

GRADE 12 MATHEMATICS MODEL EXAMINATION

TIME ALLOWED: 3 HOURS

Tahsas 2016/Dec 2023

1. Which of the following gives the prime factorization of 1008?

- A. $2^2 \times 3^2 \times 11$
B. $2^2 \times 3^3 \times 7$
C. $2^4 \times 3^2 \times 7$
D. $2^3 \times 3^2 \times 13$

2. Which of the following is always true?

- A) The quotient of two rational numbers is a rational number
B) The set of irrational numbers is closed under addition
C) There is a real number R such that for each real number X , $X+R=X$
D) When we multiply a rational number by an irrational number, the product is irrational

3. The numerical value of $(\sqrt[5]{0.00243}) - (\sqrt[7]{0.0000128})^3$ is equal to:

- A) 0.292
B) - 0.292
C) 0.1
D) - 0.1

4. The GCF of two numbers is 3 and their LCM is 252. If one of the number is 21 what is the other number?

- [illegible]

5. What is the value of x that makes: $\frac{(1000)^x}{(10)^{4x-3}} = \frac{1}{10}$?

- A) 4 B) 4 C) 2 D) 0

6. The solution set of the inequality $x^2 + 7x + 12 \geq 0$ is:

- A) $\{x: 3 \leq x \leq 4\}$ C) $\{x: x \leq -4 \text{ or } x \geq -3\}$
B) $\{x: -3 \leq x \leq -4\}$ D) $\{x: x \leq 3 \text{ or } x \geq 4\}$

7. Which of the following is the solution set of $|1 - 2x| - 5 = 3x + 1$?

- A) $\{-1, 7\}$ B) $\{-7\}$ C) $\{-1\}$ D) $\{-1, -7\}$

8. If a function f is given by $f(x) = \sqrt{9 - x^2}$; where $x \in [-3, 3]$, then the range of f is:

- A) $[-9, 9]$ B) $[-3, 3]$ C) $[0, 3]$ D) $\mathbb{R}$

D 9. If $f(x) = x^2 + 6x + 9$, then which of the following statement is true about the graph of f ?

- A) The range of f is $\{y : y \geq 0\}$
B) The graph of f is open down ward

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C) The minimum value of this function is 9

D) The graph of f is symmetrical with respect to the y-axis

- A 10. Samuel has two younger brothers. The sum of the ages of the three brothers is 48 and the difference between his age and the age of one of his younger brothers is 3. How old is Samuel?

A) 18

B) 24

C) 16

D) 21

- A 11. The sum of the roots of the equation $3x^2 + 8x + 5 = 0$ is _____

A) $\frac{5}{3}$

B) $-\frac{5}{3}$

C) $-\frac{8}{3}$

D) 8

- C 12. The degree measure of each exterior angle of a regular eight sided polygon is _____

A) 90°

C) 45°

B) 135°

D) 270°

- B 13. If the perimeter of $\triangle ABC$ is 30 cm, $\triangle PQR$ is formed by joining the mid points of the sides of $\triangle ABC$, then the perimeter of $\triangle PQR$ is

A) 10 cm

B) 15 cm

C) 20 cm

D) 12 cm

- C 14. Which of the following is **not** true about triangles

A) the three medians of any triangles intersect at a point inside the triangle

B) the altitude of any triangle are concurrent

C) the point at which the medians intersect is located at $\frac{1}{3}$ of the way from the vertex to the opposite side

D) the angle bisectors of an isosceles triangle are concurrent

- C 15. If the diagonals of quadrilateral bisect each other at right angles, then the quadrilateral is necessarily

A) parallelogram

B) rectangles

C) rhombus

D) trapezium

- B 16. The following data gives the years of services of ten mathematics teachers in a certain high school; 12, 15, 14, 12, 11, 18, 16, 14, 12, 16, then the median years of services of the teacher is:

A. 12

B. 14

C. 14.5

D. 15.5

- C 17. Two non zero vectors are said to be equal if:

A) they have the same magnitude

C) they have the same magnitude and direction

B) they have the same direction

D) they meet at the same point

- D 18. Let $\vec{A} = (3, -2)$ and $\vec{B} = (7, 4)$ be distinct vectors in the coordinate plane, then which one of the following is the position vector of $\vec{AB}$

A) $(-3, -6)$

B) $(-4, -6)$

C) $(11, 2)$

D) $(4, 6)$

- D 19. Which one of the following is a polynomial expression?

A) $\frac{x^2 - 1}{x^2 + 1}$

C) $\sqrt{(x^2 - 1)^2}$

B) $2x^3 + 5x^{-2} + x - 7$

D) $\frac{(x-1)(x^2+1)}{x^2+1}$

20. What is the remainder when $f(x) = 6x^3 - 19x^2 + 16x - 7$ is divided by $x - 2$

A) -7

B) -3

C) 0

D) 15

21. One of the following is not true about a polynomial function of degree seven and negative leading coefficient.
- A) It can have six turning points
B) Its graph intersects the y-axis exactly at one point
C) Far to the right the graph rises up
D) Its range is the set of real numbers
22. If the mean of 7, 3, 6, X, 7, 4, 5, 9 is 10, then what is the value of X?
- A) 38
B) 37
C) 40
D) 39
23. The base of a prism is equilateral triangle of length of side 6 cm and its altitude is 8 cm, then what is its volume?
- A) 125
B) $9\sqrt{3}$
C) $34\sqrt{21}$
D) $72\sqrt{3}$
24. Which of the following is true about the line with the equations $kx + y = 5$ and $9x + ky = -5$
- A. If the lines are parallel then $k = 3$ or $k = -3$
B. If the lines are perpendicular, $k = 0$
C. If the lines meet at $p(1, 2)$, then $k = 7$
D. They are neither parallel nor perpendicular
25. Which of the following points are collinear?
- A. (2, 5), (0, 1), (-1, 1)
B. (2, 3), (3, 4), (5, 6)
C. (-1, 1), (0, 0), (0, 1)
D. (-1, 1), (0, 0), (0, 4)
26. Which of the following is true about cosecant function?
- A. Its period is 2π
B. Its range is $[-1, 1]$
C. Its graph increases on the interval $[0, \pi]$
D. It is positive in the fourth quadrant
27. When a pilot of an aeroplane was flying horizontally at a height of 600m above a level stretch of land, he observed a car at an angle of depression of 30° . how far was the car from the aeroplane?
- A) $600\sqrt{3}$ m
B) $1200\sqrt{3}$ m
C) 300m
D) 1200m
28. $\frac{\cos 40^\circ}{\sin 130^\circ} \times \sin 150^\circ$ is equal to :
- A. 2
B. -2
C. $\frac{1}{2}$
D. $-\frac{1}{2}$
29. If θ is an angle in the second quadrant measured in counter clockwise direction, then which of the following is true
- A) $\cot \theta = \frac{1}{\tan(\pi - \theta)}$
B) $\csc \theta = \frac{1}{\sin(\pi - \theta)}$
C) $\sec \theta = \frac{1}{\csc(\pi - \theta)}$
D) $\csc \theta = \frac{-1}{\sin \theta}$
30. The shortest distance from a point to a circle is 6cm and the greatest distance from the same point to the circle is 24cm. find the length of the tangent from that point to the circle.
- A) 12cm
B) 18cm
C) 144cm
D) 96cm
31. The measure of the opposite angles of a circles quadrilateral is in the ratio 2:3, what is the measures of the larger of these angles.
- A) 72°
B) 120°
C) 60°
D) 108°

32. Which of the following is **not** true?
- A) An angle subtended by an arc greater than semi-circle is acute
 - B) An angle subtended by a minor arc is acute
 - C) An angle inscribed in a major arc is acute
 - D) Two inscribed angles subtended by the same arc on the same circle are congruent
33. The simplified form of $\log_{0.01}(\sqrt{0.001})$.
- A) -2
 - B) 3
 - C) 2
 - D) -3
34. Let $f(x) = 2^x$ and $g(x) = 3^x$, then which one of the following is true?
- A. $f(x) > g(x)$, for $x > 0$
 - B. $f(x) < g(x)$, for $x > 0$
 - C. $f(x) < g(x)$, for $x < 0$
 - D. $f(x) = g(x)$, for $x < 0$
35. Which one of the following logarithm function is the inverse of $y = \left(\frac{1}{3}\right)^x$?
- A) $y = \log_9 x$
 - B) $y = \log_3 x$
 - C) $y = \log_2 x$
 - D) $y = \log_{\frac{1}{3}} x$
36. Suppose A and B are sets such that $n(A) = 30$ and $n(B) = 40$. If $n(A \cap B) = 8$ then which of the following is **not** true?
- A) $n(A \cup B) = 62$
 - B) $n(A \setminus B) = 22$
 - C) $n(A \Delta B) = 54$
 - D) $n(A' \cap B) = 40$
37. If $A = \{x: x \text{ is a real number and } x = x^2\}$ and $B = \{-1, 0, 1\}$ then which of the following is true?
- A) $A \cap B = \{ \}$
 - B) $A = B$
 - C) $A \subseteq B$
 - D) $A \subset B$
38. If f is greatest integer function and g is the absolute value function, then what is the value of $(f \circ g)\left(\frac{3}{2}\right) + (g \circ f)\left(\frac{-4}{3}\right)$?
- A) 1
 - B) -1
 - C) 2
 - D) 3
39. Which one of the following is a one to one function?
- A. $f = \{(1, 6), (2, 7), (3, 6), (4, 8)\}$
 - B. $k: \mathbb{R} \rightarrow \mathbb{R}$ given by $h(x) = |x - 3|$
 - C. $k: (0, \infty) \rightarrow \mathbb{R}$ given by $h(x) = \log x$
 - D. $g = \{(x, y): x \text{ is a student and } y \text{ is his / her rank}\}$
40. Which one of the following functions has NO vertical asymptote?
- A. $f(x) = \ln(x+1)$
 - B. $f(x) = \frac{x^2+1}{x^3+8}$
 - C. $f(x) = \frac{x^2-9}{x-3}$
 - D. $f(x) = \frac{x-1}{x^2-x}$
41. The solution set of the equation $\frac{x^2}{x+3} + \frac{3x}{x^2+5x+6} = \frac{2x}{x+3}$ is:
- A. $\{0, 1\}$
 - B. $\{-1, 1\}$
 - C. $\{-1, 0, 1\}$
 - D. $\{-1, 0\}$

42. Which one of the following is equation of a circle whose center is on y-axis and radius is 3?
- A. $x^2 + y^2 + 6y = 0$ C. $(x - 2)^2 + y^2 = 9$
 B. $x^2 + (y - 2)^2 = 3$ D. $x^2 - 2x + y^2 = 8$

43. If in a hyperbola, the distance between the foci is 10 and the transverse axis has length 8, then the length of its latus rectum is

- A. 9 B. $\frac{9}{2}$ C. $\frac{32}{2}$ D. $\frac{64}{3}$

44. One of the following is not true about the ellipse whose equation is given by $2x^2 + 8y^2 = 32$
- A. the length of the minor axis is 4 C. the major axis is parallel to the x - axis
 B. the foci are $(0, -2\sqrt{3})$ and $(0, 2\sqrt{3})$ D. $(-4, 0)$ and $(0, 2)$ are vertices

45. Suppose the following are the premises of an argument.

"He was lazy or he did not like the classroom.
 He could not pass the exam, if he was lazy.
 He passed the exam."

Which of the following can be a conclusion that makes the argument valid?

- A. He did like the classroom
 B. He did not like the classroom.
 C. If he was not lazy, he did like the classroom
 D. He was not lazy and he did like the classroom.

46. Which of the following is not true statement on the set of real numbers?

- A. $(\forall x)(\exists y)(y = x + 2)$ C. $(\exists x)(\exists y)(x^2 + y^2 = 5)$
 B. $(\exists y)(\forall x)(y + x = 3)$ D. $(\exists x)(\exists y)(y < x)$

47. Below are the marks of grade 12 students in mathematics out of 100. What is the variance for the frequency distribution given below

Marks	20-40	40-60	60-80	80-100
Number of students	4	10	4	2

- A. 107.2 B. 4 C. 304 D. 17.5

48. Which one of the following is the constant term of the expansions of $(x^2 + \frac{2}{x^3})^5$?
- A. 40 B. 80 C. 60 D. 20

49. In a random arrangement of the word "SOCIETY" what is the total number of words in which all the three vowels come together?
- A. 120 B. 720 C. 420 D. 840

50. The variance of 20 observations is 5. If each observation is multiplied by 2, then what is the variance of the resulting observations?
- A. 5 B. 10 C. 40 D. 20

- B 51. A three digit library identification card is to be printed from the numbers 0, 1, 2, 3, 4 and 5 in such a way that the first is non-zero and no number is to be repeated, how many such cards can be printed?

A. 100 B. 120 C. 180 D. 150

- D 52. Which of the following matrix is not in reduced row echelon form?

A. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

C. $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

- D 53. Which of the following is the solution set of the system of equation $\begin{cases} x + y + 2z = 1 \\ x + 2y + z = 1 \\ 3x + 4y + 5z = 3 \end{cases}$?

A. $\{(1, 0, 0)\}$

C. $\{(-3k + 1, k, k) | k \in \mathbb{R}\}$

B. $\{(k + 1, -k, 0) | k \in \mathbb{R}\}$

D. $\emptyset$

- D 54. If $A = \begin{bmatrix} 3 & 3 & 5 \\ 0 & -1 & 2 \\ 4 & 2 & 1 \end{bmatrix}$, then the cofactors of a_{23} and a_{31} respectively are:

A. 11 and 6

C. 6 and -11

B. -6 and 11

D. 6 and 11

- B 55. If A is a square matrix of order 3 by 3 and $|A| = 5$, then $\det(4A)$ is equal to:

A. 320

B. 20

C. 500

D. 80

- B 56. If z is a complex number such that $\frac{-5z}{4+3i} = 3i(\sqrt{3}-i)$, then $|z|$ is equal to:

A. 6

B. 9

C. 15

D. $\sqrt{15}$

- B 57. The locus represented by $|z-1| = |z+i|$ where $z = x + iy$, $x, y \in \mathbb{R}$ is

A. a circle of radius 1

C. a straight line through the origin

B. an ellipse with foci at $(1, 0)$ and $(-1, 0)$

D. a circle with centre at $(\frac{1}{2}, \frac{1}{2})$

- D 58. Which one of the following is an arithmetic sequence?

A) 3, 5, 7, 9, 11...

C) -3, 6, -9, 12, -15...

B) 3, 6, 12, 24, 48...

D) 1, 3, 6, 10, 15, 21...

- D 59. Consider the sequence $\{a_n\}_{n \geq 1}$, where the first term is $a_1 = 2$ and $a_{n+1} = a_n + 4$ for all $n \geq 1$. Then the sum $a_1 + a_4 + a_5 + \dots + a_{25}$ is equal to:

A. 2460

B. 2458

C. 2442

D. 2450

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C. $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 2 \\ 0 & 0 & 0 \end{bmatrix}$

D. $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

53. Which of the following is the solution set of the system of equation $\begin{cases} x + y + 2z = 1 \\ x + 2y + z = 1 \\ 3x + 4y + 5z = 3 \end{cases}$?

A. $\{(1, 0, 0)\}$

C. $\{(-3k + 1, k, k) | k \in \mathcal{R}\}$

B. $\{(k + 1, -k, 0) | k \in \mathcal{R}\}$

D. $\emptyset$

54. If $A = \begin{bmatrix} 3 & 3 & 5 \\ 0 & -1 & 2 \\ 4 & 2 & 1 \end{bmatrix}$, then the cofactors of a_{23} and a_{31} respectively are:

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B. 9

C. 15

D. $\sqrt{15}$

57. The locus represented by $|z-1| = |z+1|$ where $z = x + iy$, $x, y \in \mathcal{R}$ is

A. a circle of radius 1

C. a straight line through the origin

B. an ellipse with foci at (1, 0) and (-1, 0)

D. a circle with centre at $(\frac{1}{2}, \frac{1}{2})$

58. Which one of the following is an arithmetic sequence?

A) 3, 5, 7, 9, 11...

C) -3, 6, -9, 12, -15...

B) 3, 6, 12, 24, 48...

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59. Consider the sequence $\{a_n\}_{n \geq 1}$, where the first term is $a_1 = 2$ and $a_{n+1} = a_n + 4$ for all $n \geq 1$. Then the sum $a_1 + a_4 + a_5 + \dots + a_{35}$ is equal to:

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B. 2458

C. 2442

D. 2450