0770/1/2023
P.M.S. A/L

SOUTH WEST REGIONAL MOCK EXAMINATION
GENERAL EDUCATION

The Teachers' Resource Unit (TRU) in collaboration with the Regional Pedagogic Inspectorate for Science Education and the South-West Association of Mathematics Teachers (SWAMT)	**Subject Code** 0770	**Paper Number** 1
CANDIDATE NAME .... CANDIDATE NUMBER .... CENTRE NUMBER	**Subject Title** **PURE MATHEMATICS WITH STATISTICS**	
ADVANCED LEVEL	**DATE: TUESDAY 28/03/2023 - MORNING**	

Time Allowed: One hour thirty minutes

INSTRUCTIONS TO CANDIDATES:

1. USE A SOFT HB PENCIL THROUGHOUT THIS 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 Mathematics with Statistics, Paper 1".
4. Insert the information required in the spaces provided above.
5. Without opening the booklet, pull out the answer sheet carefully from inside the front cover of this booklet. 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. Insert the information required in the spaces provided on the answer sheet using your HB pencil:
Candidate Name, Centre Number, Candidate Number, Subject Code Number and Paper Number.

How to answer questions in this examination:

7. Answer ALL the 50 questions in this examination. All questions carry equal marks.
8. Non-programmable calculators are allowed.
9. For each question there are four suggested answers, A, B, C, and D. Decide 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]

10. Mark only one answer for each question. If you mark more than one answer, you will score zero for that question. If you change your mind about an answer, erase the first mark carefully, and then mark your new answer.
11. Avoid spending much time on any question. If you find a question difficult, move to the next question. You can come back to this question later.
12. Do all rough work in this booklet using, where necessary, the blank spaces in the question booklet.
13. Mobile phones are **NOT ALLOWED** in the examination room.
14. **You must not take this booklet and answer sheet out of the examination room. All question booklets and answer sheets will be collected at the end of the examination**

1. Given that
$L = \sqrt[4]{81} - \sqrt{20} + \sqrt{45} - (-27)^{\frac{1}{3}}$,
the value of L is

A. 11
B. $6 + \sqrt{5}$
C. -11
D. $6 - \sqrt{5}$

2. The equation $2^{(2x+1)} - 3(2^x) + 1 = 0$ has roots

A. $-1, 0$
B. $\frac{1}{2}, 1$
C. $0, \log 2$
D. $0, 1$

3. Given that $\log_6 36 - \log_x 9 = 0$, x can take the value(s)

A. $-3 \text{ or } 3$
B. -6
C. 4.5
D. 3

4. If $f(x) \equiv 2(x-2)^2 + 7$, then

A. The graph of $y = f(x)$ cuts the $x-$axis at two points.
B. The graph of $y = f(x)$ has a principal axis where $f(2) = 0$.
C. $f(x) \geq 0 \text{ and } f(x)_{max} = 7$
D. $f(x) > 0 \text{ and } f(x)_{min} = 7$

5. Given that $4x^2 - 12x + 9 \equiv P(x+Q)^2 + R$, the values of P, Q and R are, respectively,

A. $4, -\frac{3}{2}, 0$
B. $1, -\frac{3}{2}, \frac{3}{4}$
C. $1, \frac{3}{2}, 0$
D. $4, \frac{3}{2}, \frac{3}{4}$

6. Given that $\left|\frac{5-x}{x+5}\right| = \frac{5-x}{x+5}$, then

A. $x \leq -5 \text{ or } x \geq 5$
B. $-5 < x \leq 5$
C. $-5 < x < 5$
D. $x < -5 \text{ or } x > 5$

7. If $|2x-1| \geq 3$, then

A. $(x \leq -1) \cup (x \geq 2)$
B. $-1 \leq x \leq 2$
C. $(x < -1) \cup (x \geq 2)$
D. $-2 \leq x \leq 1$

8. When the polynomial $P(x)$ is divided by $x^3 - 2x + 1$, the quotient is $4x^2 + 8$ and the remainder is $-11x^2 + 16x - 9$. $P(x)$ is given as

A. $x^3 - 7x^2 + 14$
B. $4x^5 + 4x^2 + 8$
C. $4x^5 - 7x^2 - 1$
D. $x^3 - 15x^2 + 18$

9. The graph of $g(x) = ax^3 - 2x + b$ has $y-$intercept 20 and $(x-2)$ is a factor of $g(x)$. The values of a and b are respectively

A. $2, -20$
B. $-2, 20$
C. $\frac{1}{2}, -20$
D. $-\frac{1}{2}, 20$

10. When θ is small and measured in radians, the expression $\frac{2\theta - \sin\theta}{\sin 2\theta - \theta}$ decomposes to

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

11. Given that $\sin\frac{\pi}{6} = \frac{1}{2}$,
$\sin^{-1}(\frac{\sqrt{3}}{2}) - \cos^{-1}(\frac{\sqrt{3}}{2}) =$

A. $\frac{\pi}{2}$
B. $\frac{\pi}{3}$
C. $\frac{\pi}{6}$
D. $\frac{\sqrt{3}}{2}\pi$

12. If $L = \lim_{x \to 1} \frac{1-x^3}{1-x}$, then L has value

A. ∞
B. 3
C. 0
D. 1

13. Given that $M = \lim_{n \to 0} \frac{e^{3n} - n}{3n}$, then M takes the value

A. 0
B. ∞
C. $\frac{2}{3}$
D. 1

14. Given that $y = 7^{(4x^2-5)}$, the derived coefficient of y with respect to x is given as

A. $8(7^{4x^2-5})$
B. 7^{8x}
C. $8x ln7$
D. $8(7^{4x^2-5}) x ln7$

15. The surface area of a sphere increases from $100\pi\ cm^2$ to $100.4\pi\ cm^2$. Given that the area of a sphere $= 4\pi r^2$, the approximate increase in the radius, r, of the sphere, in cm, is

A. $0.4\,\pi$
B. $0.01\,\pi$
C. 0.01
D. $40\,\pi$

16. The function $\frac{2x^2+1}{16-x^2}$ has asymptotes

A. $x = -4,\ x = 4$ and $y = -2$
B. $x = -8$ and $y = 0$
C. $x = -4,\ x = 4$ and $y = \frac{1}{2}$
D. $x = 8,$ and $y = \frac{1}{2}$

17. Using the substitution $x = sin^2\theta$ transforms the integral $\int \frac{dx}{x\sqrt{1-x}}$ to the integral with respect to θ of

A. $\frac{2}{sin\theta}$
B. 2
C. $2sin\theta$
D. $cos^2\theta$

18. Given that $\frac{dy}{dt} = 15e^{3t} - 4$ and that $y = 4$ when $t = 0$, then the function y is expressed as

A. $5e^{3t} - 4t - 9$
B. $5e^{3t} - 4t - 1$
C. $45e^{3t} - 4t - 41$
D. $45e^{3t} - 4t - 49$

19. Two arithmetic means between 9 and 21 are

A. 12, 17
B. 13, 17
C. 14, 16
D. 13, 16

20. The sum of the first n terms of a series is given by $S_n = n(1 + 2n)ln2$. The fifth term of the series is

A. $9ln2$
B. $19ln2$
C. $5ln2$
D. $55ln2$

21. Given that a court room has four access doors, the number of ways a lawyer can enter the court room through one door and leave through another door is

A. 144
B. 16
C. 12
D. 7

22. The number of arrangements of the letters of the word PARALLAX which begin and end with the letter L is

A. 3360
B. 6720
C. 720
D. 120

23. Given that $(-1 + 2x)^4 = 1 - 8x + ax^2 + kx^3 + 16x^4$ the value of k is

A. 24
B. -32
C. -24
D. -3

24. When terms in x^2 and higher powers of x are negligible, the function $(x-2)(1+3x)^8$ is approximately equal to

A. $-2-5x$
B. $-2+x$
C. $-16-40x$
D. $-2-47x$

25. Expressed in the form $a+bi$, where a and b are real numbers, $\frac{2i}{1-i}$ is

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

26. Given that $z=-3i+4j$, $\sin(argz)$ *is*

A. $\frac{4}{5}$
B. $\frac{4}{3}$
C. $-\frac{4}{3}$
D. $-\frac{4}{5}$

27. The polynomial equation $x^2+x-6=0$ has a real root in the interval $(-3.3,-2.9)$. Using one iteration of the interval bisection method, a smaller interval which contains the root is

A. $(-3.2,-2.9)$
B. $(-3.1,-2.9)$
C. $(-3,-2.9)$
D. $(-3.1,-3)$

28. A circle touches the $x-axis$ *and* the line $x=7$. Its centre lies on the positive $y-axis$. Then the equation of the circle is

A. $x^2+y^2-14x-49=0$
B. $x^2+y^2-49=0$
C. $x^2+y^2-14x=0$
D. $x^2+y^2-14y=0$

29. Given that two sides of a triangle lie along the lines $x+y-6=0$ and $3x-y-2=0$, one possible vertex of the triangle is the point

A. (4, 2)
B. (2 , 4)
C. (4, −2)
D. (2, −4)

30. The distance of the plane $5x+2y-4z=21$ from the origin is

A. $\frac{7\sqrt{5}}{5}$
B. 21
C. $7\sqrt{5}$
D. $\frac{21}{\sqrt{13}}$

31. The scalar (or dot) product of the vectors $2i+j+k$ and $5i+2j-4k$ is

A. −22
B. 8
C. 22
D. − 8

32. $R:P\rightarrow W$ and $R:x\mapsto x+6$
$P=\{1,2,3,4,5\}$ and $W=\{7,8,9,10,11\}$
Relation R is

A. reflexive
B. injective
C. bijective
D. surjective

33. The negation of the proposition "Joseph always comes to school early." Is

A. Joseph never comes to school early.
B. Joseph always comes to school late.
C. Joseph sometimes comes to school early.
D. Joseph sometimes comes to school late.

34. The curvilinear relation $y=ax^{-t}$ between x and y, where a and t are real constants, can be linearized in the form

A. $logy = loga - tlogx$
B. $\frac{1}{y}=\frac{1}{a}-t\left(\frac{1}{x}\right)$
C. $logy = alogx - logt$
D. $logy = tlogx - loga$

35. $M = \begin{pmatrix} -2 & 1 & x \\ 3 & 4 & 2 \\ 5 & -1 & 6 \end{pmatrix}$

The cofactor of the entry 4 in matrix M *is*

A. -8
B. $-(5x + 12)$
C. -23
D. $3x + 4$

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36. A discrete random variable has probability distribution as follows;

X	1	2	3	4
$P(X = x)$	0.2	0.3	0.4	0.1

$E(X^2) =$

A. 2.4
B. 4.2
C. 5.6
D. 6.6

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37. Two independent random variables X and Y have variances 3 and 1, respectively. Given that the variable $Z = 2X - 3Y + 5$, then the variance of Z is

A. 3
B. 8
C. 21
D. 26

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38. Given that the Cumulative distribution function of a discrete random variable X, is $F(X) = \frac{x^2 - x}{20}$, for x = 1,2,3,4,5.

$P(X = 4) =$

A. $\frac{3}{5}$
B. $\frac{2}{5}$
C. $\frac{1}{5}$
D. $\frac{3}{10}$

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40. The best unbiased estimate for the population mean from which the sample 25, 32, 28, 45, 60, 59 is drawn is

A. 41.5
B. 36.5
C. 45.0
D. 49.8

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41. The random variable X is such that $X \sim B(6, p)$ and $Var(X) = \frac{5}{2}$. Then:

A. $12p^2 - 12p - 5 = 0$
B. $12p^2 + 12p + 5 = 0$
C. $12p^2 - 12p + 5 = 0$
D. $12p^2 + 12p + 5 = 0$

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42. The number of cars entering a car wash station per hour follows a Poisson distribution with mean 4.

The probability that exactly 5 cars will enter the station in 2 hours is

A. $\frac{8^5 e^{-8}}{5!}$
B. $\frac{4^5 e^{-4}}{5!}$
C. $\frac{5^8 e^{-5}}{8!}$
D. $\frac{5^4 e^{-5}}{4!}$

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43. Conducting a Hypothesis test on a normal distribution at the 5% level of significance with $H_0: \mu = 2.5$ and $H_1: \mu > 2.5$, the rejection criteria is "reject H_0" if

A. $Z \neq 1.645$
B. $Z > 1.645$
C. $|Z| > 1.645$
D. $Z < 1.645$

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44. For a given data set, the equations of the regression lines Y on X and X on Y are given as $Y = 4 - 0.9X$ and $X = 1.2 - 0.4Y$, respectively. The product moment correlation coefficient for the data is

A. -0.6
B. 0.36
C. 0.6
D. -0.36

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45. A continuous random variable X, follows a uniform rectangular distribution with probability density function given as

$$f(x) = \frac{1}{k-2}, \quad 2 \le x \le k.$$

If $E(X) = 3$, then the value of k is?

A. 2
B. 3
C. 4
D. 5

46. A random sample of size n = 144, with mean $\overline{x}$ = 125.5 and standard deviation σ = 4.5 is drawn from a normal population. The central 95% confidence interval for μ, the population mean, is

A. (124.765, 126.235)
B. (124.622, 126.372)
C. (124.628, 126.235)
D. (124.765, 126.372)

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47. For a set of 30 observations, $\sum(x) = 60$ and $\sum(x^2) = 195$.
The variance of the distribution is

A. 4.5
B. 2.5
C. 6.5
D. 3.25

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48. Given that X is a discrete random variable, the continuity correction for $P(2 < X < 7)$ is

A. $P(2.5 < X < 6.5)$
B. $P(2.5 < X < 7.5)$
C. $P(1.5 < X < 6.5)$
D. $P(1.5 < X < 7.5)$

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49. For 8 pairs of ranking $\sum(d^2) = 10$. The spearman's coefficient of rank correlation, r_s, for the data is

A. $\frac{5}{42}$
B. $\frac{20}{21}$
C. $\frac{37}{42}$
D. $\frac{5}{14}$

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50. A continuous random variable X has probability density function
$f(x) = \frac{1}{8}(4 - x), \ 0 \leq x \leq 4$.
The mean, $E(X) =$

A. 1
B. $\frac{4}{3}$
C. $\frac{1}{2}$
D. $\frac{16}{3}$

END

GO BACK AND CHECK YOUR WORK