CHRIST HIGH SCHOOL

CHRIST HIGH SCHOOL PLOT 5, CHS STREET, KM 32, ABUJA-KEFFI ROAD UKE, NASARAWA STATE

FIRST TERM EXAMINATION
2024/2025 ACADEMIC SESSION

SUBJECT: FURHER MATHEMATICS (PAPER I)
CLASS: SS 3
TIME: 2 Hour 30 Minutes

NAME……

CANDIDATE'S ADMISSION NO.

INSTRUCTION

Write your name and number in the space provided on your answer booklet. Write your name on any extra sheet used.

At the end of the examination, staple all your work securely together.

FOR EXAMINER'S USE	
Total Score:	+

ANSWER ALL QUESTIONS

1. Solve for x: $2^{x+1} = 8$
   A. 2
   B. 3
   C. 4
   D. -2
   E. -4
2. The fourth derivative of the function
   Y = e^{ax} is
   A. a^2e^{ax}
   B. a^5e^{ax}
   C. a^4e^{ax}
   D. a^3e^{ax}
   E. $a^{-4}e^{ax}$
3. Evaluate $\lim_{x\to 3} \frac{x^2-2x-3}{x-3}$
   A. 4
   B. 3
   C. 2
   D. 0
   E. 1
4. What is the coefficient of x^3 in the expansion of
   $(x^2-x+1)(x^2-3x+1)$
   A. 3
   B. -4
   C. -16
   D. -6
   E. 4

5. what is the radius of a circle whose equation is $x^2+ y^2- 6x - 7= 0$,
   A. $\sqrt{2}$ units
   B. 2 units
   C. $\sqrt{7}$ units
   D. 4 units
   E. 16 units

6. Find the coordinate of the centre of a circle $x^2+y^2-2x- 4y - 4 = 0$
   A. (2,1)
   B. (-2,1)
   C. (1,2)
   D. (-1,2)
   E. (-1,-2)

7. The roots of $x^3 + bx + c = 0$ are 1, 2, and s. find s.
   A. -4
   B. 2
   C. 3
   D. -2
   E. -3

8. A binary operation * is defined on the set of real numbers, $\mathcal{R}$, by $x * y = \frac{3x-2y}{xy+3x}$, $x, y \neq 0$, where $x\ and\ y$ are real numbers. Evaluate -2*4
   A. 7
   B. 8
   C. -7
   D. 6
   E. -8

9. If r = -2**i** + 3**j** and n = 3**i** – 2**j**, find the magnitude of 2n – r to two decimal places.
   A. 10.64
   B. 10.60
   C. 10.62
   D. 10.63
   E. 10.65

10. A particle moving with a velocity of $5ms^{-1}$ accelerates at $2ms^{-1}$. Find the distance it covers in 4 seconds.
    A. 16cm
    B. 26cm
    C. 36cm
    D. -36cm
    E. 46cm

11. If $2x^3 + y^{-2} + x - y = 0$, evaluate $\frac{dy}{dx}$, when $x = 3$ and $y = 2$.
    A. -11
    B. 12
    C. 11
    D. -12
    E. 10

12. Evaluate : $\lim_{x \to 7} \frac{x^2 - 4x - 21}{x - 7}$
    A. 10
    B. 12
    C. 11
    D. 7
    E. 3

13. Express $\frac{2}{2+\sqrt{12}}$ in the form $x - y\sqrt{m}$
    A. $-\frac{1}{4} - \frac{1}{4}\sqrt{3}$
    B. $\frac{1}{4} - \frac{1}{4}\sqrt{3}$
    C. $\frac{1}{4} - \frac{1}{4}\sqrt{2}$
    D. $\frac{1}{4} + \frac{1}{4}\sqrt{3}$
    E. $\frac{1}{4} - \frac{1}{3}\sqrt{3}$

14. Simplify : $(\log\sqrt{27} - \log\sqrt{8}) \div (\log 3 - \log 2)$

A. $-\frac{1}{5}$

B. $-\frac{3}{2}$

C. -3

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

E. $\frac{1}{3}$

15. Evaluate $\log_{10}6 + \log_{10}45 - \log_{10}27$

A. 0

B. 1

C. 1.1738

D. 1.3802

E. 10

16. Evaluate $\log_{0.25}8$

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

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

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

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

E. $\frac{1}{2}$

17. Simplify $\sqrt{98}$

A. $2\sqrt{7}$

B. $7\sqrt{7}$

C. $7\sqrt{2}$

D. $3\sqrt{7}$

E. $7\sqrt{3}$

18. If vectors **A** = $a\underline{i} - 2\underline{j} + \underline{k}$, **B** = $2a\underline{i} + a\underline{j} - 4\underline{j}$. Find the value of **a** for which **A** and **B** are perpendicular.

A. -1 or 2

B. 1 or 2

C. 1 or -2

D. -1 or -2

E. 2 or -1/2

19.If $A = [2 \quad -1 \quad 4]$ and $B = [1 \quad 0 \quad 4]$, find A + B.

A. $[2 \quad 1 \quad 4]$
B. $[3 \quad 1 \quad 8]$
C. $[2 \quad -1 \quad 8]$
D. $[3 \quad -1 \quad 4]$
E. $[3 \quad -1 \quad 8]$

20.The first term of an arithmetic progression is 5, and the common difference is 3. Find the 10^{th} term.

A. 14
B. 17
C. 21
D. 11
E. 18

21. The equation of a circle is $x^2 + y^2 - 8x + 9y + 15 = 0. find\ its\ radius.$

A. 5
B. ½
C. $\frac{1}{2}\sqrt{15}$
D. $\frac{1}{2}\sqrt{85}$
E. $85\frac{1}{2}$

22. Express $\log\frac{1}{8} + \log\frac{1}{2}$ in terms of $\log 2$.

A. $-4\log 2$
B. $-3\log 2$
C. $-2\log 2$
D. $4\log 2$
E. $3\log 2$

23.Find the unit vector in the direction of the vector $-12i + 5j$.

A. $\frac{-12i}{13} - \frac{5j}{13}$
B. $\frac{-1i}{13} + \frac{5j}{13}$
C. $\frac{-12i}{13} + \frac{5j}{13}$
D. $\frac{12i}{13} - \frac{5j}{13}$
E. $\frac{12i}{13} + \frac{5j}{13}$

24. A box contains 4 red and 3 blue identical balls. If two balls are picked at random, one after the other without replacement, find the probability that one is red and the other is blue.

A. 4/7
B. 2/7
C. 1/7
D. 1/12
E. 3/12

25. Evaluate : $\int_{-2}^{3}(3x^2 - 2x - 12)dx$.

A. -30
B. 30
C. -25
D. -18
E. 6

26. The roots of a quadratic equation are $(3 - \sqrt{3})$ *and* $(3 + \sqrt{3})$ .Find the equation.

A. x^2-6x-9
B. x^2-6x+6
C. x^2+6x-9
D. x^2+6x-6
E. x^2-9x-6

27. Given the sequence

7, 4, 1,-1,… find the 31st term.

A. -86
B. -83
C. -80
D. -77
E. -74

28. Given the matrices A= $\begin{pmatrix} 4 & 2 \\ 6 & 3 \end{pmatrix}$ and B= $\begin{pmatrix} 3 & -2 \\ -6 & 4 \end{pmatrix}$, evaluate BA.

A. $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$
B. $\begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$
C. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$
D. (1)

E. $\begin{pmatrix} 0 & 1 \\ 2 & 0 \end{pmatrix}$

29. If The roots of the equation $x^2-2x-1=0$ are α and β, find $(\alpha-\beta)^2$

A. -3
B. $\sqrt{8}$
C. 4
D. 8
E. 18

30. Find the sum of 10 terms of the arithmetic progression(A.P) $-6, -2, 2, \ldots$ Starting from the 6^{th} term.

A. 120
B. 240
C. 320
D. 330
E. 340

31. Resolve into its partial fraction

$\frac{4x+2}{(x+6)(x+8)}$

A. $\frac{4}{x+2}+\frac{6}{X+5}$
B. $\frac{3}{x+2}+\frac{15}{x+4}$
C. $-\frac{11}{x-8}-\frac{1}{x+3}$
D. $\frac{15}{x+8}-\frac{2}{x+6}$
E. $\frac{15}{x+8}-\frac{11}{x+6}$

32. Differentiate $x^2+y^2=4$ with respect to x

A. $\frac{x}{y}$
B. $-\frac{x}{y}$
C. $\frac{y}{x}$
D. $-\frac{y}{x}$
E. $\frac{x^2}{y}$

33. Given that

$\frac{5x-1}{(x+5)(x+3)}=\frac{A}{x+5}+\frac{B}{x+3}$

Find the value of 2A-B

A. 37
B. 30
C. 34
D. 20
E. 17

34. If $7^{x-1} = log_{\sqrt{5}} 5^{\frac{1}{2}}$ find the value of x

A. -7
B. -1
C. 0
D. 1
E. 7

35. Find the length of a tangent to the circle $x^2 + y^2 + 4x - 4y - 8 = 0$ from the point (6,9).

A. $\sqrt{21}$
B. $\sqrt{33}$
C. $\sqrt{68}$
D. $\sqrt{97}$
E. $\sqrt{273}$

36. Evaluate $\int (3x^2 - \frac{5}{x} + 6)\, dx$

A. $X^3 - 5\ln x + 6x + C$
B. $6x^2 - \frac{5}{x^2} + 6x + C$
C. $3X^3 - 5\ln x + 6x + C$
D. $X^3 - 5\ln x + 6 + C$
E. $2X^2 - 5x + 6 + C$

37. Calculate the value of λ for which the vectors $(5\lambda i + 2j)$ and $(4i - 3j)$ are perpendicular.

A. $6\sqrt{5}$
B. 5
C. 1
D. $\frac{1}{2}$
E. $\frac{3}{10}$

38. Two fair dice are thrown once. Find the probability that the sum obtained is a prime number.
    A. $\frac{13}{36}$
    B. $\frac{1}{3}$
    C. $\frac{5}{12}$
    D. $\frac{1}{2}$
    E. $\frac{7}{12}$
39. The sum of 6 numbers is 42 and the sum of their squares is 364. Find the variance.
    A. 60.67
    B. 49.00
    C. 11.67
    D. 7.00
    E. 3.42
40. Determine the coefficient of x^6 in the binomial expansion of $(x+y)^8$.
    A. $8y^2$
    B. $28y^2$
    C. $56y^2$
    D. $70y^2$
    E. $80y^2$
41. Given that $\alpha \; and \; \beta$ are the roots of a quadratic equation such that $\alpha + \beta = 3 \; and \; \alpha\beta = 2$, find the equation.
    A. $x^2 - 3x + 2 = 0$
    B. $x^2 - 2x + 3 = 0$
    C. $x^3 - 3x + 2 = 0$
    D. $x^2 - 3x + 3 = 0$
    E. $x^2 - 3x - 2 = 0$
42. Two statements are represented by P and Q as follows; ***P: He is brilliant, Q: He is regular in class.*** Which if the following symbols represents the statement, ***"He is regular in class but dull"***?
    A. $Q \vee \backsim P$
    B. $\backsim Q \vee \backsim P$
    C. $\backsim Q \wedge \backsim P$
    D. $\backsim Q \vee P$

E. $Q \wedge \backsim P$

43. Evaluate $\int_1^2 \frac{4}{x^3} dx$.

A. $-1\frac{1}{2}$

B. $-1\frac{15}{6}$

C. $\frac{15}{6}$

D. $-\frac{15}{6}$

E. $1\frac{1}{2}$

44. If $\begin{bmatrix} 3 & x \\ 2 & x-2 \end{bmatrix} = -2$, find the value of x.

A. -8

B. -4

C. 4

D. 8

E. -2

45. If $h(x) = x^3 - \frac{1}{x^3}$, evaluate $h(a) - h\left(\frac{1}{a}\right)$.

A. -1

B. 0

C. $2a^3 - \frac{2}{a^3}$

D. $2a^3 - \frac{1}{a^3}$

E. $a^3 + \frac{2}{a^3}$

46. What is the angle between **a** = (3i-4j) and **b** = (6i+4j)?

A. 13°

B. 100°

C. 87°

D. 110°

E. 85°

47. A function is defined by $f(x) = \frac{3x+1}{x^2-1}, x \neq \pm 1$. Find $f(-3)$.

A. $-1\frac{1}{4}$

B. -1

C. $\frac{4}{3}$

D. 1

E. 2

48. Which of the following sets is equivalent to $(P \cup Q) \cap (P \cup Q')$?
    A. P
    B. $P \cap Q$
    C. Q
    D. $P \cup Q$
    E. $\emptyset$

49. Find the coordinates of the center of the circle $3x^2 + 3y^2 - 6x + 9y - 5 = 0$.
    A. (-3,9/2)
    B. (-1,3/2)
    C. (1,-3/2)
    D. (3,-9/2)
    E. (2,-3/2)

50. A binary operation $*$ is defined on the set of real numbers, $\mathbb{R}$, by $x * y = x^2 - y^2 + xy, where\ x, y \in \mathbb{R}$, evaluate $(\sqrt{3}) * (\sqrt{2})$.
    A. $1 - \sqrt{6}$
    B. $\sqrt{6} - 1$
    C. $\sqrt{6}$
    D. $1 + \sqrt{3}$
    E. $1 + \sqrt{6}$

ANSWER ALL QUESTIONS

(1 mark each)

51. A binary operation * is defined on the set Q f rational numbers by X*y=5xy. Find the identity element.
    A. -5
    B. $-\frac{1}{5}$
    C. $\frac{1}{5}$
    D. 5
    E. $-\frac{1}{5X}$
52. Calculate the inverse function in the binary operation* for all a, b € R. a*b = $\frac{ab}{5}$

A. $\frac{25}{a}$

B. $-\frac{25}{a}$

C. $\frac{-a}{5}$

D. $\frac{a}{25}$

E. $\frac{a}{5}$

53. If A and B are two independent events such that $P(A) = \frac{2}{5}$ and $P(A \cap B) = \frac{2}{15}$. Find P(B).

A. $\frac{3}{5}$

B. $\frac{1}{3}$

C. $\frac{1}{6}$

D. $\frac{2}{15}$

E. $\frac{1}{15}$

54. Simplify $^{n}P_4 \div {}^{n}C_4$

A. 24

B. 18

C. 12

D. 6

E. *32*

55. A moving body under gravity a given velocity of projection U m/s attains its maximum range R, when the angle of projection Ɵ is……..

A. 90^0

B. 75^0

C. 60^0

D. 45^0

E. 30^0

56. What is the time of flight of a particle which is projected with an initial speed of 50m/s and an angle of elevation of 60^0? (take g= 10m/s)

A. 10.6 sec

B. 9.8 sec

C. 8.66sec

D. 7.66sec

E. 5.40sec

57. Express $\frac{7\pi}{6}$ in degrees

A. 315^0
B. 210^0
C. 105^0
D. 57^0
E. 120^0

58. The roots of a quadratic equation are $(3-\sqrt{3})$ *and* $(3+\sqrt{3})$ .Find the equation.

A. x^2-6x-9
B. x^2-6x+6
C. x^2+6x-9
D. x^2+6x-6
E. x^2-9x-6

59. Express 75^0 in radians, leaving your answers in terms of π.

A. $\frac{5\pi}{12}$
B. $\frac{3\pi}{4}$
C. $\frac{5\pi}{6}$
D. $\frac{7\pi}{6}$
E. $\frac{\pi}{6}$

60. Evaluate $Cos\left(\frac{\pi}{2}+\frac{\pi}{3}\right)$

A. $-\frac{2}{\sqrt{3}}$
B. $-\frac{\sqrt{3}}{2}$
C. $\frac{3}{\sqrt{4}}$
D. $\frac{4}{\sqrt{3}}$
E. $\frac{3}{\sqrt{3}}$

61. Find the remainder when the polynomial $3x^3+8x^2+3x+10$ is divided by $x+3$

A. 10
B. 8
C. -8
D. -9
E. -10

62. The operation * on the set of real numbers is defined by
a*b = a + b- 2 for all a,b€ R.
Find the neutral element in R

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

63. Given Cot Θ = $\frac{12}{5}$, where Θ is acute, find Cosec Θ.

A. $\frac{5}{13}$
B. $\frac{5}{12}$
C. $\frac{13}{12}$
D. $\frac{12}{5}$
E. $\frac{13}{5}$

64. If a*b = $\sqrt[3]{(ab)}$, find 16*32.

A. 6
B. 8
C. 9
D. 10
E. 12

65. Given the sequence
7, 4, 1,-1,…find the 31st term.

F. -86
G. -83
H. -80
I. -77
J. -74

66. Given the matrices A= $\begin{pmatrix} 4 & 2 \\ 6 & 3 \end{pmatrix}$ and B= $\begin{pmatrix} 3 & -2 \\ -6 & 4 \end{pmatrix}$, evaluate BA.

A. $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$
B. $\begin{pmatrix} 0 & 1 \\ 0 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

D. (1)

E. $\begin{pmatrix} 0 & 1 \\ 2 & 0 \end{pmatrix}$

67. Given that

q : all justices are lawyers

r: all lawyers are bold.

Which of the following statement

is true?

A. All bold people are lawyers

B. All justices are bold.

C. All justices are not lawyers

D. All lawyers are justice.

E. Some lawyers are bold.

68. Evaluate sin 295^0

A. −0.9063

B. −0.8024

C. −0.7804

D. −0.6122

E. −0.5192

69. If f(x) = 2x-1 and
g(x) = $2x^2$+ 1 . Find fg(2).

A. 3

B. 9

C. 17

D. 19

E. 27

70. Given log 2=0.3010 and log 3 =0.4771. find the value of x in
$2^{x-1} = 3^x$, correct to 2 decimal places.

A. 0.75

B. 0.58
C. 0.36
D. −1.71
E. −2.50

71. If The roots of the equation $x^2-2x-1=0$ are α and β, find $(\alpha-\beta)^2$
A. −3
B. $\sqrt{8}$
C. 4
D. 8
E. 18

72. Find the sum of 10 terms of the arithmetic progression(A.P) −6, −2, 2,….. Starting from the 6^{th} term.
A. 120
B. 240
C. 320
D. 330
E. 340

73. Resolve into its partial fraction
$\frac{4x+2}{(x+6)(x+8)}$
A. $\frac{4}{x+2}+\frac{6}{X+5}$
B. $\frac{3}{x+2}+\frac{15}{x+4}$
C. $-\frac{11}{x-8}-\frac{1}{x+3}$
D. $\frac{15}{x+8}-\frac{2}{x+6}$
E. $\frac{15}{x+8}-\frac{11}{x+6}$

74. Differentiate $x^2+y^2=4$ with respect to x
A. $\frac{x}{y}$
B. $-\frac{x}{y}$
C. $\frac{y}{x}$
D. $-\frac{y}{x}$
E. $\frac{x^2}{y}$

75. Find the range of the inequality

3x-2< x+ 1≤ 2x + 3

A. $-2 \leq x < \frac{3}{2}$

B. $-2 \geq x < \frac{2}{3}$

C. $-2 \leq x \leq \frac{3}{2}$

D. $2 \leq x < \frac{3}{2}$

E. $2 \leq x < \frac{2}{3}$

76.If $7^{x-1} = log_{\sqrt{5}} 5^{\frac{1}{2}}$ find the value of x

A. -7

B. -1

C. 0

D. 1

E. 7

77.Given the statements:

q : pilots are brave

r: scientists are wizard.

Use logical connectives to describe

the statement: pilots are brave but

Scientists are not wizard"

A. p∧q

B. pV q

C. p∧~q

D. pV~ q

E. ~p∧~q

78. Given that

$\frac{5x-1}{(x+5)(x+3)} = \frac{A}{x+5} + \frac{B}{x+3}$

Find the value of 2A-B

A. 37
B. 30
C. 34
D. 20
E. 17

79. Differentiate y = $\frac{1}{x^3}$ with respect to x

A. $3x^{-3}$
B. $\frac{2}{3}x^{\frac{1}{3}}$
C. $\frac{2}{3}x^{-\frac{1}{3}}$
D. $\frac{3}{2}x^{-\frac{1}{2}}$
E. $-3x^{-4}$

80. The inverse of the function e^x is

A. e^x
B. $ln\ 1$
C. $ln\ x$
D. $\ln e$
E. e^2

81. Solve $(0.25)^{x-2} = 0.125$

A. −3.5
B. −3.0
C. 0.5
D. 3.0
E. 3.5

82. If the root of $14+4\sqrt{6} = \sqrt{a} + \sqrt{b}$, Evaluate a + b

A. 4
B. 6
C. 12
D. 14
E. 24

83. Find the sum of coefficient in the expansion of $(x + y)^7$.

A. 31
B. 64
C. 93
D. 101

E. 128

84. Evaluate $\int (3x^2 - \frac{5}{x} + 6)\, dx$

A. $X^3 - 5\ln x + 6x + C$

B. $6x^2 - \frac{5}{x^2} + 6x + C$

C. $3X^3 - 5\ln x + 6x + C$

D. $X^3 - 5\ln x + 6 + C$

E. $2X^2 - 5x + 6 + C$

85. Find the value of x for which

$\begin{vmatrix} 4x & -3 \\ 2x & -1 \end{vmatrix} = -10$

A. -5

B. -1

C. 1

D. 3

E. 5

86. The coordinate of the point A and B are (6,-8) and (x, -5) respectively. Find the least value of x if AB= 5.

A. 10

B. 4

C. 2

D. -2

E. -6

87. The gradient of a line passing through the point (x, 3) and (4,7) is $\frac{4}{5}$. Find the value of x.

A. -2

B. -1

C. $\frac{-3}{4}$

D. 1

E. 2

88. Find the length of a tangent to the circle $x^2 + y^2 + 4x - 4y - 8 = 0$ from the point (6,9).

A. $\sqrt{21}$

B. $\sqrt{33}$

C. $\sqrt{68}$

D. $\sqrt{97}$

E. $\sqrt{273}$

89. Find the mid- point of the AB if A= (3,4) and B= (-5, -2).
    A. (-1,1)
    B. (-1,-1)
    C. (1,-1)
    D. (-1,-2)
    E. (1,2)

90. Calculate the value of λ for which the vectors (5 λi +2j) and (4i-3j) are perpendicular.
    A. $6\sqrt{5}$
    B. 5
    C. 1
    D. $\frac{1}{2}$
    E. $\frac{3}{10}$

91. Find the resultant of the vectors:
$\overrightarrow{2AC}$, $\overrightarrow{5BC}$, $\overrightarrow{2CD}$, $\overrightarrow{5CD}$ and $\overrightarrow{2DA}$.
    A. $\overrightarrow{2AD}$
    B. $\overrightarrow{2BD}$
    C. $\overrightarrow{5AD}$
    D. $\overrightarrow{5BC}$
    E. $\overrightarrow{5BD}$

92. A stone of mass 20kg rests on a horizontal plank. If the coefficient of friction between the stone and the plank is 0.55, find the minimum force required to just move the stone along the horizontal plank.
(Take g= 10m/s^2)
    A. 110N
    B. 120N
    C. 130N
    D. 145N
    E. 160N

93. A particle is projected a point with an initial velocity of 600km/hr at an angle of 30^0 to the horizontal, find the maximum height attained.
    A. 900km
    B. 1800km
    C. 3600km

D. 4500km
E. 7200km

(Take g= 10m/s^2)

94. A body of mass 5kg attained a speed of 2m/s from rest over a distance of 10m. Find the magnitude of the force.
    A. 10N
    B. 7N
    C. 5N
    D. 3N
    E. 1N
95. A force of 30N acts on a body of mass 2kg travelling at 3m/s for 0.6s in the direction of its motion. Find the final velocity of the body.
    A. 4m/s
    B. 6m/s
    C. 9m/s
    D. 10m/s
    E. 12m/s
96. A force of 20N acts at perpendicular distance of 0.60m from a turning point. What is the moment of the force?
    A. 33.3Nm
    B. 20.60 Nm
    C. 16.00 Nm
    D. 12.00 Nm
    E. 10.25 Nm
97. Find the unit vector in the direction of $7i + 6j - 5k$
    A. $\frac{1}{\sqrt{138}}(7i - 6j - 5k)$
    B. $\frac{1}{\sqrt{139}}(7i - 6j + 5k)$
    C. $\frac{1}{\sqrt{138}}(7i + 6j - 5k)$
    D. $\frac{1}{\sqrt{140}}(7i + 6j + 5k)$
    E. $\frac{1}{\sqrt{110}}(7i + 6j - 5k)$
98. A particle of mass 16kg is acted upon by a force P. If the particle moves an upward distance of 50m in line of action of the force, find the work done. (Take g= 10m/s^2)
    A. 8000J

B. 5000J
C. 160J
D. 76J
E. 66J

99. Calculate the potential energy of 10kg which is 150m above the earth's surface.
(Take g= 9.8m/s)
A. 16908J
B. 14700J
C. 12980J
D. 11327J
E. 4700J

100. The sum of 6 numbers is 42 and the sum of their squares is 364. Find the variance.
A. 60.67
B. 49.00
C. 11.67
D. 7.00
E. 3.42

101. X is normally distributed with mean 5 and variance 1.44. Determine the standardized value when X is 7.
(Correct your answer to 2d.p)
A. -1.67
B. -1.39
C. 1.39
D. 1.64
E. 1.67

102. Two fair dice are thrown once. Find the probability that the sum obtained is a prime number.
A. $\frac{13}{36}$
B. $\frac{1}{3}$
C. $\frac{5}{12}$
D. $\frac{1}{2}$
E. $\frac{7}{12}$

103. One out of every one thousand laptops produced is found to be defective. If five thousand laptops are produced, find the probability that exactly two are defective.
    A. 0.084
    B. 0.036
    C. 0.027
    D. 0.020
    E. 0.015
104. Calculate the mean deviation 0f the numbers 2, 8, 9, 7, 6 and 4.
    A. 2
    B. 3
    C. 6
    D. 8
    E. 10
105. Find the number of different arrangement of the letters x, y, y, w and z.
    A. 60
    B. 50
    C. 40
    D. 30
    E. 20
106. In how many ways can a team of 6 coaches be selected from 9 coaches?
    A. 84
    B. 184
    C. 210
    D. 224
    E. 284
107. A candy box contains 15 sweets of which 9 are banana flavor and the rest have strawberry flavor. Three sweets are selected from the box at random, one after the other without replacement. Find the probability that the first two have banana flavor. And the third have straw berry.
    A. $\frac{77}{125}$
    B. $\frac{101}{455}$
    C. $\frac{72}{455}$

D. $\frac{18}{125}$

E. $\frac{18}{455}$

Use the information below to answer question 58 and 59

A game whose pay off matrix is given by:

Player A

Player B

$$\begin{pmatrix} 4 & 5 \\ 7 & 6 \end{pmatrix}$$

108. Determine the Row minima and column maxima

A. (4,6) and (7,6)
B. (6,5) and (7,6)
C. (4,6) and (7,6)
D. (4,6) and (7,6)
E. (4,6) and (7,6)

109. Determine the value of the game.

A. 3
B. 4
C. 5
D. 6
E. 7

110. Determine the coefficient of x^6 in the binomial expansion of $(x+y)^8$.

A. $8y^2$
B. $28y^2$
C. $56y^2$
D. $70y^2$
E. $80y^2$

111. What is the value of $(6! - 4!)2$

A. 1392
B. 1239
C. 12932
D. 1923
E. 1932

112. What is the factorial expression of

n (n-1) (n-2) (n-3).

A. $\frac{n!}{(n-2)!}$

B. $\frac{n!}{(n-3)!}$

C. $\frac{n!}{(n-4)!}$

D. $\frac{n!}{(n-1)!}$

E. $\frac{n!}{n-3}$

113. The value of $^{n}\mathbf{C}_{r}$ is the same as

A. r ! $^{n}\mathbf{P}_{r}$

B. $\frac{\mathbf{P}}{r!}$

C. $^{n}\mathbf{P}_{r}$

D. $^{r}\mathbf{P}_{n}$

E. $^{n}\mathbf{P}_{r} \div \mathbf{r!}$

114. If $^{6}\mathbf{P}_{r} = {}^{6}\mathbf{C}_{r}$,find the possible value of r.

A. 0, 1

B. 0, 5

C. 1, 5

D. 0, 1, 5

E. 2, 1

115. What is the coefficient of x^3 in the expansion of $(4x^2-3x+1)(x^2-4x+1)$

A. 7

B. -19

C. -16

D. -17

E. 16

116. Find the equation of a circle with centre (2.-3) and radius 3 unit.

A. $x^2+y^2-4x+6y+4=0$,

B. $x^2+y^2-4x-6y-9=0$,

C. $x^2+y^2-4x+6y-9=0$,

D. $x^2+y^2-4x-6y+9=0$,

E. $x^2+y^2-4x+6y=0$,

117. A polynomial is defined by $F(x)=x^3+3x^2-4x+2$, find $F^{II}(2)$.

A. -8
B. -12
C. 24
D. 18
E. -6

118. If $y = 3\cos(\frac{x}{3})$, find $\frac{dy}{dx}$ at $x = \frac{3\pi}{2}$

A. 1
B. -3
C. 2
D. -1
E. 0

119. Find the coordinate of the point at which the gradient of the curve is $Y= x^2-x+ 4$ is 3.

A. (1,4)
B. (2,6)
C. (1,6)
D. (3,5)
E. (5,3)

A circle whose diameter has end points A(5,4) and B(7,4).
Use the information above to answer question 70 and 71.

120. The coordinate of the centre of the circle is……

A. (5,4)
B. (4,6)
C. (5,4)
D. (6,4)
E. (5,5)

121. The radius of the circle is

A. 1 unit
B. 2 units
C. 3 units
D. 4units
E. 5units

The equation of a circle is given by $x^2+y^2-6x - 7= 0$ from the point (5,10). Use the information above to answer question 72 - 76.

122. The coordinate of the centre of the circle is……
   A. (0,3)
   B. (3,0)
   C. (0,4)
   D. (4,0)
   E. (3,4)

123. The radius of the circle is
   A. 1 unit
   B. 2 units
   C. 3 units
   D. 4units
   E. 5units

124. The length of the tangent is
   A. $\sqrt{104}$
   B. $\sqrt{88}$
   C. 104
   D. 88
   E. 16

125. The slope of the tangent to the curve at (5,10) is
   A. $-\frac{1}{5}$
   B. $-\frac{1}{4}$
   C. -5
   D. 5
   E. $\frac{1}{5}$

126. The slope of the normal to the curve at (5,10) is
   A. $-\frac{1}{5}$
   B. $-\frac{1}{4}$
   C. -5
   D. 5
   E. $\frac{1}{5}$

127. Simplify $\sqrt{98}$

F. $2\sqrt{7}$
G. $7\sqrt{7}$
H. $7\sqrt{2}$
I. $3\sqrt{7}$
J. $7\sqrt{3}$

128. Express $17\sqrt{2}$ as a single surd

A. $\sqrt{875}$
B. $\sqrt{587}$
C. $\sqrt{578}$
D. $\sqrt{478}$
E. $\sqrt{785}$

129. The power of an empty set is……

A. 0
B. 1
C. 2
D. 3
E. 4

130. Evaluate $\log_{10}6 + \log_{10}45 - \log_{10}27$

A. 0
B. 1
C. 1.1738
D. 1.3802
E. 10