

ENTRANCE TRICKS PRIVATE SCHOOL
FIRST ROUND UNIVERSITY
ENTRANCE MODEL EXAMINATION
MATHEMATICS, TIKIMT 2017/ NOV
2024

ENTRANCE TRICKS PRIVATE SCHOOL FIRST ROUND UNIVERSITY ENTRANCE MODEL
EXAMINATION MATHEMATICS, TIKIMT 2017/ NOV 2024

BOOKLET CODE: 03

SUBJECT CODE: 03

Time Allowed: 02:00 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS *ENGLISH* EXAMINATION. THE CODE FOR THIS EXAMINATION IS **03** AND THE CODE FOR THIS PARTICULAR BOOKLET IS **03**.

IN THIS EXAMINATION, THERE ARE A TOTAL OF 60 **QUESTIONS**. EACH SECTION CONTAINS **MULTIPLE CHOICE QUESTIONS** CONSISTING OF FOUR POSSIBLE ANSWERS. CAREFULLY SELECT THE BEST ANSWER. YOU ARE ALLOWED TO WORK ON THE EXAM FOR 02:00 **HOURS**. BEFORE TIME IS CALLED, YOU MUST SUBMIT YOUR RESPONSES.

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

DO NOT FORGET SUBMIT YOUR ANSWERS BEFORE THE GIVEN TIME IS FINISHED

1. Email *

2. Full name

3. School name

4. Region

Check all that apply.

- ☐ Addis Ababa
- ☐ Dire Dawa
- ☐ Amhara
- ☐ Tigray
- ☐ Oromiya
- ☐ Afar
- ☐ Somali
- ☐ Benishangul Gumz
- ☐ Harari
- ☐ Gambela
- ☐ Central Ethiopia
- ☐ South west Ethiopia
- ☐ Sidama
- ☐ South Ethiopia

5. Sex

Check all that apply.

- ☐ Male
- ☐ Female

6. Phone number

2017 Entrance Tricks Mathematics First round Model Examination

Choose the correct Answer Based on the given instructions.

7. 1.What is the result of adding $(1101)_2$ and $(1010)_2$?

1 point

Mark only one oval.

☐ A) 10111

☐ B) 11111

☐ C) 10011

☐ D) 11001

8. 2.Which of the following numbers is irrational?

1 point

Mark only one oval.

☐ A) $\sqrt{4}$

☐ B) $\sqrt{2}$

☐ C) 0.75

☐ D) -3

9. 3.Which of the following is not a prime number?

1 point

Mark only one oval.

☐ A) 29

☐ B) 31

☐ C) 49

☐ D) 37

10. 4.What is the sum of the first five prime numbers?

1 point

Mark only one oval.

☐ A) 28

☐ B) 26

☐ C) 30

☐ D) 32

11. 5.Which of the following is a complex number?

1 point

Mark only one oval.

☐ A) 5

☐ B) -3

☐ C) $4 + 2i$

☐ D) $\sqrt{2}$

12. 6.What is the sum of the rational numbers $\frac{3}{4}$ and $\frac{5}{6}$?

1 point

Mark only one oval.

☐ A) $\frac{19}{24}$

☐ B) $\frac{27}{24}$

☐ C) $\frac{1}{2}$

☐ D) 1

13. 7.Which of the following is an irrational number?

1 point

Mark only one oval.

☐ A) 0.333...

☐ B) $\sqrt{5}$

☐ C) -4

☐ D) $7/8$

14. 8.What is the result of rationalizing the denominator of the expression $1/(\sqrt{3})$?

1 point

Mark only one oval.

☐ A) $\sqrt{3}/3$

☐ B) $3/\sqrt{3}$

☐ C) $1/\sqrt{3}$

☐ D) $\sqrt{3}$

15. 9.Which of the following sets contains only integers?

1 point

Mark only one oval.

☐ A) $\{-1, 0, 1, 2.5\}$

☐ B) $\{-2, -1, 0, 1\}$

☐ C) $\{\pi, e, \sqrt{2}\}$

☐ D) $\{1/2, 3/4, 5/6\}$

16. 10. What is the product of the rational numbers $\frac{2}{3}$ and $-\frac{9}{4}$?

1 point

Mark only one oval.

- ☐ A) $-\frac{6}{4}$
- ☐ B) $-\frac{3}{2}$
- ☐ C) $-\frac{27}{12}$
- ☐ D) $-\frac{9}{8}$

17. 11. Which of the following is a real number but not a rational number?

1 point

Mark only one oval.

- ☐ A) $\sqrt{16}$
- ☐ B) π
- ☐ C) -7
- ☐ D) 0.75

18. 12. What is the result of rationalizing the denominator in the expression $\frac{2}{(\sqrt{5} + 1)}$?

1 point

Mark only one oval.

- ☐ A) $\frac{2(\sqrt{5} - 1)}{(4)}$
- ☐ B) $\frac{2(\sqrt{5} - 1)}{(4)}$
- ☐ C) $\frac{2(\sqrt{5} + 1)}{(4)}$
- ☐ D) $\frac{2(\sqrt{5} + 1)}{(4)}$

19. 13.Which of the following statements is true about rational numbers?

1 point

Mark only one oval.

- ☐ A) All rational numbers are integers.
- ☐ B) All integers are rational numbers.
- ☐ C) Rational numbers cannot be negative.
- ☐ D) Rational numbers cannot be whole numbers.

20. 14.What is the square root of an irrational number?

1 point

Mark only one oval.

- ☐ A) Always irrational
- ☐ B) Always rational
- ☐ C) Can be either rational or irrational depending on the number
- ☐ D) Always an integer

21. 15.Which of the following expressions represents a rational number?

1 point

Mark only one oval.

- ☐ A) $\sqrt{7} / \sqrt{3}$
- ☐ B) $(\pi^2 - \pi) / (\pi - \pi^2)$
- ☐ C) $(3 + \sqrt{2}) / (\sqrt{2} + \sqrt{3})$
- ☐ D) $(7 + i) / (2 + i^2)$

22. 16. If $x = \sqrt{2}$, what is x^4 ?

1 point

Mark only one oval.

- ☐ A) 2
- ☐ B) 4
- ☐ C) 8
- ☐ D) None of the above

23. 17. What is the product of two irrational numbers?

1 point

Mark only one oval.

- ☐ A) Always irrational
- ☐ B) Always rational
- ☐ C) Can be either rational or irrational
- ☐ D) Always an integer

24. 18. Solve for x : $3x - 5 = 16$

1 point

Mark only one oval.

- ☐ a) $x = 7$
- ☐ b) $x = 11/3$
- ☐ c) $x = 21$
- ☐ d) $x = 7/3$

25. 19.Solve for y: $2y + 7 > 13$

1 point

Mark only one oval.

☐ a) $y > 3$

☐ b) $y < 3$

☐ c) $y > 6$

☐ d) $y < 6$

26. 20.Solve for x: $\sqrt{x + 5} = 3$

1 point

Mark only one oval.

☐ a) $x = 4$

☐ b) $x = 14$

☐ c) $x = 2$

☐ d) $x = -14$

27. 21.Solve for x: $|x - 3| = 5$

1 point

Mark only one oval.

☐ a) $x = 8$ or $x = -2$

☐ b) $x = 2$ or $x = 8$

☐ c) $x = 3$ or $x = -5$

☐ d) $x = -8$ or $x = 2$

28. 22.Solve for x: $|2x + 1| < 7$

1 point

Mark only one oval.

- ☐ a) $-4 < x < 3$
- ☐ b) $x < -4$ or $x > 3$
- ☐ c) $-3 < x < 4$
- ☐ d) $x < 3$ or $x > -4$

29. 23.Solve the system:

1 point

$$2x + y = 7$$

$$x - y = 2$$

Mark only one oval.

- ☐ a) $x = 3, y = 1$
- ☐ b) $x = 1, y = 3$
- ☐ c) $x = -3, y = -1$
- ☐ d) $x = -1, y = -3$

30. 24.Which point lies in the solution set of the system:

1 point

$$y < 2x + 1$$

$$y > -x - 2$$

Mark only one oval.

- ☐ a) (1, 4)
- ☐ b) (2, -1)
- ☐ c) (-1, 3)
- ☐ d) (0, -3)

31. 25. Solve for x: $x^2 - 5x + 6 = 0$

1 point

Mark only one oval.

☐ a) $x = 2$ or $x = 3$

☐ b) $x = -2$ or $x = -3$

☐ c) $x = 1$ or $x = 6$

☐ d) $x = -1$ or $x = -6$

32. 26. Solve for x: $x^2 - 4x - 5 > 0$

1 point

Mark only one oval.

☐ a) $x < -1$ or $x > 5$

☐ b) $-1 < x < 5$

☐ c) $x < -5$ or $x > 1$

☐ d) $-5 < x < 1$

33. 27. Solve for x: $|x - 2| = |x + 3|$

1 point

Mark only one oval.

☐ a) $x = -1/2$

☐ b) $x = -5/2$

☐ c) $x = 1/2$

☐ d) $x = 5/2$

34. 28.Solve for x: $(x + 1)/(x - 1) = 3$

1 point

Mark only one oval.

☐ a) $x = 2$

☐ b) $x = 1$

☐ c) $x = -1$

☐ d) $x = -2$

35. 29.Solve the inequality: $(x - 3)(x + 2) \leq 0$

1 point

Mark only one oval.

☐ a) $-2 \leq x \leq 3$

☐ b) $x \leq -2$ or $x \geq 3$

☐ c) $x \leq -3$ or $x \geq 2$

☐ d) $-3 \leq x \leq 2$

36. 30.The sum of the squares of two consecutive even numbers is 52. Find the numbers.

1 point

Mark only one oval.

☐ a) 4 and 6

☐ b) 2 and 4

☐ c) 6 and 8

☐ d) 8 and 10

37. 31.Solve for x: $2x^2 + 5x - 3 = 0$

1 point

Mark only one oval.

- ☐ a) $x = -3$ or $x = 1/2$
- ☐ b) $x = 3$ or $x = -1/2$
- ☐ c) $x = -1$ or $x = 3/2$
- ☐ d) $x = 1$ or $x = -3/2$

38. 32.Which of the following is a polynomial function?

1 point

Mark only one oval.

- ☐ a) $f(x) = x^2 + \sqrt{x} - 3$
- ☐ b) $g(x) = 2x^3 - 5x + 1/x$
- ☐ c) $h(x) = 4x^4 - 2x^2 + 7$
- ☐ d) $k(x) = |x| + 3x^2$

39. 33.What is the degree of the polynomial $f(x) = 3x^5 - 2x^3 + 7x - 1$?

1 point

Mark only one oval.

- ☐ a) 1
- ☐ b) 3
- ☐ c) 5
- ☐ d) 7

40. 34. Find the product of the polynomials:

1 point

$$p(x) = x - 2$$

$$q(x) = x^2 + 3x - 1$$

Mark only one oval.

☐ a) $x^3 + x^2 - 7x + 2$

☐ b) $x^3 + x^2 + 7x + 2$

☐ c) $x^3 - x^2 - 7x + 2$

☐ d) $x^3 - x^2 + 7x + 2$

41. 35. What is the remainder when the polynomial $x^3 - 2x^2 + 5x - 1$ is divided by $(x - 2)$?

1 point

Mark only one oval.

☐ a) 11

☐ b) 9

☐ c) 7

☐ d) 5

42. 36. If $f(x) = x^3 - 3x^2 + 2x - 1$, and $f(1) = -1$ and $f(2) = 1$, then according to the Intermediate Value Theorem, there exists at least one root of $f(x)$ in the interval:

1 point

Mark only one oval.

☐ a) $(0, 1)$

☐ b) $(1, 2)$

☐ c) $(-1, 0)$

☐ d) $(2, 3)$

43. 37.The polynomial function $f(x) = x^3 - 4x + 1$ has a root in the interval:

1 point

Mark only one oval.

☐ a) (0, 1)

☐ b) (1, 2)

☐ c) (2, 3)

☐ d) (-1, 0)

44. 38.Determine the value of 'k' so that the polynomial $x^3 - kx^2 + 3x - 2$ has a factor of $(x - 2)$.

1 point

Mark only one oval.

☐ a) $k = 1$

☐ b) $k = 2$

☐ c) $k = 3$

☐ d) $k = 4$

45. 39.Find the remainder when the polynomial $x^{2023} - 2x^{2022} + 3x^{2021} - 1$ is divided by $(x - 1)$.

1 point

Mark only one oval.

☐ a) 1

☐ b) -1

☐ c) 3

☐ d) -3

46. 40. The end behavior of the polynomial function $f(x) = -2x^5 + 3x^2 - 1$ is:

1 point

Mark only one oval.

- ☐ a) As $x \rightarrow \infty$, $f(x) \rightarrow \infty$; As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$
- ☐ b) As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$; As $x \rightarrow -\infty$, $f(x) \rightarrow \infty$
- ☐ c) As $x \rightarrow \infty$, $f(x) \rightarrow \infty$; As $x \rightarrow -\infty$, $f(x) \rightarrow \infty$
- ☐ d) As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$; As $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$

47. 41. If $f(x) = 3^x$, find $f(-2)$.

1 point

Mark only one oval.

- ☐ a) 9
- ☐ b) $1/9$
- ☐ c) -9
- ☐ d) $-1/9$

48. 42. Solve for x : $\log_3(x + 1) = 2$

1 point

Mark only one oval.

- ☐ a) $x = 8$
- ☐ b) $x = 9$
- ☐ c) $x = 2$
- ☐ d) $x = 1$

49. 43. Solve for x : $\ln(x) + \ln(x - 1) = \ln(6)$

1 point

Mark only one oval.

☐ a) $x = 3$

☐ b) $x = -2$

☐ c) $x = -3$

☐ d) $x = 2$

50. 44. Solve for x : $2^{(x+1)} = 8^{(x-2)}$

1 point

Mark only one oval.

☐ a) $x = 3$

☐ b) $x = 2$

☐ c) $x = 1$

☐ d) $x = 4$

51. 45. Find the domain of the function $f(x) = \log_2(x - 3)$.

1 point

Mark only one oval.

☐ a) $x > 3$

☐ b) $x > -3$

☐ c) $x < 3$

☐ d) $x < -3$

52. 46. Simplify: $\log_5(25) * \log_2(8)$

1 point

Mark only one oval.

☐ Option 1

☐ a) 3

☐ b) 6

☐ c) 12

☐ d) 24

53. 47. The graph of the exponential function $f(x) = 3^{-x}$ is a reflection of the graph of $f(x) = 3^x$ across:

1 point

Mark only one oval.

☐ a) The x-axis

☐ b) The y-axis

☐ c) The line $y = x$

☐ d) The line $y = -x$

54. 48. Which of the following graphs represents the function $g(x) = \log_2(x)$?

1 point

Mark only one oval.

☐ a) [Image of a logarithmic function with a vertical asymptote at $x = 0$]

☐ b) [Image of an exponential growth function with a y-intercept at $(0,1)$]

☐ c) [Image of an exponential decay function with a y-intercept at $(0,1)$]

☐ d) [Image of a linear function with a positive slope]

55. 49. Which of the following is a power function?

1 point

Mark only one oval.

- ☐ a) $f(x) = 2x^3 - 5x + 1$
- ☐ b) $g(x) = \sqrt{x} + 3$
- ☐ c) $h(x) = 4x^{(1/2)} - 2x^2 + 7$
- ☐ d) $k(x) = |x| + 3x^2$

56. 50. What is the domain of the power function $f(x) = x^{-2}$?

1 point

Mark only one oval.

- ☐ Option 1
- ☐ a) All real numbers
- ☐ b) All real numbers except 0
- ☐ c) $x > 0$
- ☐ d) $x < 0$

57. 51. What is the value of $\text{sgn}(-5)$?

1 point

Mark only one oval.

- ☐ a) 5
- ☐ b) -5
- ☐ c) 1
- ☐ d) -1

58. 52.Simplify: $|-7|$

1 point

Mark only one oval.

☐ a) -7

☐ b) 7

☐ c) 0

☐ d) $1/7$

59. 53.What is the domain of the rational function $f(x) = (x + 2)/(x - 3)$?

1 point

Mark only one oval.

☐ a) All real numbers

☐ b) All real numbers except 3

☐ c) All real numbers except -2

☐ d) All real numbers except 2 and 3

60. 54.Find the horizontal asymptote of the function $f(x) = (3x^2 + 1)/(x^2 - 2)$.

1 point

Mark only one oval.

☐ a) $y = 3$

☐ b) $y = 1/2$

☐ c) $y = -2$

☐ d) $y = 0$

61. 55. What is the domain of the function $f(x) = \sqrt{x - 2}$?

1 point

Mark only one oval.

- ☐ a) $x \geq 2$
- ☐ b) $x \leq 2$
- ☐ c) $x > 2$
- ☐ d) All real numbers

62. 56. What is the range of the function $g(x) = 1/(x + 1)$?

1 point

Mark only one oval.

- ☐ a) All real numbers
- ☐ b) All real numbers except 0
- ☐ c) All real numbers except 1
- ☐ d) All real numbers except -1

63. 57. What is the range of the function $k(x) = |x| + 2$?

1 point

Mark only one oval.

- ☐ a) $y \geq 2$
- ☐ b) $y > 2$
- ☐ c) $y \leq 2$
- ☐ d) All real numbers

64. 58. What is the domain of the function $p(x) = (x^2 - 1)/(x^2 + 1)$?

1 point

Mark only one oval.

- ☐ a) All real numbers
- ☐ b) All real numbers except 1
- ☐ c) All real numbers except -1
- ☐ d) All real numbers except 1 and -1

65. 59. Let $f(x) = \sqrt{x}$ and $g(x) = x + 1$. Find $(g \circ f)(4)$.

1 point

Mark only one oval.

- ☐ a) 3
- ☐ b) 5
- ☐ c) 2
- ☐ d) 1

66. 60. If $(f \circ g)(x) = x^2 + 1$ and $g(x) = x + 1$, find $f(x)$.

1 point

Mark only one oval.

- ☐ a) $f(x) = x^2 - 2x + 2$
- ☐ b) $f(x) = x^2 + 1$
- ☐ c) $f(x) = x^2 - 1$
- ☐ d) $f(x) = x^2 + 2x + 2$