ADDIS ABEBA EDUCATION BUREAU

YEKA SUB CITY EDUCATION OFFICE

MATHEMATICS MODEL EXAMINATION

FOR GRADE 12 SOCIAL SCIENCE.

JANUARY 2024

NUMBER OF QUESTIONS:65 **TIME ALLOWED: 3:00 HRS**

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS MATHEMATICS EXAMINATION FOR THE SOCIAL SCIENCE CANDIDATES ONLY.

IN THIS EXAMINATION, THERE ARE A TOTAL OF 65 MULTIPLE CHOICE QUESTIONS.

THERE IS ONLY ONE BEST ANSWER FOR EACH QUESTION. CHOOSE THE BEST ANSWER FROM THE SUGGESTED OPITIONS AND BLACKEN THE LETER OF YOUR CHOICE ON THE ANSWER SHEET.USE ONLY PENCIEL TO MARK YOUR ANSWERS.

YOU WILL BE ALLOWED TO WORK ON THE EXAM FOR 3 HOURS. WHEN TIME IS CALLED, YOU MUST IMMEDIATELY STOP WORKING, PUT YOUR PENCIL DOWN, AND WATI FOR FURTHER INSTRACTIONS.

ANY FORM OF CHEATING OR AN ATTEMT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMNATION HALL AND CANCELLATION OF YOUR SCORE(S).

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

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

DIRECTIONS: FOR EACH OF THE FOLLOWING PROBLEMS, CHOOSE THE BEST ANSWER FROM THE GIVEN ALTERNATIVES AND CAREFULLY BLACKEN THE LETTER OF YOUR BEST CHOICE ON THE SEPARATE ANSWER SHEET PROVIDED.

1. **Among the following general terms of a recursive sequence which one is represent mulatu's number?**

A. $$a_n=\begin{cases}1, \text{if } n=0\\1, \text{if } n=1\\a_{n-1}+a_{n-2}, \text{if } n\geq 2\end{cases}$$

B. $$a_n=\begin{cases}4, \text{if } n=0\\1, \text{if } n=1\\a_{n-1}+a_{n-2}, \text{if } n\geq 2\end{cases}$$

C. $$a_n=\begin{cases}2, \text{if } n=0\\2, \text{if } n=1\\na_n, \text{if } n\geq 2\end{cases}$$

D. $$a_n=\begin{cases}2, \text{if } n=0\\1, \text{if } n=1\\a_{n-1}+a_{n-2}, \text{if } n\geq 2\end{cases}$$

2. **The simplified form of the expression** $\frac{6\sqrt{20}-3\sqrt{45}}{3\sqrt{75}}$ **is equal to:**

A. $\sqrt{5}$ **B.** $\frac{\sqrt{15}}{15}$ **C.** 5 **D.** 1/5

3. **Which one of the following set is the symmetric difference** $A\Delta B$**, of the set A={1, 2, 5, 6, 8, 10} and B={2, 5, 8, 11}?**

A. {1, 6, 10} **B. {2, 11}** **C. {1, 6, 10, 11}** **D. {1, 2, 5, 6, 8, 10,11}**

4. What is the solution set of system of linear equation in two variable of $\begin{cases} 2x+5y=26 \\ 5x-3y=-28 \end{cases}$ **is?**

A. {(6, 2)} B. {(3, 2)} C. {(-2, 6)} D. {(1, 2)}

5. Which one of the following is <u>true</u> about the graph of a quadratic function $f(x)=x^2+6x-5$**?**

A. the graph opens downward B. the vertex of the function is $(3,14)$

C. the domain of the function $(0,\infty)$ **D. the range of the function is** $[-14,\infty)$

6. If The area of two similar triangles are 144m² and 64m², then a side of the first triangle is 6m, and what is the value of the side of the second triangle?

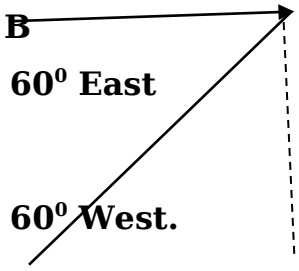
A. 5m B. 6m C. 3m D. 4m

7. The variance of a sample data a, b, c, d, e is 4 and its mean is 3. Which one of the following is <u>true</u> about a sample data of a, b, c, d, e?

A. the variance of a+2, b+2, c+2, d+2, e+2 is 6 B. the mean of a+3, b+3, c+3, d+3, e+3 is 3

C. the standard deviation of 2a, 2b, 2c, 2d, 2e is 4. D. the mean of 2a, 2b, 2c, 2d, 2e is12

8. A car travels 4km to the north and then $4\sqrt{3}$**km to the east. What is the displacement of the car from A to the final position C?**



A. 8km in the direction of North 60⁰ East

B. 2km in the direction of South 60⁰ West.

60^0 **C. 4km in the direction of North 60^0 East**

A 30^0 **D** **D. 12km in the direction of North 30^0 East**

9. Which of the following is not a factor of a polynomial function $p(x) = x^3 - \pi x^2 - x + \pi$?

A. $x - 1$ **B.** $x + \pi$ **C.** $x + 1$ **D.** $x - \pi$

10. Which one is <u>not true</u> about the polynomial function $f(x) = x(x-2)^3(x+5)^2$?

A. the graph lies below the x-axis on the interval (-5, 0) **B. the zeros are 0, 2 & -5**

C. the domain is the set of real number **D. the graph crosses the x-axis at x=2**

11. What is the maximum value of the liner programming Z= 4X+6Y,

$$x \geq 0$$
$$y \geq 0$$
$$-x + y \leq 11$$
$$x + y \leq 27$$
$$2x + 5y \leq 90$$

Subject to:

A. 132, X=15&Y=12 **B. 140, X=15&Y=12** **C. 108, X=15&Y=12** **D. 172, X=15&Y=12**

12. A Mobile sealer buys a mobile for birr 1,200 and then sells it for birr 1,500. What is the percentage profit? **A. 13%** **B. 25%** **C. 30%** **D. 10%**

13. A sunshine real stat home is purchased with a mortgage of birr 600,000. The buyer pays a loan origination fee of $2\frac{1}{2}$ points. How much is the loan origination fee?

A. 20,000 **B. 30, 000** **C. 10,000** **D. 15,000**

14. What is The solution set of the system of linear equation

$$\begin{cases} x-3y-2z=6 \\ 2x-4y-3z=8 \\ -3x+6y+8z=-5 \end{cases}$$ is?

A. {-1, -3, -2} **B. {-1, -3, 2}** **C. {1, -3, 2}** **D. {1, 3, -2}**

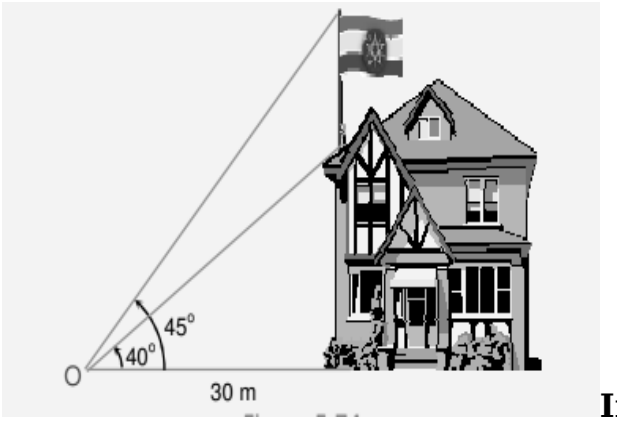
15. The simplest form of $\frac{4-3i}{3+4i}+\overline{1-2i}$ is equal to:

A. $2-i$ **B.** $1+3i$ **C.** $1-3i$ **D.** $1+i$

16. If $A=\begin{pmatrix} 3 & -2 & 8 \\ 0 & 6 & 7 \\ 0 & 4 & 5 \end{pmatrix}$, then $\det(A^TA)$ is equal to: **A. 12** **B. 30** **C. 15** **D. 36**

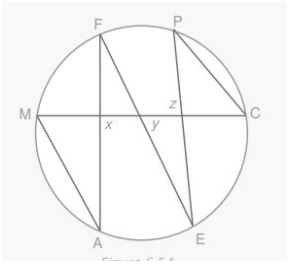
17. The two statements p and q, $P\equiv T \text{ and } q\equiv F,$ then which of the following has a truth value T?

A. $\neg p \wedge q$ **B.** $\neg q \Rightarrow \neg p$ **C.** $p \Leftrightarrow q$ **D.** $\neg p \vee \neg q$



18. In the above figure If the observer O, the angle of elevation of the bottom and the top of a flagpole are 40^0 and 45^0 respectively, then what is the value of the height of the flagpole?

A. 20m B. 5.2m C. 4.83m D. 2.17m



19. In the above figure If m (∠ FAM) = 40^0 and m (∠ CPE) = 50^0, what is the degree measure of (∠ EYC)?

A. 60^0 B. 50^0 C. 30^0 D. 100^0

20. What is the solution set of the absolute inequality $|8-3x| \geq 7$ is?

A. $\left(-\infty, \frac{1}{3}\right] \cup [5, \infty)$ B. [1/3, 5] C. $(-\infty, 3] \cup [7, \infty)$ D. [3, 7]

21. A line passes through the point of A(5, -1) and B(-3, 3). What is the equation of a line?

A. 2x+y-3=0 B. x+2y-3=0 C. y-2x+3=0 D. x-2y-3=0

22. What is the area of a regular eight –sided polygon with radius 4m?

A. $36\sqrt{3}m^2$ C. $12\sqrt{3}m^2$ C. $32\sqrt{2}m^2$ D. $36\sqrt{2}m^2$

23. What is the solution set of a quadratic inequality $x^2 - 3x - 4 \leq 0$?

A. $(-\infty, -1] \cup [4, \infty)$ B. $[-1, 4]$ C. $(-\infty, -4] \cup [1, \infty)$ D. $[-4, 1]$

24. Which one of the following is not equal to $\sin(1340^0)$?

A. $\sin(-100^0)$ B. $-\sin(80^0)$ C. $-\cos(10^0)$ D. $\cos(-20^0)$

25. What is The solution set of the logarithmic equation of $\log_5 x + \log_5 (x+1) = \log_5 2$?

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

26. Among the following expression, which one is <u>not correct</u>?

A. $\log_2 32+\log_2 2=6$ B. $\log_{10} 1000000=6$ C. $\left(\frac{5}{2}\right)^{-3}=\frac{8}{125}$ D. $\left(\frac{3}{4}\right)^{0}=\frac{3}{4}$

27. If the altitude of a right circular cone is 12cm and the radius of a right circular cone is 5cm, then what is the value of a total surface area of a right circular cone?

A. $65\pi cm^2$ B. $90\pi cm^2$ C. $100\pi cm^2$ D. $36\pi cm^2$

28. A frustum of a regular square pyramid has height 6cm, the upper base of side is 3cm and the lower base of side is 5cm. what is the volume of the frustum?

A. $98cm^3$ B. $32cm^3$ C. $40cm^3$ D. $49cm^3$

29. What are the domain and range of the function $F(x)=2x^{3/4}$ respectively?

A. $[0,\infty),R$ B. $R,[0,\infty)$ C. $[0,\infty),[0,\infty)$ D. $(0,\infty),(0,\infty)$

30. Which one of the following not true about the graph of $f(x)=\frac{2x^2}{x^2-x-2}$?

A. The range of f is the set of $i/\{2\}$ B. The graph of f(x) crosses its horizontal asymptotes

C. X= -1 and X= 2 are its V.A D. $As\, x\to\infty, f(x)\to 2$

31. What is the equation of the tangent line to the circle with equation $(x-3)^2+(y-4)^2=20,$ at P(1, 0) ? A. 3X+4y=20 B. 2y-3x=1 C. x + y= 4 D. x+2y=1

32. A parabola with focus at (3, -1) has directrix y=3 which one of the following is equation of the parabola? A. $(x-3)^2=-4(y+1)$ B. $(x-3)^2=4(y+1)$

C. $(x-3)^2=-8(y-1)$ D. $(x-3)^2=8(y-1)$

33. A bag contains 7 white, 5 red and 8 black balls, one ball is drawn at random. What is the probability that the drawn is not red? A. ¾ B. 5/4 C. 7/20 D. ¼

34. What is the coefficient of x^2y^3 in the binomial expansion $(2x+y)^5$?

A. 80 B. -40 C. 40 D. -80

35. The mark that students scored in an examination is grouped in class intervals as shown in the following table

Class interval (mark)	55 - 64	65 - 74	75 - 84	85 - 94	95 - 100
Number of students	8	12	20	6	4

What is Q_2, D_6 and P_{25} of the distribution respectively?

A. 75.5, 79.5&68.5 B. 76.5, 79.5 & 68.25 C. 68, 79 & 76 D. 75, 79.25 & 69.25

36. Which one of the following is an arithmetic progression (A.P)?

A. { -3, 6, -9, 12, -15, …} B. {3, 5, 7, 11, …}

C. {3, 6, 12, 24, 48, …} D. {1, 3, 6, 10, 15, 21, …}

37. What is the sum of all multiples of 5 between 100 and 501?

A. 48,400 B. 11,300 C. 24,600 D. 24,200

38. A ball is dropped from a height of 60m and always rebounds one-third the distance from Which it falls. What is the total distance when the ball is rest?

A. 150 B. 185 C. 72 D. 120

39. When k- arithmetic means are inserted between 10 and 40. Then the sum of the resulting series is 175. What is the value of k? A. 5 B. 15 C. 10 D. 7

40. The value of $\sum_{n=1}^{99} \log_{10}\left(\frac{n+1}{n}\right)$ is equal to: A. 1 B. 2 C. 3 D. 4

41. If $\sum_{k=1}^{\infty} 12^{kr} = \frac{1}{11}$, then, the value of r is? A. 1 B. 12 C. -1 D. -12

42. The value of $\sum_{n=1}^{\infty} 5\left(\frac{2}{3}\right)^n$ is ? A. 0 B. 15 C. 10 D. 5

43. The partial sum of the nth A.P is $4n^2+1$, what is the value the 10th term (a_{10})?

A. 80 B. 76 C. 60 D. 120

44. What is the sum of the infinite series

$\frac{1}{5} - \frac{2}{25} + \frac{4}{125} - \frac{8}{625} + \ldots ?$

A. ½ B. -2/5 C. 1/5 D. 1/7

45. If the sum of the first three terms of a G.P is 7, and the sum of from 4th to 6th term is 448, then what is the value of the first term and common ratio of a G.P respectively?

A. 3, 4 B. 1/3, 4 C. 5, 1/7 D. 2, 7/5

46. What is the fractional form of the purely recurring decimal number $0.\overline{56}$?

A. $\frac{56}{9}$ **B.** $\frac{56}{7}$ **C.** $\frac{56}{99}$ **D.** $\frac{81}{8}$

47. Which one of the following is not absolute measure of dispersion?

A. range B. Inter-quartile range C. coefficient of range D. mean deviation

48.

x	0-20	20-40	40-60	60-80	80-100
f	3	1	2	4	1

from the above given table of data, what is the value of range of the distribution?

A. 45 B. 80 C. 95 D. 100

49. Let the following A and B are two sets of data, A:20,70,70,70,70,70,70,70,100 and

B: 20,30,50,80, 90,100, what is the value of inter-quartile range of A and B?

A. 60 B. 20 C. 40 D. 30

50.

x	f
10	2
20	4
30	7
40	6
50	1

what is the value of mean deviation about the mode of the above given data? A. 2 B. 8 C. 12 D. 20

51. What is the mean deviation about the median of the data 12, 9, 15, 12, 7, 10, 12?

A. 2.56 B. 1.86 C. 3.4 D. 7

52. Which one of the following is not true about the function defined by $f(x)=x^3-3x^2$ **on** $[-1,3]$

A. Its critical numbers at 0 and 2 B. Its Range is [4, 10]

C. It is Decreasing on [0, 2] **D. It is Increasing on [-1, 0] and [1, 3]**

53. **What is the slope of a secant line to the graph of the function $f(x)=x^3-4x+6;1\le x\le 2$?**

A. 1 **B. 2** **C. 3** **D. 4**

54. **The volume of a sphere is increasing at rate of $20\pi cm^3/sec$. What is the rate of change of the radius when the radius is 10cm?**

A. $2cm/sec$ **B.** $0.5cm/sec$ **C.** $0.05cm/sec$ **D.** $20cm/sec$

55. **A company represents, the total revenue R and total cost C given by:** $R(x)=x^3-12x^2+40x+10$ **and** $C(x)=62x^2+27,500$. **what is the marginal profit when 50 units are produced and sold?** **A. 140** **B. 250** **C. 125** **D. 4500**

56. **A closed cylindrical can having a volume of** $128\pi cm^3$ **is to be formed. What is the dimension (radius and height) of the cylinder that will minimize the amount of material to be used?**

A. r=2cm, h=3cm **B. r=4cm, h=3cm** **C. r=5cm, h=2cm** **D. r =1cm, h=5cm**

57. $\int 10dx=$_____. **A.** $10x+c$ **B.** 10 **C.** 0 **D.** $x+c$

58. **The anti-derivatives of a function** $f(x)=\left(x^2+\sqrt{x}\right)$

A. $\frac{x^3}{3}+\frac{2x^{3/2}}{3}+c$ **B.** $\frac{x^3}{3}+\frac{x^{3/2}}{3}$ **C.** $\frac{x^3}{2}+\frac{3x^{3/2}}{2}+c$ **D.** $2x+\frac{1}{2\sqrt{x}}$

59. **The value of** $\int_{-1}^{0}(x^3-3x+1)dx$ **is?** **A. 4/3** **B. 3/2** **C. 9/4** **D. 5/4**

60. **What is the area of the a region enclosed by a function** $f(x)=x^2+3;-1\le x\le 3$?

A. $\frac{3}{64}$sq.unit B. $\frac{32}{3}$sq.unit C. $\frac{3}{32}$sq.unit D. $\frac{64}{3}$sq.unit

61. $\int_0^4 2x\,dx =$ ____.
A. 4 B. 8 C. 16 D. 32

62. If $f(x)=\sqrt{x^2+4x-1}$,then $f'(1)=$_____. A. 3 B. ½ C. 3/2 D. 4/5

63. What is the range of $f(x)=x^3+3x^2-9x+5$ on an interval [-2, 2]?
A. [-21, 32] B. [1, 5] C. [0, 32] D. [1, 21]

64. What is the normal line to the graph of a function $f(x)=\sqrt{20-x^2};(2,4)$?
A. $y=\frac{-1}{2}x+5$ B. $y=2x$ C. $y=-2x$ D. $y=\frac{1}{2}x+5$

65. If $f(x)=\frac{x^2}{x+1}$, then $f'(0)$ is equal to: A. 0 B. 1 C. 2 D. 4