

ADDIS ABEBA EDUCATIONAL BUREAU

YEKA SUB CITY EDUCATIONAL OFFICE

MATHEMATICS MODEL EXAM FOR GRADE 12 JANUARY 2026

NUMBER OF QUESTIONS:60

TIME ALLOWED 3:00HRS

GENERAL DIRECTIONS

THIS BOOKLEET CONTAINS MATHEMATICS EXAMINATION FOR THE NATURAL AND SOCIAL SCIENCE CANDIDATES.

IN THIS EXAMINATIONN, THERE ARE A TOTAL OF 60 MULTIPLE CHOICE QUESTIONS.THERE ARE ONLY ONE BEST ANSWER FOR EACH QUESTION. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPITIONS AND BLAKEN THE LETER OF YOUR CHOICE ON THE ANSWER SHEET. USE ONLY PENCIL TOMARK YOUR ANSWERS.

YOU WILL BE ALLOWED TO WORK ON THE EXAM FOR 3 HOURS. WHEN TIME CALLED. YOU MUST IMMEDETELY STOP WORKING, PUT YOUR PENCIL DOWN AND WAIT FOR FURTHER INSTRUCTIONS.

ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORES.

PLEASE MAKE SURE THAT YOU HAVE WRITTEN ALL THE REQUIRED INFORMATION ON THE ANSWER SHEET BEFORE YOU START TO WORK ON THE EXAMINATION.

DO NOT TURN OVER UNTIL YOU ARE TOLD TO DO SO.

DIRECTIONS: FOR EACH OF THE FOLLOWING PROBLEMS CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES AND BLACKEN THE LETTER OF YOUR CHICE ON THE SEPARETE ANSWER SHEET.

- Which of the following pairs of numbers are Twin Primes?
A) 2 & 3 B) 11 & 13 C) 7 & 9 D) 15 & 17
- The LCM & GCF of two numbers are 8 & 96 respectively. If one of the numbers is 32. What is the other numbers?
A) 768 B) 120 C) 24 D) 96
- The equivalent fraction form of $1.30\dot{2}$ is _____
A) $\frac{1002}{900}$ B) $\frac{102}{990}$ C) $\frac{172}{900}$ D) $\frac{1172}{900}$
- Which one of the following is always true for $a \in \mathbb{R}$ and m & n are natural numbers
A) $a^{n \times m} = a^n + a^m$ B) $a^{m+n} = a^m \cdot a^n$ C) $a^{\frac{m}{n}} = a^m - a^n$ D) $a^0 = 1$
- The solution set of $27^x \cdot 5^{-3x} = \sqrt{(0.6)^{x+1}}$
A) $\left\{\frac{1}{5}\right\}$ B) $\left\{\frac{1}{3}\right\}$ C) $\left\{\frac{3}{2}\right\}$ D) $\{5\}$
- The solution of $|x + 5| = -3$ is _____
A) $\{-5, -2\}$ B) $\{-2\}$ C) Real numbers D) Has no solution
- If the system $\begin{cases} y = 2x - k \\ 6x - 3y = 9 \end{cases}$ has infinitely many solution ,then the value of k is _____
A) 2 B) -3 C) 3 D) 7
- If the sum of the roots of a quadratic equation $x^2 - kx - 10 = 0$ is 3 , then the value of k is ____
A) 3 B) 5 C) -5 D) -3
- Let set $A = \{\emptyset, 1, \{2, 3\}\}$ which one of the following is true about set A?
A) $\emptyset \in A$ B) $\{2\} \in A$ C) $1 \subseteq A$ D) $\{2, 3\} \subseteq A$
- In a group of 200 peoples 125 can speaks English and 145 can speak Arabic. how many peoples can speak both English and Arabic if they can speak if the language
A) 75 B) 60 C) 125 D) 70
- $R = \{(x, y): y > x + 5\}$ is relation. Which one of the following point is not belongs to A
A) (0, 10) B) (-7, -1) C) (0, 5) D) (3, 13)
- Which one of the following relation is function?
A) $x^2 + y^2 = 1$ C) $y \geq x + 2$
B) $y = \begin{cases} x + 2, & \text{for } x \leq -1 \\ x^2 & \text{for } -1 < x < 2 \end{cases}$ D) $R = \{(x, y): x \text{ is a father of } y\}$
- Which one of the following is true about the domain of $f(x) = \frac{1}{\sqrt{x+3}}$
A) $[3, \infty)$ B) $[0, \infty)$ C) $\mathbb{R}$ D) $(-3, \infty)$
- What is the range of the function $f(x) = 7 + \operatorname{sgn}(x)$
A) $\{6, 7, 8\}$ B) $\{-1, 0, 1\}$ C) $\mathbb{R}$ D) $\mathbb{R}/\{0\}$

15. Which of the following is false about the function $f(x) = (x - 3)^2 + 4$
 A) Vertex (3,4) B) shift to left 3 units C) shift up 4 units D) the graph opens upward
16. If $x+1$ is a factor of $x^3 - kx^2 - 2x + 2$, then the value of k is _____
 A) 3 B) 2 C) 5 D) 7
17. Which one of the following is **not true** about the graph of a polynomial function $f(x)=x^2(x-1)^3$
 A) f is odd degree polynomial C) At $x=1$ the graph crosses the x axis
 B) The leading coefficient of f is negative D) It has at most 4 turning points
18. Let $f(x) = x^7 + 4x^2 - 1$ and $g(x) = x^2 + 1$. Which one of the following is true about f/g
 A) The remainder is $-x+6$ C) The degree of the quotient is 5
 B) The quotient is $x^5 - x^3 + x + 5$ D) the remainder is 2
19. Which one of the following is an example of exponential function
 A) $(x) = 2^{-x}$ B) $f(x) = x^2$ C) $f(x) = \sqrt{x}$ D) $f(x) = 2^2$
20. Which one of the following is true for an exponential function $f(x) = a^x$
 A) If $a > 1$, and $x < 0$, then $0 < y < 1$ C) If $0 < a < 1$, and $x > 0$, then $y > 1$
 B) If $a > 1$, then $f(x) = a^{-x}$ is an increasing function D) $f(0) = a$
21. Let $f(x) = \log_2 x$, which one is true about f
 A) It is decreasing C) asymptote x -axis
 B) x -intercept (1,0) D) y -intercept (0,1)
22. The symmetric line of a function $f(x) = 2^x$ and $g(x) = \log_2 x$ is a line
 A) x -axis B) y -axis C) $y = 1$ D) $y = x$
23. Let $f(x) = x^2 + 2x - 1$ and $g(x) = -2x^2 - 4x + 10$, then $f + g =$ _____
 A) $-3x^2 + 6x + 9$ B) $-x^2 - 2x + 9$ C) $x^2 + 6x + 9$ D) $x^2 - 2x + 9$
24. Which one of the following is a rationalizing factor of $\frac{-3}{\sqrt{5}+2}$
 A) $\frac{1}{\sqrt{5}}$ B) $\frac{\sqrt{5}+2}{\sqrt{5}+2}$ C) $\frac{\sqrt{5}-2}{\sqrt{5}-2}$ D) $\frac{-\sqrt{5}+2}{-\sqrt{5}+2}$
25. What must be the next term of the sequence 3, 6, 11, 18, 27, 38, 51, 66, ...
 A) 101 B) 73 C) 91 D) 83
26. If the 3^{rd} term of an arithmetic sequence is 8 and the 5^{th} term is 14, then what is the n^{th} term of the sequence?
 A) $2n + 4$ B) $2n + 1$ C) $3n - 1$ D) $3n$
27. What is the actual sum of the series $\sum_{n=1}^{\infty} \frac{3^n + 9^n}{36^n}$?
 A) $\frac{33}{14}$ B) $\frac{24}{33}$ C) $\frac{14}{33}$ D) $\frac{33}{24}$
28. A bouncing ball loses $\frac{1}{4}$ of its previous height each time that it rebounds. If the ball is thrown up to a height of 60m, how many meters will it travel before coming to rest?
 A) 480m B) 120m C) 160m D) 240m

29. What is the gradient of the tangent line to the graph of a function $f(x) = 2x^3 - 4x + 5$ at (1,3)?
 A) -2 B) 3 C) -3 D) 2
30. If $f(x) = \frac{2x+3}{x^2+4x}$, then $f'(1)$ is equals to _____
 A) $-\frac{4}{5}$ B) $\frac{4}{5}$ C) 1 D) -1
31. What is the geometric mean between 6 and 24?
 A) 13 B) 15 C) 12 D) 11
32. If the sum of the 1st 20 terms of an arithmetic progression with common difference 6 is 1200, then its 3rd term is
 A) 3 B) 15 C) 9 D) 21
33. What is the range of the function $f(x) = x^3 - 12x + 4$ on $[-2, 2]$?
 A) $[-5, 13]$ B) $[-12, 13]$ C) $[-5, 20]$ D) $[-12, 20]$
34. Which one of the following is true about the $f(x) = \frac{2x^2}{1-x^2}$?
 A) Decreasing on $(-\infty, -1) \cup (-1, 0]$ C) Increasing on $[0, \infty)$
 B) Has local minimum at $x = \pm 1$ D) Has local maximum at $x = 0$
35. Alem begins a saving program in which she will save Birr 2000 the first year. Each subsequent year, she will save 300 more than she did the previous year. How much she save during the 10th year?
 A) 3800 B) 4700 C) 5000 D) 3800
36. The instantaneous rate of change of a function $f(x) = 6\sqrt{x}$ at $x = 9$ is
 A) -1 B) $\frac{1}{2}$ C) 1 D) 2
37. Let $y = 2x^6 - 4\sqrt{x} + \frac{1}{x} + 3$, then $\frac{dy}{dx} |_{x=1}$?
 A) 9 B) 8 C) 10 D) -9
38. The equations of the tangent line to the graph of the function $f(x) = x^3 - 2x + 1$ at a point (1,0) is
 A) $x + y + 1 = 0$ B) $x - y + 1 = 0$ C) $-x + y - 1 = 0$ D) $x - y - 1 = 0$
39. Air is being pumped in to a spherical balloon at the rate of $6 \text{ cm}^3/\text{min}$, then the rate of change of the radius when the radius is 4cm ?
 A) $\frac{1}{10\pi} \text{ cm}/\text{min}$ B) $\frac{3}{32\pi} \text{ cm}/\text{min}$ C) $\frac{3\pi}{32} \text{ cm}/\text{min}$ D) $\frac{1}{11} \text{ cm}/\text{min}$
40. A certain Air plane determines that the marginal profit resulting from sale of x seats on a plane traveling from Addis Ababa to Kenya Nairobi in hundreds of dollars is given by $p'(x) = 2x + 1$; what is the total profit when 10 seats are sold.
 A) 110 B) 100 C) 210 D) 120

41. Which of the following is false about measures of dispersion
- A) An absolute measure of dispersion measures only the variability in terms of different units
 - B) An absolute measure of dispersion measures the variability in terms of the same units of the data.
 - C) A relative measures of dispersion compare the variation of two or more distributions
 - D) IQR ignores 50 % of the data.
42. The following are the average daily temperatures in(°F) of ten days for two cities A and B:
- A: 20,24,25,26,26,27,27,28,30,30
- B: 22,23,24,24,25,25,26,26,27,28
- which of the following is true about these data?
- A) B is more consistent or clustered than A
 - B) B possesses higher variability than A
 - C) A is more clustered than B
 - D) A is less scattered than B
43. Which one of the following is measures of relative dispersion
- A) Range
 - B) Standard deviation
 - C) Mean deviation
 - D) Coefficient of Range
44. The mean deviation about the mean of the data 2, 1, 4, 3, 7, 6, 7, 10.
- A) 3.5
 - B) 2.5
 - C) 4
 - D) 2
45. What is the variance of the data set 5, 4, 10, 7, 9?
- A) 1.6
 - B) 1.7
 - C) 5.2
 - D) 3.4
46. Let $A = \begin{bmatrix} 8 & a+b \\ 5 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 8 & 3 \\ 5 & a-b \end{bmatrix}$. If $A=B$, then what are the values of a and b respectively?
- A) 2, 2
 - B) 1, 2
 - C) 3, 2
 - D) 2, 1
47. The solution set of the system of linear equations $\begin{cases} x + 2y - z = 0 \\ 2x + y - z = 3 \end{cases}$ is
- A) $\{(y + 3, y, 3y + 3): y \in \mathbb{R}\}$
 - B) $\{1,2,5\}$
 - C) $\{ \}$
 - D) $\{ 2,5, 1\}$
48. If $A = \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$, $B^{-1} = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$ then $(AB)^{-1}$ is equals to
- A) $\begin{bmatrix} 2 & 2 \\ 10 & 3 \end{bmatrix}$
 - B) $\begin{bmatrix} 2 & 3 \\ 5 & 5 \end{bmatrix}$
 - C) $\begin{bmatrix} -2 & 1 \\ -10 & 4 \end{bmatrix}$
 - D) $\begin{bmatrix} -2 & 1 \\ 4 & -10 \end{bmatrix}$
49. In a triangle, the smallest angle measures 10° less than half of the largest angles. The middle angle measures 20° more than the smallest angle. The measures of each angles of the triangle are
- A) 40,50,90
 - B) 30,55,95
 - C) 20,65,95
 - D) 35,55,90
50. Let A and B are 3x3 matrices such that $A = \begin{bmatrix} -1 & -2 & 1 \\ 5 & 3 & 0 \\ 0 & 1 & 4 \end{bmatrix}$ and $|B^T| = 1/33$, which of the following is equals to $|4AB|$?
- A) 23
 - B) 64
 - C) 4
 - D) 4/23

51. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 4 & 1 \\ 0 & 0 & 6 \end{bmatrix}$ and $B^T A = 2I$, where B is 3×3 matrix and I is identity matrix of order 3, then what is the value of $\det(B)$?
- A) $1/3$ B) 3 C) $1/2$ D) -2
52. which of the following is the inverse of a matrix $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$
- A) $\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$ B) $\begin{bmatrix} -2 & 1 \\ 3/2 & -1/2 \end{bmatrix}$ C) $\begin{bmatrix} -2 & 1 \\ 3 & 4 \end{bmatrix}$ D) $\begin{bmatrix} 2 & 1 \\ 3/2 & -1 \end{bmatrix}$
53. Consider the system $\begin{cases} 2x + 3y - 5z = 1 \\ x + y - z = 2 \\ 2y + z = 8 \end{cases}$ if the determinant of the coefficient matrix is -7, then what is the solution of the system of equation?
- A) $\{(1, 2, 3)\}$ B) $\{3, 2, 4\}$ C) $\{(1, 3, 2)\}$ D) $\{(0, 2, 1)\}$
54. The solution set of $[2x + 5] = -3$ is _____
- A. $-4 \leq x < \frac{-7}{2}$ B. $\frac{-7}{2} \leq x < -4$ C. $-4 \leq x < \frac{-7}{2}$ D. $-4 \leq x < -3$
55. Which one of the following is **not** power function
- A. $f(x) = 3x^2$ B. $f(x) = \frac{1}{2}x^{-3}$ C. $f(x) = \sqrt[3]{x^{-1}}$ D. $f(x) = 2^x$
56. If $f(x) = \text{sgn}(x^2 - 5x) = -1$, then the value of x is _____
- A) $(0, 5)$ B. $(5, \infty)$ C. $(-\infty, 0)$ D. $\mathbb{R}$
57. Which one of the following is one to one correspondence?
- A) $f: [0, \infty) \rightarrow \mathbb{R}$ defined by $f(x) = |x|$
 B) $f: \mathbb{R} \rightarrow [0, \infty)$ defined by $f(x) = x^2$
 C) $f: \mathbb{R} \rightarrow [0, \infty)$ defined by $f(x) = 2^x$
 D) $f: (0, \infty) \rightarrow \mathbb{R}$ defined by $f(x) = \log_3 x$
58. The invers of the relation $R = \{(x, y): y = \frac{e^x + 1}{e^x - 1}, x, y \in \mathbb{R}\}$ is _____
- A) $R^{-1} = \{(x, y): y = \ln \left| \frac{x+1}{x-1} \right| \}$ C) $R^{-1} = \{(x, y): y = \ln|x + 1|\}$
 B) $R^{-1} = \{(x, y): y = \ln|x - 1|\}$ D) $R^{-1} = \{(x, y): y = \ln|x|\}$
59. The solution set of $\frac{x^2 - 2x - 3}{x + 5} \leq 0$ is
- A) $[-5, -3]$ B) $[-5, -3] \cup [1, \infty)$ C) $(-\infty, -3) \cup [-3, -1]$ D) $[1, \infty)$
60. Which one of the following is true about the graph of $f(x) = \frac{x^2 - 1}{(x + 1)(x + 3)}$?
- A) The domain of f is $\mathbb{R}/\{-3\}$ C) has vertical asymptote at $x = -1$ & $x = -3$
 B) x-intercept $(-1/3, 0)$ D) its horizontal asymptote $y = 1$