8, 9, 4 is

A 4.0
B 6.0
C 6.5
D 8.5

37. Two independent events A and B are such that $P(A) = 0.3$ and $P(A \cup B) = 0.58$.
$P(B) =$

A 0.40
B 0.60
C 0.42
D 0.88

38. The set of ordered pairs $\{(x, y)\}$,
$\{(4, 8), (5, 9), (6, 6), (7, 3)\}$ is such that $\bar{x} = 5.50$ and $\bar{y} = 6.50$
The covariance of the ordered pairs is

A 2.25
B 1.50
C -1.50
D -2.25

39. A random variable X has cumulative distribution function $F(x) = k(3x - 1)$ for $x = 1, 2, 3$. The value of the real constant k is

A $\frac{1}{2}$
B $\frac{1}{5}$
C $\frac{1}{8}$
D $\frac{1}{15}$

40. Random variable $X \sim B(n, p)$. If $E(X) = 2$ and $(X) = 1.6$, the value of n is

A 25
B 32
C 8
D 10

41. A frequency distribution is such that:
Lower quartile = 22.5, Median = 24.3 and Upper quartile = 28.7. The quartile deviation for the distribution is

A 3.1
B 6.2
C 1.8
D 2.2

42. A sample of size 30 is drawn from an infinite population with mean μ and variance σ^2. The variance of the sample mean is

A $\frac{\sigma}{29}$
B $\frac{\sigma}{30}$
C $\frac{\sigma^2}{29}$
D $\frac{\sigma^2}{30}$

43. A sample of size 8 drawn from a population gives rise to

$$\sum x = 391, \sum x^2 = 19159.$$

Using this sample, the unbiased estimate of the population variance is

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44. A population has mean 15 and standard deviation 2.3. A random sample of size 81 is taken from the population and its mean is found to be 15.4. A hypothesis test is to be conducted to verify if the mean has changed. The value of the test statistic for this test is

A -1.645
B -1.565
C 1.565
D 1.645

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45. For ten pairs of values (x, y),
$\bar{x} = 13$, $\bar{y} = 7.08$, $S_x^2 = 1.246$, $S_y^2 = 1.611$ and $S_{xy} = 1.389$
The product moment correlation coefficient is

A 0.98
B 0.69
C 0.89
D 0.83

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46. A continuous random variable X has probability density function f given by

$$f(x) = \frac{3}{16}x(4-x), 2 \leq x \leq 4$$

The mode of X is

A 2.4
B 2.2
C 2.5
D 2.0

---

47. A continuous random variable X has probability density function g given by
$g(x) = ax(2-x)$, $0 \leq x \leq 2$.
The value of the constant a is

A $\frac{5}{8}$
B $\frac{3}{4}$
C $\frac{3}{8}$
D $\frac{1}{4}$

---

48. A random variable $X \sim P_o(\lambda)$.
If $49P(X=0) = 8P(X=2)$, the value of the parameter λ is

A 12.25
B 3.50
C 3.00
D 1.75

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49. For two events A and B,
$P(A) = \frac{1}{5}$, $P(B) = \frac{3}{5}$, $P(B/A) = \frac{1}{10}$.
The value of $P(A \cap B)$ is

A $\frac{3}{50}$
B $\frac{1}{50}$
C $\frac{3}{25}$
D $\frac{9}{10}$

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50. A discrete random variable $X \sim B(100, 0.2)$.
Using the normal approximation, $P(X > 30)$ is equivalent to

A $P(Z > 1.88)$
B $P(Z > 2.52)$
C $P(Z > 1.86)$
D $P(Z > 2.50)$

GO BACK AND CHECK YOUR WORK