



Name: _____ 2024/2025 1st Semester
Full date: _____ Model Exam -2
Subject: Mathematics Grade - 12

Time Allowed: 2:30 hrs

Choose the correct option from the given four alternatives and BLACKEN the letter of your best choice on the separate answer sheet provided.

- Which of the following defines a sequence?
A. It is a function whose domain is the set of integers
B. It is a function whose domain is the set of real numbers
C. It is a function whose domain is the set of natural numbers
D. It is a function whose domain is the set of rational numbers
- Let $\{5, 8, 11, \dots\}$ be a sequence. Then the n th term of the sequence a_n is given by
A. $a_n = 2n + 3$ B. $a_n = 2n + 8$ C. $a_n = 3n + 2$ D. $a_n = 3n - 8$
- If $b_n = \frac{9}{2n}$ is the n th term of a sequence, then the 18th term of the sequence is
A. $\frac{1}{2}$ B. $\frac{3}{4}$ C. $\frac{3}{2}$ D. $\frac{1}{4}$
- Which of the following set of ordered pairs are points on the graph of the sequence $\{c_n\}$, where $c_n = 2 - \frac{2}{n}$?
A. $\{(1, 0), (2, 1), (3, \frac{4}{3}), (4, \frac{3}{2})\}$ C. $\{(1, 0), (2, 2), (3, \frac{4}{3}), (4, 3)\}$
B. $\{(1, 1), (2, 1), (3, \frac{4}{3}), (4, 4)\}$ D. $\{(1, 0), (2, 0), (3, 0), (4, 0)\}$
- Let $a_1 = 2$, $a_2 = 3 + a_1$ and $a_n = 2a_{n-1} + 5$ for $n \geq 3$, then the value of $\sum_{i=2}^5 a_i$ is equal to:
A. 160 B. 130 C. 190 D. 220
- The terms of the sequence defined recursively $a_1 = 1$, $a_2 = 3$ and $a_n = \frac{1}{2}(a_{n-1} + a_{n-2})$, $n \geq 3$, and then which statement is not true?
A. $a_3 = 2$ B. $a_4 = \frac{5}{2}$ C. $a_5 = \frac{9}{2}$ D. $a_6 = \frac{19}{8}$
- Arithmetic progression is a sequence in which each term except the first term is obtained by
A. Adding any number to the preceding term.
B. Multiplying the fixed number to the preceding term.
C. Dividing the fixed number to the preceding term.
D. Adding the fixed number to the preceding term.
- Which one of the following general terms is the n th term of an Arithmetic sequence?
A. $a_n = 2 + \frac{1}{n}$ B. $a_n = \frac{1}{3}n - 6$ C. $a_n = 2n^2 + 4$ D. $a_n = \frac{1}{n^2}$
- The Arithmetic mean of 78 and 100 is
A. 89 B. 92 C. 90 D. 88



10. If 5-arithmetic means are inserted between 5 and 125, what are the inserted numbers?
- A. {25,45,65,85,105} C. {15,35,55,75,95}
B. {35,55,75,95,115} D. {20,40,60,80,100}
11. A geometric progression is a sequence in which each term except the first term is obtained by
- A. Multiplying any number to the preceding term.
B. Dividing any number to the preceding term.
C. Multiplying the fixed number to the preceding term.
D. Adding the fixed number to the preceding term.
12. If the first term of a Geometric progression is $G_1 = 20$ and the common ratio $r = \frac{1}{2}$, then the 10th term G_{10} is
- A. $\frac{5}{128}$ B. 40 C. $\frac{1023}{512}$ D. -40
13. The terms of geometric sequence, $G_4 = 3$ and $G_7 = 24$ then G_1 and r respectively are:
- A. $\frac{3}{8}$ and 2 B. 2 and 8 C. 4 and 3 D. $\frac{1}{2}$ and $\frac{5}{8}$
14. Which of the following is NOT the expression of $3^3 + 6^3 + 9^3 + 12^3 + 15^3 + 18^3 + 21^3 + 24^3 + 27^3 + 30^3$ in Sigma notation?
- A. $3 \sum_{k=1}^{10} 3^2 k^3$ C. $3^3 \sum_{k=1}^{10} k^3$
B. $\sum_{k=1}^{10} (3k)^3$ D. $\sum_{k=1}^{10} k^3$
15. The sum of the first ten terms of an arithmetic sequence $\{a_n\}$ is 60, the sixth term is 10. Then what is the general term a_n of the sequence?
- A. $a_n = 8n + 48$ B. $a_n = 8n - 48$ C. $a_n = 8n + 38$ D. $a_n = 8n - 38$
16. If the first term a_1 and the 9th term a_9 of an Arithmetic progression are 10 and 58 respectively, then the 10th partial sum S_{10} of the Arithmetic progression is
- A. 370 B. 740 C. 320 D. 640
17. The sum of the first 6 terms of the sequence $\{\frac{2}{3}, \frac{2}{9}, \frac{2}{27}, \dots\}$ is equal to
- A. 1 B. $\frac{728}{729}$ C. $\frac{728}{2187}$ D. $\frac{728}{187}$
18. What is the sum of the first 40 terms of the sequence whose general term is $a_n = 5n + 10$?
- A. 3500 B. 4000 C. 5500 D. 4500
19. The sum of the first four terms of a Geometric sequence is 12, and the sum from fifth to eighth term is 192. Which one of the following is the possible first three terms of the Geometric sequence?
- A. $\frac{-12}{5}, \frac{24}{5}, \frac{-48}{5}$ C. $\frac{4}{5}, \frac{8}{5}, \frac{16}{5}$
B. $\frac{-4}{5}, \frac{8}{5}, \frac{-16}{5}$ D. $\frac{12}{5}, \frac{-24}{5}, \frac{48}{5}$
20. Which one of the following is true about a series?
- A. A finite series is a series with an infinite number of terms.
B. An infinite series is a series with finite number of terms.
C. $29 + 25 + 21 + \dots$ is an infinite series.
D. $10 + 20 + 30 + \dots$ is a finite series.



21. Which of the following is true about the convergence or divergence of a Geometric sequence?

- A. The sequence $\{G_n\}$ converges to a real number M as $n \rightarrow +\infty$, $G_n \rightarrow +\infty$.
- B. The sequence $\{G_n\}$ diverges to a positive infinity as $n \rightarrow +\infty$, $G_n \rightarrow +\infty$.
- C. The sequence $\{G_n\}$ converges to a real number M as $n \rightarrow +\infty$, $G_n \rightarrow -\infty$.
- D. The sequence $\{G_n\}$ diverges to a negative infinity as $n \rightarrow +\infty$, $G_n \rightarrow +\infty$.

22. Which of the following Geometric sequence is convergent?

- A. $\{G_n\}$, where $G_n = \frac{1}{5}(5)^n$
- B. $\{G_n\}$, where $G_n = \frac{1}{2}(-2)^n$
- C. $\{G_n\}$, where $G_n = \frac{8}{3}\left(\frac{3}{8}\right)^n$
- D. $\{G_n\}$, where $G_n = \frac{4}{7}\left(\frac{7}{4}\right)^n$

23. The Geometric series $\sum_{n=1}^{\infty} G_1 r^{n-1}$ is convergent for the case when

- A. $r > 1$ or $r < -1$.
- B. $-1 \leq r \leq 1$.
- C. $r = 1$ or $r = -1$.
- D. $-1 < r < 1$.

24. The sum of the first 30 terms of $2 + 5 + 8 + \dots$ is :

- A. 1350
- B. 1275
- C. 1175
- D. 1365

25. Which one of the following series is a divergent series?

- A. $4 + 8 + 16 + \dots$
- B. $81 + 54 + 36 + 24 + \dots$
- C. $81 - 54 + 36 - 24 + \dots$
- D. $24 - 16 + \frac{32}{3} - \frac{64}{9} + \dots$

26. Which of the following is a divergent sequence?

- A. $\left\{7^{\frac{1}{n}}\right\}$
- B. $\left\{(\sqrt{3})^n\right\}$
- C. $\left\{1 + \frac{(-1)^n}{5^n}\right\}$
- D. $\left\{\left(\frac{\pi}{6}\right)^n\right\}$

27. The sum of the terms of the Geometric sequence $\frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$ is

- A. 1
- B. $\frac{1}{2}$
- C. 2
- D. $\frac{4}{3}$

28. The value of the series $\sum_{n=1}^{\infty} 4(5^{(2-n)})$ is

- A. 20
- B. 25
- C. 100
- D. 16

29. An infinite geometric series representation of the repeating decimal $4.8646464\dots$ is

- A. $4.8 + 0.064 + 0.0064 + 0.000064 + \dots$
- B. $4.8 + 0.0064 + 0.00064 + 0.0000064 + \dots$
- C. $4.8 + 0.064 + 0.00064 + 0.0000064 + \dots$
- D. $4.8 + 0.64 + 0.0064 + 0.000064 + \dots$

30. The fraction form of the repeating decimal $3.2\dot{5}$ is:

- A. $\frac{325}{99}$
- B. $\frac{293}{99}$
- C. $\frac{290}{9}$
- D. $\frac{293}{90}$

31. Which of the following recurring decimal converges to the corresponding fraction?

- A. $0.232323\dots = \frac{23}{100}$
- B. $0.5555\dots = \frac{5}{9}$
- C. $7.313131\dots = \frac{31}{99}$
- D. $63.7777\dots = \frac{70}{9}$



32. Let $G_n = 4(5^{n-1})$ be the general term of a Geometric progression. How many terms of the Geometric progression will be needed so that the sum of the sequence is 78, 124?
 A. 5 B. 6 C. 7 D. 8
33. A Doctor prescribed 42 pills of medicine for his patient to be taken in the first week. Given that the patient should decrease the dosage by 7 pills every week, what is the week in which the patient stops taking the medicine completely?
 A. 7th week C. 5th week
 B. 6th week D. 4th week
34. To build up endurance, you start an exercise program in which you exercised 60 minutes for the first day, 65 minutes for the second day, 70 minutes for the third day, 75 minutes for the fourth day, and so on, each day extending your exercise by five minutes. If you continue at this rate, ending at 5 hours, what is the total time you spend exercising?
 A. 8, 640 minutes C. 8, 820 minutes
 B. 8, 460 minutes D. 8, 100 minutes
35. A pendulum that is released to swing freely travels 30m on the first swing. On each successive swing, the pendulum travels 75% of the distance of the previous swing. What is the total distance the pendulum swings before it comes to rest?
 A. 40m B. 90m C. 120m D. 45m
36. The population of a certain town is increasing at a rate of 2% per year. If the population is currently 100,000, then what will the population be 2 years from now?
 A. 14,040 B. 10,404 C. 104,040 D. 10,404
37. The population of a certain town is increasing at the rate of 5% per year. If the present number of population is 48000, what will the population be 8 years from now?
 A. $48000(0.5)^8$ C. $48000(1.5)^8$
 B. $48000(1.05)^8$ D. 384000
38. The rate of change of one quantity with respect to another quantity when their values increase at the same time is
 A. positive B. negative C. zero D. undefined
39. The average rate of change of a function $f(x)$ over the interval $[a, b]$ is given by:
 A. $f(b) - f(a)$ C. $\frac{f(b) - f(a)}{b - a}$
 B. $f'(a)$ D. $f'(b)$
40. Which one of the following is the average rate of change of $f(x) = x^3 - 2x$ over the interval $[1, 3]$?
 A. -11 B. 10 C. 11 D. -10
41. What is the instantaneous rate of change of $f(x) = x^2 + 5x$ at $x = -3$?
 A. 1 B. 0 C. -1 D. 2
42. The following table shows the distance traveled by a runner at various times. What is the average rate of change from 1 to 3 minutes?

Distance (meters)	0	100	250	400
Time (minutes)	0	1	2	3

- A. 150 m/min B. 200 m/min C. 100 m/min D. 250 m/min



43. If $f(t) = 4t^3 - 2t + 1$, what is the instantaneous rate of change at $t = 1$?
A. 10 B. 12 C. 14 D. 16
44. What is the derivative of $f(x) = x^2 + 3x - 5$?
A. $2x + 3$ B. $3x + 2$ C. $2x - 3$ D. $x + 3$
45. If $f(x) = \pi^2 + 5$, what is $f'(x)$?
A. 2π B. π C. 0 D. 1
46. If $f(x) = (3x)(x^2 + 1)$, what is $f'(x)$?
A. $3x^2 + 3$ B. $6x^2 + 3$ C. $3x^2 + 6x$ D. $9x^2 + 3$
47. What is the derivative of $f(x) = \frac{x^2}{x+1}$?
A. $\frac{(2x)(x+1) - (x^2)(1)}{(x+1)^2}$ C. $\frac{2x}{x+1}$
B. $\frac{(x+1)(2x) - (x^2)(1)}{(x+1)^2}$ D. $\frac{x^2+1}{x^2}$
48. If $f(x) = 2x^2 + 3x + 1$, what is $f'(2)$?
A. 11 B. 10 C. 9 D. 8
49. The derivative of $f(x) = \frac{1}{x} + x^2$ is:
A. $-\frac{1}{x^2} + 2x$ C. $-\frac{1}{x} + 2x$
B. $-\frac{1}{x^2} + x$ D. $-\frac{1}{x^3} + 2$
50. If $f'(2) = 2$ and $g'(2) = 3$, then what is $(3f + g)'(2)$?
A. 9 B. 6 C. 8 D. 12
51. Given $f(2) = 1$, $g(2) = 4$, $f'(2) = 2$, and $g'(2) = 3$, what is $(f \cdot g)'(2)$?
A. 14 B. 10 C. 8 D. 12
52. If $f'(a) = 6$ and $f(x) = x^2 - 4x$, what is the value of a ?
A. 4 B. 2 C. 5 D. 3
53. Let $f(x) = kx^2 + 2x$ and $f'(1) = 8$. What is the value of k ?
A. 3 B. 4 C. 5 D. 6
54. What is the derivative of $f(x) = x^2 + \pi^2$?
A. $2x$ B. 2π C. 0 D. $2x + 2\pi$
55. The derivative of $f(x) = 2\sqrt{x} + x^2$ is:
A. $\frac{1}{\sqrt{x}} + 3x^2$ C. $2x + 3x^2$
B. $\frac{1}{2\sqrt{x}} + 3x^2$ D. $\frac{1}{2x} + 3x^2$
56. If $f(x) = x^2 + 3x$ and $g(x) = 2x - 1$, find the derivative of $(f + g)'(x)$.
A. $2x + 5$ C. $4x + 2$
B. $2x + 2$ D. $4x + 4$
57. At what point on $f(x) = x^2$ is the instantaneous rate of change equal to 10?
A. $x = 5$ B. $x = 10$ C. $x = 20$ D. $x = 100$



58. The derivative of a function at a point represents:

- A. The equation of the tangent line.
- B. The average rate of change.
- C. The instantaneous rate of change.
- D. The area under the curve.

59. If $f'(x) = 0$ for all x , then $f(x)$ is:

- A. a linear function
- B. a constant function
- C. a quadratic function
- D. an exponential function

60. If $f(x) = 3x^5 - \sqrt{2}x^3 + 10$, then what is the value of $f'(\sqrt{2})$?

- A. $60 - 3\sqrt{4}$
- B. $60 - 6\sqrt{2}$
- C. $60 - 3\sqrt{2}$
- D. 48

61. What is the derivative of $f(x) = \frac{1}{3x^{12}}$?

- A. $\frac{1}{36x^{-13}}$
- B. $\frac{-4}{x^{11}}$
- C. $\frac{1}{36x^{11}}$
- D. $\frac{-4}{x^{13}}$

62. Which one of the following is true about the derivative of a polynomial function

$$f(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0?$$

- A. The degree of f' is n .
- B. The leading coefficient of f' is a_n .
- C. The constant term of f' is a_1 .
- D. If $n = 1$, then $f'(x) = a_1 x + a_0$.

63. If $f(x) = \frac{x^2+2}{x+1}$, then $f'(x)$ is

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

64. Let $f(x) = x^2 + 2x - 3$. Then what is value of $\frac{f(2+h)-f(2)}{h}$ as h approaches to 0?

- A. 6
- B. -6
- C. 3
- D. -3

65. Let $f(x) = \frac{x^3+2x}{x^2}$ then the derivative of $f(x)$ is

- A. $1 - \frac{2}{x^2}$
- B. $1 + \frac{2}{x^4}$
- C. $\frac{1-2x}{x^4}$
- D. $3 + \frac{1}{x^3}$

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