

2016 E. C Arsi University special-non boarding school Grade 12 Mathematics Model Exam1 =71

Time allowed 3: 00

Direction: The paper contains mathematics examination for grade 12. In this examination there are a total 65 multiple choice items. There are only one best answer for the item. Choose the best answer from the suggested option and write the letter of your choice on the answer sheet.

- For any real numbers a, b, c if $a < b$, then which of the following is necessarily TRUE?
A. $a - b < 0$ B. $ac < bc$ C. $a/b < 1$ D. $a/c > b/c > 1$
- The solution of the system of equation $\begin{cases} x - 3y = -3 \\ 3x + 2y = 13 \end{cases}$ is:-
A. (2, 3) B. (-3, -2) C. (3, 2) D. (-1, 3)
- Which of the following statement is not true about number?
A. Between any two rational numbers there is at least one rational number.
B. The set of real numbers is equivalent to the set of points on the number line.
C. The set of irrational numbers is not closed under any of the operation.
D. the product of an irrational number and any rational number is irrational
- The solution set of $|2x + 3| = 1 - 2x$ is:- A. $\{\}$ B. $\{-1/2\}$ C. $\{1/2\}$ D. $\{-1/2, 1/2\}$
- The rationalizing factor of $\frac{2 + \sqrt{3}}{5 - 2\sqrt{2}}$ is:- A. $\frac{5 - 2\sqrt{2}}{5 - 2\sqrt{2}}$ B. $\frac{5 + 2\sqrt{2}}{5 + 2\sqrt{2}}$ C. $\frac{2 + \sqrt{3}}{2 + \sqrt{3}}$ D. $\frac{10 + 4\sqrt{2} + 5\sqrt{3}}{17}$
- What is the solution set of $2x^2 - 4x = 6$? A. ϕ B. $\{-2, 3\}$ C. $\{-1, 3\}$ D. $\{1, -3\}$
- If the universal set is Rational number the solution set of $x^2 - 6 = 0$ is:
A. $\{-\sqrt{6}, \sqrt{6}\}$ B. ϕ C. $\{6\}$ D. $\{\sqrt{6}\}$
- Let $a = 286$ and $b = 23$. what is the value of q and r respectively such that $a = bq + r$ where $0 \leq r < b$?
A. 10 and 2 B. 8 and 20 C. 12 and 10 D. 20 and 8
- One of the following is an irrational number identify
A. $\frac{\sqrt{3} - 1}{\sqrt{3} + 1} + \frac{\sqrt{3} + 1}{\sqrt{3} - 1}$ B. $\frac{\sqrt[3]{27}}{\sqrt[6]{64}}$ C. 25^2 D. $\frac{\sqrt{44}}{\sqrt{11}}$
- If α and β are roots of $3x^2 + 6x - 2 = 0$, then $\frac{1}{\alpha} + \frac{1}{\beta}$ is equal to: A. 2 B. 3 C. -2
- The scientific notation of $\frac{796 \times 10 \times 10^2}{10^7}$ is A. 7.96×10^8 B. 7.96×10^6 C. 7.96×10^{16}
- The lower bound of $\frac{54.5}{36.0}$ to 2 decimal places is:- A. 1.51 B. 1.52 C. 1.01 D. 0
- If the roots of $\beta x^2 + 8x = -1$ are $\frac{\sqrt{15} - 4}{2}$ and $\frac{\sqrt{15} - 4}{2}$ then the value of β is _____
A. -2 B. -4 C. -2 D. 4
- The fractional form of $0.2\overline{525}$ is equal to :-
A. $\frac{25}{99}$ B. $\frac{250}{99}$ C. $\frac{25}{990}$ D. $\frac{15}{99}$
- If $x = 0.5757757775...$ and $y = 0.2424424442$ then $x - y =$ ____

- A. $0.\bar{3}$ B. $\frac{3}{10}$ C. $\frac{3}{9}$ D. A and C

16. The simplest form of $\frac{27^{\frac{1}{3}}}{729^{\frac{1}{3}}}$ is:- A. $\frac{1}{9}$ b. $\frac{3}{6}$ C. $\frac{1}{3}$ D. $\frac{27}{729}$

17. Which one of the following is the solution set of $-3(2x+4)=2(-3x-6)$?

- A. $\mathbb{R}$ B. ϕ C. $\{0\}$ d. $\{-6\}$

18. What is the value(s) of k such that the system $\begin{cases} x + ky = 2 \\ kx + y = 4 \end{cases}$ has no solution?

- A. $k=-2$ B. $k = -1$ or 2 C. $k = -2$ or -1 D. $k = -1$ or 1

19. If x is irrational number and y is rational number then which of the following is always true?

- A. xy is irrational B. x + y is rational C. x - y is irrational D. xy is irrational

20. If $x = \sqrt{3}$ then $\frac{3}{x-2} =$ _____ A. $6 + 3\sqrt{3}$ B. $-6 + 3\sqrt{3}$ C. $-6 - 3\sqrt{3}$ D. $6 - 3\sqrt{3}$

21. The quadratic equation whose roots are 2 and $\frac{3}{2}$ is:

- A. $2x^2 - 7x + 3 = 0$ B. $2x^2 - 7x + 6 = 0$ C. $x^2 - 7x + 3 = 0$ D. $-2x^2 - 7x - 6 = 0$

22. The GCF of 160, 320, 480 is: A. 160 B. $2^6 \times 3 \times 5$ C. $2^5 \times 3 \times 5$ D. no

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

- A. $\mathbb{R}$ B. $\{0\}$ C. $\mathbb{R} \setminus \{0, 2\}$ D. $\emptyset$

24. 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

25. $f(x) = 2x + 1$, $g(x) = [2x - 1]$ and $h(x) = \text{sgn } x$ then $(g \circ h \circ f)(-3)$ is equal to _____

- A. 3 B. -1 C. -3 D. -4

26. All of the following functions are invertible (have inverses), except:

- A. $g(x) = x + 3$ B. $h(x) = x^3 + 1$ C. $f(x) = \frac{2}{3}x - 5$ D. $l(x) = 4 + x^2$

27. Which one of the following relations is a function?

- A. $R = \{(x, y): x \text{ is the sister of } y\}$ C. $R = \{(x, y): x = |y|, x \in \mathbb{R}, y \in \mathbb{R}\}$
 B. $R = \{(2, 1), (1, 2), (3, 5), (-3, 1), (4, 5)\}$ D. $R = \{(x, y): y \text{ is the grand mother of } x\}$

28. Let $f: \mathbb{R} \rightarrow \mathbb{B}$ given by $f(x) = 1 - 2|x|$ is an Onto function. Then set B is equal to:-

- A. $\mathbb{R}$ B. $(-\infty, 1]$ C. $(-\infty, 1)$ D. $[0, \infty)$

29. Let $R = \{(x, y); 2x - 3y \geq 3\}$ which of the following points does not satisfy the relation R^{-1}

- A. $(2, 3)$ B. $(1, 3)$ C. $(-3, -2)$ D. $(1, 4)$

30. Let $f(x) = 2^{x^2 - x + 3}$ and $g(x) = 2x + 1$. Which of the following is correct?

- A. $(f \circ g)(1) = 9$ B. $(g \circ f)(-1) = 12$ C. $(f \circ g)(x) = 8^{x^2} + 6x + 4$ D. $(g \circ f)(x) = 4^{x^2} + 2x + 6$

31. The following functions are correctly matched with their respective domains except one

- identify it. A. $f(x) = \sqrt{3-x}; (-\infty, 3]$ C. $f(x) = \frac{x^{-3}}{2x-1}; \mathbb{R} \setminus \{0, \frac{1}{2}\}$
 B. $f(x) = \frac{2x-5}{x-2x^2}; \mathbb{R} \setminus \{0, \frac{1}{2}\}$ D. $f(x) = \sqrt{3x-4}; [4, \infty)$

32. All of the following expressions is not a rational expressions ?

- A. $\frac{\sqrt{x^4}}{5x+1}$ B. $|x + \pi|$ C. $\frac{\sqrt{(x^2+2)^2}}{5x-1}$ D. $5x+3$

33. Which one of the following function does not satisfy the property $f(ab) = f(a) \cdot f(b)$?

- A. $f(x) = x^{-7}$ B. $f(x) = \frac{1}{x^3}$ C. $f(x) = \frac{x}{3}$ D. $f(x) = \sqrt[5]{x}$

34. Given that $g(x) = \begin{cases} 3x+4, & -1 \leq x < 2 \\ 1+x, & 2 \leq x \leq 5 \end{cases}$ and $f(x) = \begin{cases} 3x-5, & x < 1 \\ x^2-1, & x \geq 1 \end{cases}$, then which one is not true

- A. $(g \circ f)(3) = 12$ B. $(\frac{g}{f})(-1) = 0$ C. $(f \circ g)(0) = -20$ D. $(g(f(g(-1)))) = 4$

35. Which of the following functions is Not onto?

- A. $f: [0, \infty) \rightarrow [3, \infty), f(x) = 3 + \sqrt{x}$ C. $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = 3x + 5$
 B. $f: \mathbb{R} \rightarrow (0, \infty), f(x) = 5^x$ D. $f: \mathbb{R} \rightarrow \mathbb{R}, f(x) = x^2 - 1$

36. Given a rational function $f(x) = \frac{x^4 - 8x}{3x^5 - 2x^2 - 8x}$. Which of the following is False?

- A. $x = -\frac{4}{3}$ 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
 $x = 2$

D. The graph of f has holes at $x = 0$ &

37. which one is the equation of the rational function graphed below?

A. $f(x) = \frac{-4(x-1)^2}{(x+1)^2(x-2)}$

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

C. $f(x) = \frac{4(x+1)^2}{(x-1)^2(x+2)}$

D. $f(x) = \frac{4(x-1)^2}{(x+1)^2(x-2)}$

38. If $P(x) = \frac{2x-x^3}{2} + x^2 - 3x^3 - \frac{5x+10}{5}$, then which one is NOT true about P ?

A. the leading coefficient is $-\frac{7}{2}$ B. the term a_{n-2} is 0 C. the constant term is -2 D. the

39. If $x-2$ is a common factor of the expressions $(m+n)x^3 - n$ and $2x^2 + (m-1)x + (m+2n) + 5m - 10$ is:- A. -138 B. 54 C. -42 D. -48

40. Which interval does not contain a zero of $f(x) = x^4 - 6x^3 + x^2 + 12x - 6$?

A. $(-2, -1)$ B. $(0, 1)$ C. $(2, 3)$ D. $(1, 2)$

41. The polynomial function $f(x) = x^2 + \frac{2}{5}x - 5x^6 + \pi$ is:- A. a polynomial over a rational B. a polynomial over a real number C. a polynomial over a complex number D. of six roots

42. What is the remainder if $f(x) = 4x^4 - 5x^2 + 1$ is divided by $2x - \sqrt{3}$? A. $-\frac{3}{2}$ B. $\frac{1}{2}$ C. 1

43. If $x+1$ and $x-2$ are factors of $x^3 + qx^2 - px + 6$, then $p - q$ is:- A. -5 B. -4 C. 1

44. Which one does not have $x+2$ as a factor? A. $x^3 - 7x - 6$ B. $x^3 - 5x^2 + 24$ C. $x^3 - 2x^2 + 1$

45. Which of the following statements is false?

- A. Every horizontal line must intersect the graph of any polynomial of degree three at least once.
- B. The graph of every polynomial function of degree four must have a y-intercept.
- C. If f is a polynomial function and both $f(1)$ and $f(2)$ are negative, f cannot have a zero between 1 and 2.
- D. The degree of the product of any two polynomials is the sum of their degrees.
- E. C and D.

46. When factorized $x^3 + 6x^2 + 11x + 6$ becomes A. $(x+1)(x-2)(x-3)$ B. $(x+1)(x+2)(x+3)$ C. $(x-1)(x+2)(x+3)$ D. $(x+1)(x+2)(x+3)$

47. 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. -2 is a zero of multiplicity 2 C. the degree of f is 9 D. the graph of f crosses the x-axis at $x=2$

48. If $2x^5 + 5x^4 - 4x^3 + 8x^2 + 1$ is divided by $2x^2 - x + 1$ then which of the following is not true? A. The degree of the quotient $q(x)$ is 3 B. the remainder is $3x - 1$ C. the constant term of $q(x)$ is 2 D. $q(-3) = -54$

49. What is the remainder when $3x^{16} + 2x^{10} - 5x^3 + 3x^2 - 1$ is divided by $x+1$? A. 12 B. 2 C. -1

50. Which one of the following is NOT a factor of $f(x) = x^3 + 2x^2 - 5x - 6$?

A. $x+3$ B. $x-2$ C. $x+1$ D. $x-3$

51. -3 is a root of $f(x) = x^4 + 6x^3 + 7x^2 - 12x - 18$, what is the multiplicity of -3? A. 1 B. 2 C. 3

52. Which one of the following is the solution set of $x^3 + 6x^2 + 11x + 6 = 0$?

A. $\{1, 2, -3\}$ B. $\{-1, -2, 1\}$ C. $\{-3, -2, -1\}$ D. $\{-2, -3, -6\}$

53. Let f and g be two polynomial functions. If the degree of f is m and the degree of g is n , then the degree of $f+g$ is necessarily A. the degree of $f + g$ is $m+n$ B. the degree of $f - g$ is $m-n$ C. the degree of $f \cdot g$ is $m+n$

54. 13. The solution set of $\log_b^{(2-x)} - \log_b^{(2+x)} - \log_b^x + 1 = 0$ is: A. $\{1\}$ B. $\{1, -6\}$ C. $\{-6\}$
D. $\{-2, 1\}$

55. If $\log^2 = 0.301$, $\log^3 = 0.477$ and $\log^7 = 0.845$, then what is the value of $\log^6 + \log^{14}$?

- A. 0.778 B. 1.778 C. 1.146 D. 1.924

56. If the third and fifth terms of a geometric sequence are $\frac{1}{2}$ and $\frac{1}{8}$ respectively and the second term is negative, then which of the following is not true about the sequence?

- A. The common ratio is $-\frac{1}{2}$ C. The fourth term is $-\frac{1}{4}$
B. The first term is 2 D. The sum of the first four terms is -1

57. Let $a_1, a_2, a_3, \dots, a_n$ be a sequence of numbers defined by $a_1 = \sqrt{2}$ and for every positive integer n , $a_{n+1} = a_n + 2$, then $a_1 + a_2 + a_3 + \dots + a_n$ is equal to:

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

58. If in an arithmetic sequence the first term is -5 and the sum of the first twenty terms is 660, then which of the following is not true?

- A. The common difference is 4
B. None of the terms is equal to zero
C. The sum of the first four terms is equal to the common difference
D. None of the terms is an odd integer

59. What is the sum of the series $\sum_{k=1}^{50} \frac{1}{k(k+1)}$? A. $\frac{50}{51}$ B. $\frac{49}{50}$ C. $\frac{51}{50}$ D. $\frac{50}{49}$

60. If a, b , and x are real numbers, then which of the following statements is true?

- A. If $a > b > 0$, then $a^x > b^x$ for all x C. If $0 < a < b < 1$, then $a^x > b^x$ for $x < 0$
B. If $a > b > 0$, then $a^x > b^x$ for $x < 0$ D. If $a > 1$ and $0 < b < 1$, then $a^x > b^x$ for all x

61. If $f \circ g(x) = 4x^2 - 2x + 3$ and $f(x) = 2x - 3$, then $g(x)$ is equal to:

- A. $2x^2 - 1$ B. $1 - 2x^2$ C. $2x^2 + x - 3$ D. $2x^2 - x + 3$

62. Which one of the following is the simplified form of $\frac{x}{x^3 - 1} \div \left[2 - \frac{1}{1 + \frac{1}{x-2}} \right]$ for $x \neq 0, 1, 2$?

- A. $\frac{1}{x^2 + x + 1}$ B. $\frac{1}{x^2 - x + 1}$ C. $x^2 + x + 1$ D. $x^2 - x + 1$

63. The simplified form of $\log_2^7(\log_4 + \log_4^3) \log_5^{10}$ is:

- A. 3 B. 4 C. 9 D. 27

64. The universe of the function $f(x) = \log_2(x^2 - 4)$, is:

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

65. Which one of the following is not true about the graph of $y = 9 - 3^x$?

- A. Its domain is $\mathbb{R}$ C. its range is $\{y : y \leq 9\}$

B. Its y-intercept is $(0, 8)$

D. It crosses the x-axis at $(2, 0)$