ADDIS ABEBA EDUCATION BUREAU

YEKA SUB CITY EDUCATION OFFICE

MATHEMATICS MODEL EXAM 2 EXAMINATION

FOR GRADE 12 SOCIAL SCIENCE.

APRIL 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 questions, choose the correct answer from the given alternatives and carefully write the letter of your correct choice on the separate answer sheet provided

1. **Which one of the following describe the property of prime numbers**
   - **A. Some prime numbers has more than two factors**
   - **B. All prime numbers are odd natural number.**
   - **C. Every prime numbers has exactly two factors.**
   - **D. Every prime numbers has at least two odd factors.**
2. **The simplified form of $\sqrt[3]{(-729)^{-1}}$ is equal to**

   A. 9 B.$-\frac{1}{9}$ C.-9 D. Is not real number result
3. **If the denominator of $\frac{5\sqrt{3}}{2\sqrt{3}-\sqrt{2}}$ is rationalized, then what is the corresponding rationalizing factor?**

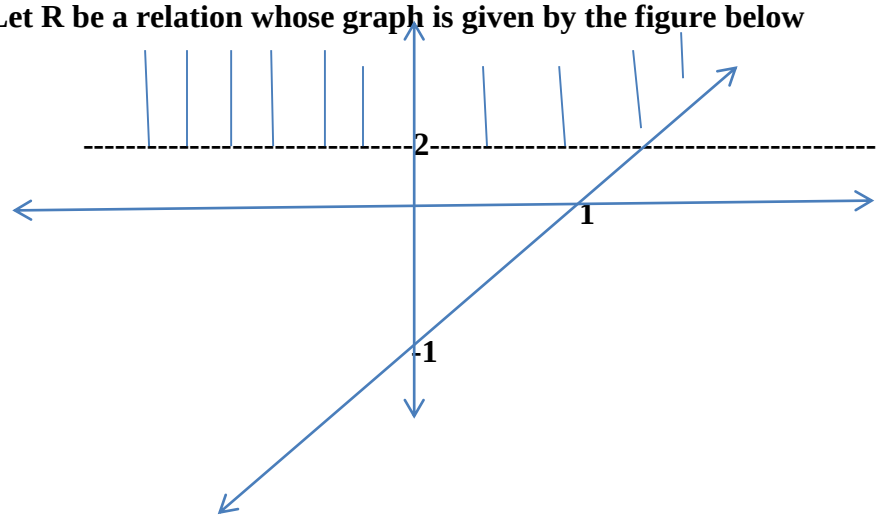
   A. $\frac{2\sqrt{3}+\sqrt{2}}{2\sqrt{3}+\sqrt{2}}$ **B.** $\frac{\sqrt{3}+\sqrt{2}}{\sqrt{3}+\sqrt{2}}$ **C.** $\frac{2\sqrt{3}-\sqrt{2}}{2\sqrt{3}-\sqrt{2}}$ **D.**$\frac{\sqrt{3}}{2\sqrt{3}}$
4. **What is the solution set of the equation $\sqrt{(0.5)}^{x} = 4^{x+5}$?**

   A. {4} B. {-2} C.$\{\frac{1}{4}\}$ **D.{-4}**
5. **Which one of the following is true about the solution of systems of linear equation**

$$\begin{cases} 2x-3y=6 \\ -6x+9y+12=0 \end{cases}$$

   - **A. has one solution**
   - **B. has infinitely many solution**
   - **C. has no solution**
   - **D. has no solution**
6. **Which one of the following is always true for any two sets A & B**
   - **A. n(AUB) = n(A) +n(B)**
   - **B. If A⊑B, then n(AUB) =n(B)**
   - **C. If A⊑B & B⊑A, then n(AUB) = 2n(AUB)**
   - **D. If n(AnB) =0, then A=B= ∅**

7. **Let R be a relation whose graph is given by the figure below**



Which one of the following is true about the domain and the range the range of the above relation?

A. The domain of R is {x: x≥ 0}
B. The range of R is {y:>2}
C. The range of R is {y:y is real numbers}
D. The domain of R is { x: x>2}

8. **Which one of the following is false about a quadratic function f(x)= $x^2 + 4x - 12$**

A. X=6 & x= -2 are zeros of f
B. (-2,-16) is vertex of f
C. the symmetric line of the graph is a line x= -2
D. the graph of f has two x- intercept

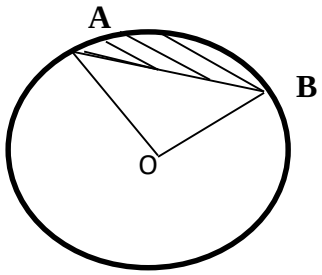
9. **Suppose $\Delta ABC \sim \Delta DEF$ and the side of ΔABC are 3cm,4cm and 5cm long. If the area of ΔDEF is 24cm^2 , what is the length of the largest sides ΔDEF**

A. 20cm B.12cm C. 8cm D.10cm

10. **If ΔABC is right angle triangle at C , <A = 45^0 and the length of $\overline{AC}$ = $\sqrt{2}$ cm. what is the length of $\overline{BC}$?**

A. 2cm B. $\sqrt{2}$ cm C.4cm D.5cm

11. In the circle shown below O is the center the radius measure 4cm and m(<AOB)=60^0



Which one of the following is the area of the segment?

A. $\frac{8\pi-24\sqrt{3}}{3}$ **cm^2** **B.** $\frac{8\pi+24\sqrt{3}}{3}$ **cm^2** **C.** $\frac{2\pi-22\sqrt{3}}{3}$ **cm^2** **D.** $\frac{8\pi-12\sqrt{3}}{3}$ **cm^2**

12. Given 2,4,6,8,& 10 are the variation of the score,. the variance of the date is

A. 2 **B.** $2\sqrt{2}$ **C.** $\sqrt{10}$ **D. 8**

13. Which one of the following quantity is vector quantity?

A. Mass **B. length** **C. force** **D. weight**

14. What is the value of "a" for the remainder is -7 when the polynomial function f(x)= $ax^2+3x+20$ divided by x-3?

A. -18 **B. -36** **C. -2** **D. -4**

15. Which one of the following is not true about the graph of a polynomial function?

A. Smooth continuous curve
B. It has at most n-1 turning points for the degree of the polynomial is n
C. It has at least n roots for the degree of the polynomial is n
D. Every odd degree polynomial has at least one x- intercept.

16. If f(x) = a^x is an exponential function, which one of the following is true about f?

A. (0,1) is the y- intercept of f **B. the range of f is {y: y ≥ 0)**
B. Increasing function for all a>0 **D. the domain of f is {x:x > 0}**

17. If a=$(\frac{1}{4})^{-x}$ $and\ b = (\frac{1}{8})^{y}$, $then$ $\log_2 ab$ is equal to

A. 2x-3y **B. -2x+3y** **C. -2x-3y** **D. 3x-2y**

18. Which one of the following is the truth set of Absolut value inequality |-2x+3| > 5?

A. {x:-1 < x < 4} **B. {x: x < -1}** **C.∅** **D. {x: x < -1 or x > 4}**

19. Which one of the is true about the solution of quadratic inequality

$2x^2 - 3x - 5 > 0$

A. $(-1,\frac{5}{2})$ **B.** $(-\infty,-1)\ u\ (\frac{5}{2},\infty)$ **C.** $(-\infty,-1)$ **D.** $(\frac{5}{2},\infty)$

20. What is the coordinates of a point that divide a line segment $\overline{PQ}$ of P(2,3) and Q(4,5) in to two equal parts

A. (6,8) B.(2,1) C.(3,4) D.(2,5)

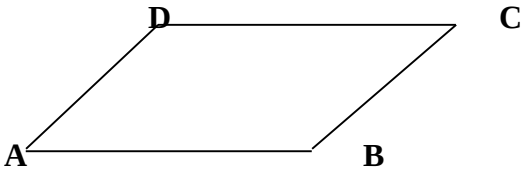
21. If θ *and* β are complementary angles, then which one of the following is true?

A. $\sin\theta = \sin\beta$ B. $\sin\theta = \frac{1}{\sec\beta}$ C. $\sin\theta = \cos(90-\beta)$ D. $\cos\beta = \frac{1}{\sec\theta}$

22. What is the height of a tree which casting a shadow of 15m when the angle of elevation of the sun is 30^0

A. $3\sqrt{3}$m B. $15\sqrt{3}$m C. $\frac{15}{2}\sqrt{3}$m D. $5\sqrt{3}$m

23. Parallelogram ABCD ,with AB//DC is given as shown in the figure below



If AD=6cm , BC=8cm & <A=30^0 what is the area of the parallelogram?

A. $24\sqrt{3}cm^2$ B . $12\sqrt{3}cm^2$ C. $48cm^2$ D. $24cm^2$

24. If a regular polygon of 4 side inscribed with a circle of radius 6cm long is given , then its area is –

A. $12cm^2$ B. $6cm^2$ C. $16cm^2$ D. $72cm^2$

25. Which one of the following is true about the volume of a square base pyramid with length of the square is 12cm and slant height of the pyramid is 10cm?

A. $542cm^3$ B. $384cm^3$ C. $222cm^3$ D.$144cm^3$

26. A frustum of height 3cm is formed from a right circular cone of height 6cm and base radius 8cm. the area of upper base of the frustum is equal to?

A. $64\pi cm^2$ B. $16\pi cm^2$ C. $6\pi cm^2$ D. $48\pi cm^2$

27. Which one of the following relation is one – one function?

A. $y \geq x+1$ B. $y = x^2+1$ C. $y = \sqrt{x+1}$ D. $y^2 = x+1$

28. If a rational function $\frac{3x+2}{x^2+3x+2}$ is decompose in a partial fraction of $\frac{A}{x+1} + \frac{B}{x+2}$, then the value of A & B respectively are ?

A. -1 & 4 B. 1 & 4 C. -4 & 1 D. 4 & -1

29. Which one of the following is the equation of a circle with center (2,5) and tangent to a line x-y=1

A. $(x-2)^2+(y-5)^2 = 8$ C. $(x-2)^2+(y-5)^2 = 2$

B. $(x-2)^2+(y-5)^2 = 4$ D. $(x-2)^2+(y-5)^2 = 64$

30. The equation of a parabola whose focus is (-4,-1) and whose directrix is the line x= 8 is?

A. $(y-1)^2 = 24(x-2)$ C. $(y+1)^2 = -24(x+2)$

B. $(y+1)^2 = -24(x-2)$ D. $(y-1)^2 = -24(x-2)$

31. If [(p∧q)⇒ r] is false, then which of the following truth value is true?

A. P⇒ r B. p∧ r C. $\neg p \vee r$ D. $\neg q \Leftrightarrow r$

32. If the following frequency distribution of grouped data is given

x	1-5	6-10	11-15	16-20
f	6	2	8	4

Which one of the following is the mode the above data?

A. 4.5 B. 10.5 C. 13.5 D. 16.5

33. How many arrangements of the word "SHEEPS''

A. 180 B.720 C.540 D.24

34. How many different ways can be 1 man and 2 women selected from 3 men and 4 women

A. 36 B. 18 C.12 D.24

35. Let matrix A=$\begin{pmatrix} a & b & c \\ d & e & f \\ a & b & c \end{pmatrix}$ then which one of the following is false?

A. |A|=|A^T| B.|rA|=r|A|, for rϵR C.|A|=0 D. |A| ≠ |A+A|

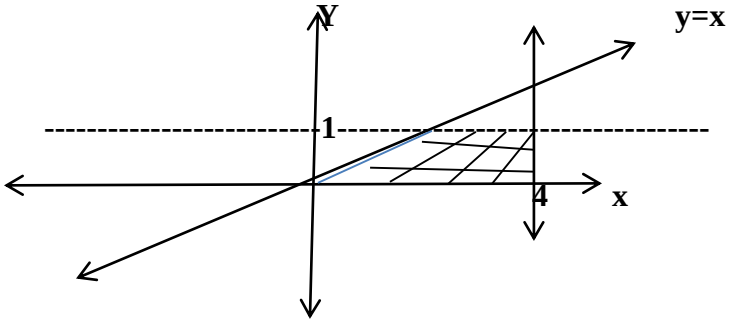
36. The solution set of the system $\begin{cases} 3x+y-z=0 \\ -2x+5y+4z=-1 \\ 3x+2y+z=1 \end{cases}$

A. $(\frac{1}{2}, \frac{-2}{3}, \frac{5}{6})$ $B.\left(\frac{-1}{2}, \frac{2}{3}, \frac{-5}{6}\right)$ $C.(\frac{1}{4}, \frac{-2}{3}, \frac{-5}{6})$ $D.(2,-3,5)$

37. The simplified form of a complex number of $\frac{2-i}{1+i}$ in the form of a+bi is

A. $2-3i$ $B.\frac{1}{2}-\frac{3}{2}i$ $C.3+2i$ $D.-2+3i$

38. The following graph of the relation of shaded region is given below



Which of the following Relation is represent the above shaded region?

A. $R=\{(x,y): y<1, x\leq 4, x\geq 0 \text{ and } y\leq x\}$
B. $R=\{(x,y): y>1, x\leq 4, x\geq 0 \text{ and } y\geq x\}$
C. $R=\{(x,y): y\geq 1, x\geq 4, x\geq 0 \text{ and } y\leq x\}$
D. $R=\{(x,y): y<1, x\leq 4, x\geq 0 \text{ and } y\geq x\}$

39. Abebe deposits birr 100at the end of every six months in account that pay 10% per year compounded semi-annually. if you made 2 deposits one at the end of each interest payment .what is the amount of interest after one year?

A. 5 birr **B.** 205birr **C.**105birr **D.** 100birr

40. Let 2, 5, 8, 11, are few terms a sequence, then the nth terms of the sequence is?

A. $a_n=2n-3$ $B. a_n=3n-2$ $C. a_n=3n-1$ $D. a_n=3n$

41. What is the geometric mean between 3 &12

A. 8 **B.**6 **C.**10 **D.**4

42. Which one of the following sequence is divergent sequence?

A. $\frac{1}{n+3}$ $B. n^{-2}$ $C. \frac{(-1)^n}{n}$ $D. (-1)^n$

43. $\sum_1^{\infty}(\frac{3}{5})^n$ **is equal to_____. A** $\frac{3}{5}$ **B.** $\frac{3}{2}$ **C.** 3 **D.** $\frac{1}{2}$

44. If the sum of the 1st 12 terms of an arithmetic progression with common difference 7 is 738, the its 1st term is _____

A. 13 **B.**15 **C.**23 **D.**45

45. A ball is dropped from a height of 30 m. one each bounce of re bounce $\frac{1}{3}$ **of the distance it fall. How far does it travel before coming rest?**

A. 30 m **B.**40 m **C.**50 m **D.** 60 m

46. Which one of the following value is the the maximum value of a function $f(x) = x^3 - 12x + 10$ on the interval [-3,3]

A. -1 B.26 C.19 D.30

47. On which interval $f(x) = x^3 - 3x^2 - 45x + 20$ is strictly increasing?

A.$(-\infty, -2)\ u\ (5, \infty)$ B. $(-2, 5)$ C. $(-\infty, -2] u\ [5, \infty)$ D. $(-\infty, 5)$

48. When a circular plate of metal is heated in an over its radius increases at a rate of 1cm/min at what rate is the plate's area increasing when the radius is 2m?

A. $400\pi cm^2/min$ B. $200\pi cm^2/min$ C. $100\pi cm^2/min$ D.$10\pi cm^2/min$

49. Which of the following is true about the length and the width of a rectangle with the area is $64cm^2$ that minimize the perimeter?

A. 16cm & 4cm B. 12cm &4cm C. 32cm & 2cm D. 8cm &8cm

50. What is the maximum profit earned by a company if the profit function is given by $f(x) = 150+40x -x^2$

A. 400 B.450 C.200 D.1200

51. $\int \left(x^{\frac{3}{2}} + x + 3\right) dx$ is equal to

A. $x^{\frac{5}{2}} + x^2 + 3x + c$ B. $\frac{2}{5}x^{\frac{5}{2}} + \frac{x^2}{2} + 3x + c$ C. $\frac{5}{2}x^{\frac{5}{2}} + 2x^2 + 3x + c$ D. $\frac{2}{5}x^{\frac{5}{2}} + 3x + c$

52. Which one of the following is the area of the region bounded by the graph $F(x) = x^2$, x-axis and between x=1 & x=3

A .$\frac{1}{3}$ B. $\frac{26}{3}$ C. $\frac{5}{3}$ D. $\frac{25}{3}$

53. $\int_1^3 (\frac{1}{x^2} + x)dx$ is equal to _____ A.$\frac{11}{3}$ B. $\frac{5}{3}$ C. $\frac{14}{3}$ D.5

54. The mean deviation about the mean of the data 1,2,4,6,7 is _____

A. 2 B. $\frac{11}{5}$ C. $\frac{26}{5}$ D. $\frac{13}{5}$

55. Mean of 10 observations is 5. At a time of the calculation two observations were wrongly taken as 7 & 9 in place of 4 & 2 respectively. What is the correcting mean of the observation?

A. 4 B. 40 C.6 D.2

56. Using the following data

X	1-3	4-6	7-9	10-12
F	3	1	5	1

Which one is true about the mean deviation about the mod of the above data?

A. 3.3 B.2.3 C. 3.2 D.1.4

57. **Given the frequency distribution table below**

x	1	2	3	4	5
f	3	2	4	1	1

Which one of the following is the Q_1 & Q_3 respectively?

A. 1 &3 B. 2&4 C.1&4 D.1&5

58. **Which of the following is true about the coefficient the mean deviation about the mean of the following data**

X	0	2	6	8
f	3	4	1	2

A. 8.666 B. 0.8666 C. 1.666 D.3.4

59. **Given the data 4 ,7, 4, 2, 1, 6 ,2 which one of the following is true statement about the Bowly's coefficient of skewnes interpretation?**

A. The distribution is symmetrical. **C. The distribution is skewed negative**

B. The distribution is skewed positive. **D. The distribution is no skewed**

60. **Which one of the following is the disadvantage of sampling technique**

A. Low of cost B. Less time consumer C. Chance bias D. Scope of sampling is high

61. **50 math's students take numbers 1-50 is arranged using a systematic sampling of size 5, starting number 3 is____**

A 1, 10,20,30,40 B. 1, 11,21,31,41 C. 3,13,23,43 D. 3,12,21,30 39

62. **Which one of the following is true about the domain and range respectively on the system of linear inequality** $\begin{cases} y \geq x \\ y < -x + 3 \\ y \geq 0 \end{cases}$

A. $\left\{0 \leq x < \frac{3}{2} \text{ and } 0 \leq y < 3\right\}$ **C.** $\left\{0 \leq x \leq \frac{3}{2} \text{ and } 0 \leq y \leq 3\right\}$

B. $\{0 \leq x < 3 \text{ and } 0 \leq y < 3\}$ **D.** $\{0 < x < \frac{3}{2} \text{ and } 0 < y < 3\}$

63. **What is the maximum value of the following linear programing problem?**

Objective function max: z=3x+5y

Subject to $\begin{cases} y \geq -x + 1 \\ y \leq 2 \\ x \leq 4 \\ x \geq 0 \\ y \geq 0 \end{cases}$ **A.10 B. 22 C.40 D.5**

64. **A manufacturer produces two types of models M_1 and M_2. Each model of the type M_1 requires 4 hours of grinding and 2 hours of polishing, whereas each models of the type M_2 requires 2 hours grinding and 5 hours of polishing. The manufacturer has 2 grinder and 3 polishers. Each grinder works 44 hours and each polisher work for 60 hours a week. Profit on model M_1 is birr 3 and on model M_2 is birr 4. Whatever is produced in a week is sold in the market. How the manufacturer should allocate his production capacity to the two types of models so that he may make the maximum profit in a week?**

Machine	Model M1	Model M2	Limitation of machine
Grading	4	2	88
polishing	2	5	180
Profit	3	4	

The maximum profit of the above LPP is ?

A . 155 **B. 108** **C.151** **D.160**

65. **A dietician wish to mix two types of food in such a way that the vitamin contains of mixture contains at least 8 units of vitamin A and 10 units of vitamin C. food '' I'' contains 2 units /kg of vitamin A and 1 unit /kg of vitamin C while food ''I I' 'contains 1 unit/kg of vitamin A and 2 units/kg vitamin C. its cost birr 5 per kg to purchase food "I" and birr 7 per kg purchase food "II" . the minimum cost to such a mixture is ___**

A 28 **B. 20** **C.38** **D.50**