

GENERAL CERTIFICATE OF EDUCATION BOARD

General Certificate of Education Examination

0770 Pure Maths With Statistics 1

JUNE 2022

ADVANCED LEVEL

Centre Number	
Centre Name	
Candidate Number	
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. The remainder when the polynomial $f(x) = 2x^3 + ax^2 - 3x + 1$ is divided by $(x + 1)$ is -2 . The value of the constant a is
- A 3
B 4
C -5
D -4
-
2. If the roots of the equation $2x^2 + 5x - 3 = 0$ are α and β , then the value of $\alpha^2 + \beta^2$ is
- A $\frac{29}{4}$
B $\frac{37}{4}$
C $\frac{25}{4}$
D $\frac{31}{4}$
-
3. If $\frac{x+1}{(x-3)(x-5)} \equiv \frac{M}{x-3} + \frac{N}{x-5}$, then
- A $M = 2$ and $N = 3$
B $M = -2$ and $N = 3$
C $M = 3$ and $N = 2$
D $M = -2$ and $N = -3$
-
4. The solution set of the inequality $|2x - 1| > 3$ is
- A $\{x: x < -1 \text{ or } x > 2\}$
B $\{x: x < -2 \text{ or } x > 1\}$
C $\{x: -1 < x < 2\}$
D $\{x: -2 < x < 1\}$
5. A partial order relation is that which is
- A reflexive, symmetric and transitive
B reflexive and anti-symmetric
C reflexive, anti-symmetric and transitive
D anti-symmetric and transitive
-
6. The number of distinct arrangements of the letters of the word **ABRACADABRAR** is
- A $12!$
B $\frac{5!3!2!}{12!}$
C $\frac{5!3!3!}{12!}$
D $\frac{5!2!2!}{12!}$
E $\frac{5!4!3!}{12!}$
-
7. A function $f: \mathbb{R} \rightarrow \mathbb{R}$ is given by $f(x) = ax + b$. If $f(3) = 3$ and $f(4) = 5$, then the values of the constants are such that
- A $a = 2, b = 3$
B $a = -2, b = 3$
C $a = 2, b = -3$
D $a = -2, b = -3$
-
8. The value of $2 \log_4 8$ is
- A 2
B 3
C $\frac{2}{3}$
D $\frac{3}{2}$
-
9. If $u_n = 5 + \frac{3}{2}(n - 1)$ is the n th term of an arithmetic progression, the sum of the first twenty terms of this progression is
- A 770
B 385
C 358
D 538
-
10. The solution set of the inequality $\frac{(1-x)(x-3)}{(x+2)} > 0$ is
- A $\{x: x < -2 \cup 1 < x < 3\}$
B $\{x: -2 < x < 1 \cup x > 3\}$
C $\{x: x < 1 \cup 2 < x < 3\}$
D $\{x: x < -2 \cup x > 3\}$
-
11. p and q are two statements. The compound statement $p \Rightarrow q$ is false when
- A p and q have the same truth value
B p and q are converse of each other
C p is true and q is false
D both p and q are false
-
12. If $a + bi = \frac{1+i}{1-2i}$, the values of the constants a and b are
- A $a = \frac{1}{5}, b = \frac{3}{5}$
B $a = \frac{1}{5}, b = -\frac{3}{5}$
C $a = -\frac{1}{5}, b = \frac{3}{5}$
D $a = -\frac{1}{5}, b = -\frac{3}{5}$

13. If $x^2 - 4x + 9 \equiv (x + A)^2 + B$, then

- A $A = 2, B = 3$
 B $A = 2, B = 5$
 C $A = -2, B = 3$
 D $A = -2, B = 5$

14. Two variables y and x are connected by the equation $y = a(x + 2)^k$. A linear equivalence of this equation is

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

15. If matrix $A = \begin{pmatrix} -1 & k & 2 \\ 2 & -6 & 0 \\ 1 & -2 & -4 \end{pmatrix}$, then the value

of k for which $|A| = 4$ is

- A 2
 B 3
 C -3
 D -2

16. If $f: \mathbb{R} \rightarrow \mathbb{R}$, where $f(x) = \ln(4 + x^2)$, then the value of $f'(2)$ is

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

17. The period of the trigonometric function,

$f: \mathbb{R} \rightarrow \mathbb{R}$, where $f(x) = \sin \frac{2}{3}x$ is

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

18. If a polynomial $P(x)$ produces a quotient $(x^2 + 2x + 1)$ and a remainder 5 when divided by $(x + 1)$, then $P(x) =$

- A $x^3 + 3x^2 + 3x + 6$
 B $x^3 + 3x^2 + 4x + 6$
 C $x^3 + 4x^2 + 3x + 6$
 D $x^3 + 2x^2 + 3x + 6$

19. The parametric equations of a curve are $1 - x = \tan \theta$ and $y = \frac{1}{\cos \theta}$. The cartesian equation of this curve is

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

20. If the cartesian equation of a plane is $x - 2y + z - 5 = 0$, then the vector normal to this plane is

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

21. Some values of the function f are given in the table below:

x	2	3	4	5
$f(x)$	5	15	28	k

If by the trapezium rule $\int_2^5 f(x) dx \approx 68$, then the value of the constant k is

- A 48
 B 42
 C 47
 D 45

22. If x_1 is a first approximate root of the equation $f(x) = 0$. By Newton-Raphson's procedure, a second approximate root of this equation is given by

- A $x_1 - \frac{f'(x_1)}{f(x_1)}$
 B $x_1 + \frac{f'(x_1)}{f(x_1)}$
 C $x_1 - \frac{f(x_1)}{f'(x_1)}$
 D $x_1 + \frac{f(x_1)}{f'(x_1)}$

23. A function f is defined by $f(x) = \frac{2x-3}{x+1}$, $x \in \mathbb{R}$, $x \neq -1$, the value of $f^{-1}(0)$ is

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

24. The values of λ and μ for which the lines

$$\mathbf{r} = 3\mathbf{i} + \mathbf{j} + \mathbf{k} + \lambda(\mathbf{i} + 2\mathbf{j} + \mathbf{k})$$

and $\mathbf{r} = 4\mathbf{i} + 4\mathbf{j} + \mathbf{k} + \mu(-\mathbf{i} + \mathbf{j} + 2\mathbf{k})$ intersect are

- A $\lambda = 2$ and $\mu = 1$
 B $\lambda = 2$ and $\mu = -1$
 C $\lambda = -2$ and $\mu = -1$
 D $\lambda = -2$ and $\mu = 1$

25. The number of ways of arranging 5 girls on a bench if the two left-handed girls must sit together is

- A 24
 B 48
 C 60
 D 96

26. $\sin\left(x + \frac{\pi}{6}\right) - \sin\left(x - \frac{\pi}{6}\right) =$

- A $-\cos x$
 B $\sin x$
 C $\cos x$
 D $-\sin x$

27. The graph of $y = \frac{4}{x^2 - 1}$ has

- A two vertical asymptotes $x = \pm 1$ and no horizontal asymptote
 B one vertical asymptote $x = 1$ and one horizontal asymptote $y = 0$
 C two vertical asymptotes $x = \pm 1$ and a horizontal asymptote $y = 4$
 D two vertical asymptotes $x = \pm 1$ and a horizontal asymptote $y = 0$

28. Given the differential equation $\frac{dy}{dx} - 2xy = 0$. If

$y = 1$ when $x = 1$, then

- A $y = e^{x^2 - 1}$
 B $y = e^{x^2 + 1}$
 C $y = e^{x^2}$
 D $y = e^{1 - x^2}$

29. The coefficient of x^2 in the binomial expansion of

$$\left(1 + \frac{1}{2}x\right)^{\frac{1}{2}}$$

- A $\frac{1}{32}$
 B $-\frac{1}{16}$
 C $\frac{1}{16}$
 D $-\frac{1}{32}$

30. The coordinates of the points where the curves $y = 2x - 3$ and $y = x^2 - 2x$ intersect are

- A $(1, -1)$ and $(3, 3)$
 B $(1, 1)$ and $(3, 2)$
 C $(-1, -1)$ and $(3, 3)$
 D $(1, -1)$ and $(3, 2)$

31. The value of the constant k for which

$$\sum_{r=1}^{\infty} \left(\frac{k}{2^{r-1}}\right) = 10$$
 is

- A $\frac{11}{55}$
 B $\frac{55}{55}$
 C $\frac{22}{22}$
 D $\frac{11}{22}$

32. If a linear reduction of the relationship $y = ax^n$ produced the result $\log y = 2 \log x + 1.3$, then a and n are such that

- A $a \approx 22$ and $n = -22$
 B $a \approx 20$ and $n = -22$
 C $a \approx 22$ and $n = 200$
 D $a \approx 20$ and $n = 200$

33. The complex number z , in the form $a + bi$, for which $(1 - 2i)z = 3 - i$ is

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

34. The value of a for which the quadratic equation $2x^2 - 6x + 3a = 0$ has equal roots is

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

35. $\int_1^3 \frac{x}{1+2x^2} dx =$

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

SECTION B: STATISTICS

36. Events A and B are such that $P(A) = \frac{3}{5}$, $P(B) = \frac{3}{10}$ and $P(A \cup B) = \frac{4}{5}$. What is the probability that both A and B will occur?

A $\frac{1}{5}$
 B $\frac{1}{10}$
 C $\frac{1}{10}$
 D $\frac{3}{4}$

37. A discrete random variable X has probability mass function f , where $f(x) = k(x-1)$ for $x = 2, 3, 4$ and $f(x) = 0$ otherwise. The value of constant k is

A $\frac{1}{6}$
 B $\frac{1}{2}$
 C $\frac{1}{3}$
 D $\frac{1}{4}$

38. The probability density function f , of a continuous variable X is given by $f(x) = \frac{2}{3}(x-2)$ for $3 \leq x \leq 4$ and $f(x) = 0$ for $x < 3$ and $x > 4$. The mean of this distribution is

A $\frac{34}{9}$
 B $\frac{33}{9}$
 C $\frac{9}{32}$
 D $\frac{31}{9}$

39. A random variable has a binomial probability distribution with mean 2 and variance 1.6. The values of the parameters n and p are

A 10 and 0.8
 B 8 and 0.2
 C 8 and 0.8
 D 10 and 0.2

40. Accidents occurring at a particular road junction happen randomly at an average rate of 2 per week. The probability that exactly 2 accidents will occur at this junction within a period of two weeks is

A $2e^{-2}$
 B $8e^{-4}$
 C $4e^{-4}$
 D $4e^{-2}$

41. The frequency distribution of a data set is as shown below.

x	1	3	5	7	9	11
f	3	4	5	5	2	1

The mean of these data is

A 5.24
 B 5.42
 C 5.20
 D 5.40

42. A cooking gas bottling company claims that each bottle contains averagely 12.5 kg of gas.

Following complaints from the consumers of this product that they are being cheated, a hypothesis test is to be conducted to verify the claim. The null hypothesis H_0 and the alternative hypothesis H_1 for this test are

A $H_0: \mu = 12.5$ and $H_1: \mu > 12.5$
 B $H_0: \mu = 12.5$ and $H_1: \mu \geq 12.5$
 C $H_0: \mu = 12.5$ and $H_1: \mu \leq 12.5$
 D $H_0: \mu = 12.5$ and $H_1: \mu < 12.5$

43. If the regression lines of y on x and x on y are $y = 0.72 - 0.49x$ and $x = 0.65 - 0.25y$ respectively, then the product moment correlation coefficient between x and y is

A 0.35
 B -0.68
 C -0.35
 D 0.68

44. Four competitors were ranked by two juries as shown below.

Jury A	2	1	4	3
Jury B	1	2	3	4

The Spearman's rank correlation coefficient between the juries is

A $\frac{1}{5}$
 B $\frac{2}{5}$
 C $\frac{4}{5}$
 D $\frac{3}{5}$

45. For two events A and B, $P(A) = \frac{x}{2}$, $P(B) = \frac{x}{3}$ and $P(A \cup B) = \frac{2}{3}$, $0 \leq x \leq 1$. If A and B are independent, then the value of x is

- A 1
 B $\frac{1}{8}$
 C $\frac{1}{4}$
 D $\frac{1}{6}$

46. A discrete random variable X takes the values 1, 2, 3, 4 and 5. If $P(X = 1) = P(X = 2) = \frac{1}{10}$ and $P(X = 3) = P(X = 4) = P(X = 5)$, then the value of $P(X = 4)$ is

- A $\frac{4}{15}$
 B $\frac{1}{15}$
 C $\frac{7}{15}$
 D $\frac{2}{15}$

47. A continuous random variable has probability density function $f(x) = k(2+x)(2-x)$ for $0 < x < 2$ and $f(x) = 0$ elsewhere. The value of constant k is

- A $\frac{3}{8}$
 B $\frac{5}{8}$
 C $\frac{1}{8}$
 D $\frac{16}{3}$

48. If the mean of a set of 4 numbers is 5 and the mean of another set of 3 numbers is 12, then the mean of the combined set of 7 numbers is

- A 6
 B 7
 C 8
 D 9

49. The following information is obtained from a bivariate data (x, y)

statistic	$\sum x$	$\sum y$	$\sum xy$	n
value	21	43	171	6

The covariance for these data is

- A 3.42
 B 3.14
 C 4.31
 D 4.31

50. The probability distribution of a discrete random variable X is given in the table below.

x	0	1	2	3
$P(X = x)$	$\frac{1}{21}$	$\frac{5}{14}$	$\frac{10}{21}$	$\frac{5}{42}$

If $E(X) = \frac{5}{3}$, then $\text{Var}(X)$ is

- A 0.55
 B 0.54
 C 0.56
 D 0.57

GO BACK AND CHECK YOUR WORK