WEST SHOA EDUCATIONAL OFFICE

GRADE 12 MATHEMATICS MODEL – EXAM, JUNE1016/2024

SCHOOL NAME: _____ **Student's Name: _____**

Section: _____ **Roll.№. _____**

TIME ALLOWED: 3 hours

General Examination Guidelines

- ✓ Don't forget to write your **Name**, **Roll.№** and **Section** on the space provided
- ✓ Cheating will degrade your mark to zero and it will dismiss you from the exam hall
- ✓ Make sure your exam is readable.
- ✓ Write your answer only in **CAPITAL LETTERS** in the answer sheet provided only
- ✓ Make sure the exam has 10pages including the cover page & answer sheet page with a total of **65**questions
- ✓ Any measure taken by the invigilator won't be compromised.

NB: *Don't turn this page until you are allowed To Do So!*

Warning: Cheating is strictly forbidden!!

SENE, 2016 E.C/JUNE,2024G.C

I. Choose the Correct answer from the given alternatives

1. If x is a rational number and y is an irrational number, then which one of the following is necessarily true?
   A. xy is an irrational number C. x+y is an irrational number
   B. $\frac{x}{y}$ is an irrational number D. $\frac{y}{x}$ is a real number
2. Which one of the following systems of linear equations is inconsistent?
   A. $\begin{cases} x+3y=2 \\ 2x-4y=1 \end{cases}$ C. $\begin{cases} 3x+y=-1 \\ -x-\frac{1}{3}y=\frac{1}{3} \end{cases}$
   B. $\begin{cases} x-2y=5 \\ -3y+6y=1 \end{cases}$ D. $\begin{cases} x+y=6 \\ 2x-5y=0 \end{cases}$

3. If A = { a, b, c, d, e, f } then n(P(A)) = _____

   A. 64 B. 46 C. 58 D. 63

4. Given a rational function f(x) = $\frac{x^4-8x}{3x^3-2x^2-8x}$. Which of the following is False?
   A. X = $-4/3$ is the only vertical asymptote of f C. The graph of f has no x – intercept
   B. Y = $\frac{1}{3}$x - $\frac{2}{9}$ is oblique asymptote of f D. The graph of f has holes at x = 0 & x = 2
5. Let R = $\{(x,y): y < x \text{ and } x+y < 2\}$. Which of the following is true?

   A. Domain of R is $[1,\infty)$ B. Domain of R is $(-\infty,1)$
   C. The range of R is $(1,\infty)$ D. The range of R is $(-\infty,1)$

6. Two sides of ΔABC are 5cm and 8cm long. If the angle included between the two sides has degree measure of 120^0. What is the area of the triangle?

   A. $9\sqrt{3}$ B. $\frac{21\sqrt{2}}{2}$ C. $3\sqrt{3}/4$ D. $10\sqrt{3}$

7. Let $\vec{A}$ and $\vec{B}$ be two vectors given by $\vec{A} = 3i - 2j \text{ and } \vec{B} = 5i - \frac{1}{2}j, \text{then the vector } \frac{1}{2}\vec{A} - \frac{2}{3}\vec{B} =$ ___
   A. $\vec{u} = -5\vec{i} + 2\vec{j}$ C. $\vec{u} = 3\vec{i} + 2\vec{j}$
   B. $\vec{u} = -\frac{11}{6}\vec{i} - \frac{2}{3}\vec{j}$ D. $\vec{u} = -5\vec{i} + 3\vec{j}$

8. The solution set of the equation $5^{2x+1} - 5^{2x-1} = 120\ is$_____.

A. {2} C. {1,2}

B. {5} D. {1}

9. Each side of a regular hexagon is 10cm long. What is the area of this hexagon?

A. $54\sqrt{3}cm^2$ C. $75cm^2$

B. $150\sqrt{3}cm^2$ D. $27cm^2$

10. $Det\begin{bmatrix}1 & -a & b-a\\ 1 & b & a+b\\ 0 & c & 2c\end{bmatrix}$ is equal to : A. 0 B. -2ac C. 2bc D.48 2c(b-a)

11. The sum of all interior angles of a regular polygon is twice the sum of all its exterior angles. Then the number of sides of the polygon is_____

A. 10 C. 12

B. 8 D. 6

12. Let p and q stands for the statements "Bedatu is intelligent" and ''Abdi is hard working '' respectively. Which of the following represent the statement ''Abdi is hard working if Bedatu is intelligent''?

A. $\neg p \wedge q$ C. $p \wedge q$

B. $\neg p \vee q$ D. $\neg q \vee p$

13. There are three children in the room, ages, three, four and five. If another four year old child enters the room, then which one of the following is true about ages of these children?

A. Mean age will stay the same but standard deviation will increase.

B. Mean age will stay the same but standard deviation will decrease.

C. Mean age and standard deviation will increase

D. Mean age and standard deviation will the same.

14. If x^2-6x+y^2+k = 0 is equation of a circle with radius 2 then what is the value of k?

A. 13 B. 5 C. 4 D. -4

15. An Ellipse is a locus of points in the plane so that

A. the points have the same distance from a given point and a given line
B. the points have the same distance from any given two points
C. the sum of the distance from two fixed points is constant
D. the difference between the distance from two fixed points is constant

16. Which of the following is an even function?

A. f(x)= $x^3 sgnx$

B. f(x) = $x^2 sgnx$

C. f(x) = sgnx

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

17. If the radius of sphere is doubled what happens to the surface area?

A. It becomes four times as large as the original surface area.

B. It becomes eight times as large as the original surface area.

C. It also doubled.

D. It increases by four square units.

18. If a metallic right circular cylinder of height 18cm and the radius of the base is 4cm is melted down to form sphere, then which of the following is true?

A. The diameter of the sphere is $12\sqrt[3]{4}\,\pi\ cm.$

B. The surface area of the sphere is 144 πcm^2

C. The volume of the sphere is $48\pi cm^3$

D. The radius of the sphere is $\frac{3}{\sqrt[3]{2}}\pi cm.$

19. The multiplicative inverse of $\frac{1+2i}{1-i}$ is

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

B. $-\frac{3}{5}+\frac{i}{5}$

C. $\frac{-1}{5}-\frac{3i}{5}$

D. $\frac{3}{5}+\frac{i}{5}$

20. If the third and fifth terms of a geometric sequence are ½ and 1/8 respectively and the second term is negative, then which of the following is not true about the sequence?

A. The common ratio is $-1/2$

B. The first term is 2

C. The fourth term is $-1/4$

D. The sum of the first four term is -1

21. Which of the following is not true about $f(x) = (x^4 - 16)^2$(x-2)?

A. 2 is a zero of multiplicity 3

B. f is exactly divisible by x+2

C. the degree of f is 9

D. the graph of f crosses the x-axis at x=-2

22. Which of the following is the solution set of $\frac{x}{x-2}-\frac{x+2}{x^2-2x}=\frac{1}{x}-1$?

A. $\Re$ B. { 0 } C. $\Re \setminus \{0, 2\}$ D. $\emptyset$

23. *If* $\frac{4X-X^2+3}{X^3+3X^2}=\frac{A}{X}+\frac{B}{X^2}+\frac{C}{X+3}$,then the values of A, B, C respectively are:

A. 1, -1, 2 B. -1 , 1, 2 C. -2 , 1 , 1 D. 1, 1, -2

24. What are the coordinates of a point that divides the line segment with end points P(0,1) and Q(5,6)in the ratio 2:3 from P? A. (3,2) B. (0,3) C. (2,3) D. (0, 2)

25. The value of $(\cos 20°)^2 + (\cos 70°)^2$ is_____

A. 0 C. $\frac{1}{2}$

B. 1 D. -1

26. If the radius of a circle is increasing at a rate of 1.5 cm/s. What is the rate at which area is increasing at the instant when the diameter is 12cm?

A. $36\pi cm^2/s$ B. $24\pi cm^2/s$ C.$18\pi cm^2/s$ D. $48\pi cm^2/s$

27. The solution set of $\log(x + 10) + \log(x - 5) = 2\ is$:

A. {10, -15} B.{10, 15} C. {-10, 15} D. {10}

28. Which one of the following geometric series is convergent?

A. $\sum_{n=1}^{\infty}(\frac{1}{10})^{-n}$ B. $\sum_{n=1}^{\infty}(\frac{1}{2})^{n}$ C. $\sum_{n=1}^{\infty}(\sqrt{3})^{n}$ D. $\sum_{n=1}^{\infty}(-3)^{n}$

29. Which one of the following is the mechanical meaning of derivative?

A. Gradient of the graphs of functions C. Area under the curve

B. Instantaneous rate of change D. slope of tangent line

30. A frustum of a cone is formed from a right circular cone of height15cm. If the radii of the frustum are 2cm and 3cm ,where the height from the smaller base to the vertex is 4cm. what is the volume of the frustum of the cone?

A. $\frac{209}{3}\pi cm^3$ B. $\frac{119}{3}\pi cm^3$ C. $\frac{195}{3}\pi cm^3$ D. $\frac{285}{3}\pi cm^3$

31. Which one of the following is not true about the derivative of a function?

A. The derivative of a function at a point is equal to the area of the region enclosed by the graph of the function and the x-axis.

B. The derivative of a function f at a pointx_0 is the instantaneous rate of change of f(x) at (a, f(a)).

C. The derivative of a function g at a point x_0 is equal to the limit of the ratio of the difference of functional values of g at x and at x_0 to x minus x_0 as x approachesx_0.

D. The derivative of a function f at a point x_0 is the slope of a line tangent to the graph of the function at the point (x_0, f(x_0)).

32. Which one of the following is the sum of finite series $\sum_{n=1}^{300}\left(\frac{1}{n} - \frac{1}{n+1}\right)$?

A. $\frac{301}{300}$ B. $\frac{299}{300}$ C. $\frac{300}{301}$ D. $\frac{300}{299}$

33. Let $f(x) = x^3 + x^2 - 5x - 5$, then which of the following is true?

A. f(x) is increasing in $[\frac{-5}{3}, 1]$ C. f(x) is decreasing [1,∞]

B. f(x) has a local minimum at x=1 D. f(x) has no local maximum x= $\frac{-5}{3}$.

34. If $g(x) = \frac{f(x)}{x+1} + (f(x))^2$, f(1)=8 and f'(1) = 2 then g'(1) is equal to:
    A. 14 B.3 6 C. 31 D. 34
35. Which one of the following is the equation of normal line to the graph of y = $x^2 + 5x$ +1 at a point where its curve crosses the line y=7?
    A. $7y = -x + 50$ B. $7y = -x + 49$ C. $7y = x - 43$ D. $A\ and\ C$
36. Suppose that the demand equation for a company is p = 100-0.01x and the cost function is C(x) =50x+10000.what is the value of x that maximize the profit?
    A. 5000 B.2000 C . 2500 D.52000
37. A manufacturer wants to design an open box having a square base and a surface area of $108m^2$.what the dimensions (length and height) respectively to produce a box with maximum volume?
    A. (4.5) B. (6.3) C. (3,6) D. (5,4)
38. What is the area of the region R which is enclosed between the graph of f(x) = (x+2)(x)(x-1) and x-axis? A.37/12 sq.units B. 53/12 sq.units C. 27/12 sq.units D 43/12 sq.units
39. Which one of the following is the solution of system of linear inequalities $\begin{cases} x + y \geq 3 \\ 2x - y \geq 0 \end{cases}$?
    A. (-1, 2) B. (-1, -2) C. (1 , 2) D. (1, -2)
40. Which one of the following is false about linear programming problem?
    A. If they have optimal values, then the solutions must occur at the corner points of the feasible regions whether the regions are bounded or unbounded.
    B. They can have infinite solutions.
    C. Not all linear programming problems have a solution.
    D. All linear programming problems with unbounded feasible region have no solutions
41. Which one of the following is the minimum value of the objective function of Z=2x -5y subjected to the constraints $\begin{cases} 3x + 2y \leq 6 \\ 2x + 5y \leq 10 \\ x \geq 0, y \geq 0 \end{cases}$? A. 4 B. 0 C. -10 D. $-\frac{150}{11}$
42. A group of people those associated for business want to maximize their profit for two products. Product A gives a profit of Birr 1.20 per kg and product B gives a profit of Birr 3.00 per kg. Their market test and amount of resources have indicated the following constraints :
    i The level of combined product A and product B should not be exceeds 900kg.
    ii The demand for the product A is not more than twice of the demand for product B. What is their maximum profit in a month?
    A. 1620 B. 2700 C. 3120 D.4870
43. A block of wood whose length is twice of its width and its height is one- half of its width. What is the ratio of length to width to height in the lowest term ?
    A. 1:2:3 B. 3:2:1 C. 4:2:1 D. 4:1:2
44. What is the effective interest rate that is equivalent to 12.5%, compounded semi-annually? A. 10.29% B. 12.89% C. 11.29% D. 12.5%

45. Which type of investment is like buying a small fraction of a company in order to get a portion of profit of a company?

A. Bonds B. Mutual funds C. Stocks Debt instrument

46. What is the monthly payment on an auto loan of birr 200,000 to be amortized over 10- years period at rate of 6%? Given $\frac{0.005}{1-(1.005)^{-120}} = 0.01110205$, $\frac{(1.005)^{120}-1}{0.005} = 163.879$, $\frac{0.06}{1-(1.06)^{-120}} = 0.6006$, $\frac{(1.06)^{120}-1}{0.06}$ = 18119.80

A. 2220.41 B. 2230.62 C.3330.41 D. 2222.43

47. A company bought a storage at cost of birr 280,000. The company estimated that the building will have a service life of 15 years and at end of which it will have a salvage value of birr 40,000.What is the amount of depreciation expense that will be recovered each year on the straight line basis?

A. 24000 B. 18000 C. 20000 D. 16000

48. If from the top of the hill 600m above the sea level the angle of depressions of two boats in line with observer were found to be $30° \; and \; 60°$,then the distance between the two boats was _____.

A. $400\sqrt{3}m$ B. 400m C. $300\sqrt{3}m$ D. $200\sqrt{3}m$

49. A certain meeting hall has 20 rows of seats. There are 20 seats in the first row, 22 seats in the second row, 24 seats in the third row, and so on .How many seats are there on the last row of the hall?

A. 46 B. 58 C.760 D. 5240

50. What is the sum of the infinite series $\sum_{n=0}^{\infty} 5(\frac{3^n - 2^n}{6^n})$?

A. $\frac{5}{4}$ B. $\frac{5}{2}$ C. $\frac{15}{4}$ D. $\frac{25}{2}$

51. Suppose the radioactive material loses three-fourth of its mass per year .If its mass is 256mg today, then how much will be left after 4 years?

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

52. If r_1 and r_2 are the roots of the equation $3x^2 + 9x + 16 = 0$,which one of the following rue?

A. $r_1 . r_2 = -\frac{16}{3}$ B. $r_1 + r_2 = 3$ C. $\frac{1}{r_1} + \frac{1}{r_2} = \frac{9}{16}$ D. ${r_1}^2 + {r_2}^2 = -\frac{5}{3}$

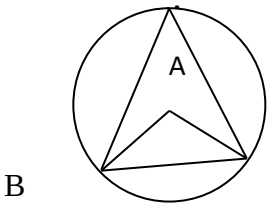
53. Let $f(x) = x^2 - 3x$. Then which one of the following is not true about function f(x)?

A. The vertex of its graph is at $(\frac{3}{2}, \frac{-9}{4})$. C. Its graph passes through (-2, 2).

B. Its graph is symmetric about the line x = $\frac{3}{2}$ D. Its y-intercept is 0.

54. In a class of 52 students; 34 students passed in mathematics and 28 passed in English. If the number of students who failed in both subjects is 9, then what is the number of students who passed in both subjects? A. 10 B. 19 C. 9 D.6

55. In the figure, O is the center of the circle. If $m(< A) + m(< BOC) = 120°$ and $m(< OBA) = 30°$,then $m(< OCA)$is equal to:

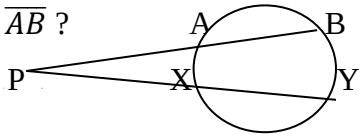


A. 50° C. 30°

B. 40° D. 10°

56. The solution set of the inequality x^2+2x+1≤0 is: A. [-1, 1] B. {} C. IR D.{-1}

57. If the measure of the angle formed by the lines of two chords intersect outside the circle PA = 5cm ,PX =7cm and PY = 10cm then what is the length of $\overline{AB}$?



A. 14cm C. 12cm

B. 9cm D. 7cm

58. Let the center of an ellipse be at (1,4) and two of its vertices be at (10,4) and (1, 2). What is the equation of the ellipse?

A. $4(x-1)^2 + 81(y-4)^2 = 324$ C. $9(x-1)^2 + 4(y-4)^2 = 4$

B. $(x-1)^2 + 9(y-4)^2 = 4$ D. $2(x-1)^2 + 9(y-4)^2 = 4$

59. The equation $x^2 - 4y^2 = -1$ represents

A. hyperbola with one of its foci at the origin

B. a hyperbola with vertices at (-1/2, 0)and(1/2,0)

C. a parabola with vertex at the origin

D. a hyperbola with foci at $(0,-\frac{\sqrt{5}}{2})$ and $(0, \frac{\sqrt{5}}{2})$.

60. Let $p(x)$: $x^2 + x$ is positive .Which of the following is equivalent to ¬(∃x)p(x)?

A. $(\exists x)(x^2 + x \leq 0)$ B. $(\forall x)\neg(x^2 + x < 0)$ C. $(\forall x)(x^2 + x \leq 0)$ D. $(\exists x)(x^2 + x > 0)$

61. The following is the frequency of a grouped data. The mean of the following frequency table is 50. Then what is the value of f_1 and f_2 respectively.

Class limit	0-20	20-40	40-60	60-80	80-100	Total
Frequency	17	f_1	32	f_2	19	120

A. 27&25 B.22&30 C. 28&24 D. 36&24

62. Which of the following pairs of events are dependent?
    A. Drawing two balls successively from a box containing balls having the same size and shape with replacement.
    B. Any events obtaining from tossing a coin and rolling a die at the same time.
    C. Tossing two coins simultaneously and obtaining head from one and tail from the other.
    D. Drawing two cards one after the other from a well shuffled pack of cards without replacement.

63. Consider the following data 6,6,7,7,7,8,8. The which of the following is true?
    A. The mean deviation from the mode is 4/7. C. The mean deviation from the median is 7/4.
    B. The mean deviation from the mean is 7/4. D. The mean deviation from the mean is 3/2

64. If A is a 3×3 matrix with det(A) =5, then what is the determinant of $2A^T$?
    A. 40 B. 30 C. 10 D. 2/5

65. What is the solution of the system $\begin{cases} 2x - 3y + z = 4 \\ x - 2y + 3z = -1 \\ 4x + y - z = 2 \end{cases}$?
    A. $\{(\frac{1}{2}, \frac{-3}{2}, \frac{-3}{2})\}$ B$\{(\frac{-11}{6}, \frac{4}{5}, \frac{7}{4})\}$ C. $\{(\frac{2}{5}, \frac{-6}{5}, \frac{12}{5})\}$ D. $\{(\frac{1}{6}, \frac{-7}{6}, \frac{5}{6})\}$

ANSWER SHEET

School Name_____ **stream**_____

NAME:_____*Section*_____*No*_____

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