



YEKA SUBCITY EDUCATION OFFICE D/WONIRAD SECONDARY SCHOOL CLUSTER CENTER 2016 E.C FIRST
SEMESTER GRADE 12th MATHEMATICS MODEL EXAM

**YEKA SUB CITY EDUCATION OFFICE
D/WONDIRAD SECONDARY SCHOOL CLUSTER
2016 E.C FIRST SEMESTER GRADE 12 MATHEMATICS MODEL EXAMINATION**

NUMBER OF ITEMS: 65

TIME ALLOWED: 3 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **MATHEMATICS** EXAMINATION. IN THIS EXAMINATION, THERE ARE A TOTAL OF **65 MULTIPLE CHOICE QUESTIONS**

THERE IS ONLY ONE BEST ANSWER FOR EACH QUESTION. SELECT THE BEST ANSWER FROM THE SUGGESTED OPTIONS AND **BLACKEN** ONLY THE LETTER OF YOUR CHOICE ON THE ANSWER SHEET PROVIDED. FOLLOW THE INSTRUCTIONS ON THE ANSWER SHEET AND THE EXAMINATION PAPER CAREFULLY. USE ONLY **PENCIL** TO MARK YOUR ANSWERS.

YOUR ANSWER MARKS SHOULD BE **HEAVY AND DARK**, COVERING THE ANSWER SPACE COMPLETELY. PLEASE ERASE ALL UNNECESSARY MARKS COMPLETELY INCLUDING ANSWERS YOU HAVE CHANGED FROM YOUR ANSWER SHEET.

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 WAIT FOR FURTHER INSTRUCTIONS. ANY FORM OF CHEATING OR AN ATTEMPT TO CHEAT IN THE EXAMINATION WILL RESULT IN AN AUTOMATIC DISMISSAL FROM THE EXAMINATION HALL AND CANCELLATION OF YOUR SCORE(S).

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

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 blacken the letter of your choice on the separate answer sheet provided.

_____1. When $v \neq -2u$ and $V \neq -u$, the simplified form of $\frac{3}{v+2u} - \frac{v-u}{(v+u)(v+2u)} + \frac{2}{v+u}$ is equal to

A. $\frac{1}{v+u}$ B. $\frac{10}{v+2u}$ C. $\frac{4}{v+u}$ D. $\frac{4v+6u}{(v+u)(v+2u)}$

_____2. Two fair dice are thrown once. What is the probability of getting the sum of the numbers on face up is 8?

A. $\frac{1}{6}$ B. $\frac{5}{6}$ C. $\frac{11}{36}$ D. $\frac{5}{36}$

_____3. The solution set of $\log_2[2 + \log_3(x + 3)] = 0$ is equal to

A. $\left\{\frac{1}{3}\right\}$ B. $\left\{\frac{-8}{3}\right\}$ C. $\{-1\}$ D. $\{1\}$

_____4. If A_1 and A_2 are arithmetic means between any two real numbers a and b and G_1 and G_2 are geometric means b/n x and y then $\frac{G_1 G_2}{A_1 + A_2}$ interims of x and y is equal to

A. $\frac{ab}{a+b}$ B. $\frac{a+b}{ab}$ C. $\frac{a-b}{ab}$ D. $\frac{ab}{a-b}$

_____5. If $\sqrt{6}x + y = \frac{\sqrt{2}-\sqrt{3}}{2\sqrt{3}+3\sqrt{2}}$ then the value of x and y respectively are _____ and _____

A. $x = \frac{-5}{6}$ & $y = 2$ B. $x = \frac{5}{6}$ & $y = -2$ C. $x = \frac{5}{6}$ & $y = 2$ D. $x = \frac{-5}{6}$ & $y = -2$

_____6. How many possible 3 member committees can be selected from an organization that contains 10 members?

A. 720 B. 120 C. 240 D. 360

_____7. The inverse of the function defined by $f(x) = \frac{2x}{x+3}$ is equal to

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

_____8. Let $f(x) = 2x+1$ and $g(x) = x^3$, then $(f \circ g)(1)$ is equal to

A. 1 B. 0 C. 2 D. 3

_____9. What is the focus of the parabola $y^2 + 4y + 8x = 4$?

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

_____10. If $c(n,3) = c(n,5)$, then what is the value of n ?

A. 1 B. 4 C. 6 D. 8

_____11. For the data: 3,6,10,25,19,14,17,22,26. What is the value of Quartile 1?

A. 8

B. 9

C. 12.5

D. 23.5

_____12. If $\begin{vmatrix} -1 & 3 & -6 \\ x & 3 & 0 \\ 1 & -2 & 1 \end{vmatrix} = 1$, then the value of x is equal to

A. $\frac{7}{9}$

B. $\frac{14}{9}$

C. $\frac{-14}{9}$

D. $\frac{-7}{9}$

_____13. If $8^{3x-1} = \left(\frac{1}{2}\right)^{4x} (128)^{-x-1}$, then what is the value of x?

A. 1

B. 5

C. $\frac{1}{5}$

D. $\frac{-1}{5}$

_____14. Let $A = \{1, 2, 3, 4, 5, 6, 7, 8\}$ and $B = \{2, 4, 6, 8, 10\}$ then what is the value of $A \Delta B$?

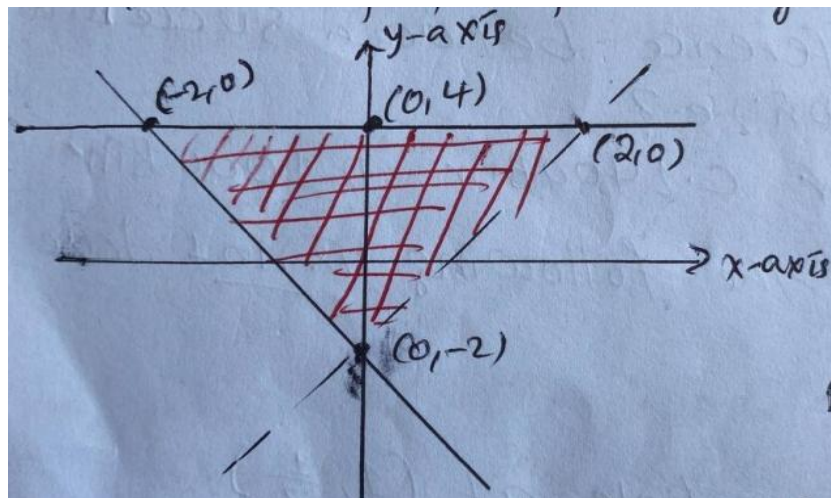
A. $\{1, 2, 3, 4, 5, 6, 7, 8, 10\}$

B. $\{1, 3, 5, 7\}$

C. $\{1, 3, 5, 7, 10\}$

D. $\{2, 4, 6, 8\}$

_____15. Which of the following **is not** true about the graph given below?



A. The domain is $\{x: -2 \leq x < 2\}$

B. The range is $\{y: -2 < y \leq 4\}$

C. The relation R is $\{(x, y): y \leq 4, y > x - 2 \text{ \& } y \leq -x - 2\}$

D. The relation R is $\{(x, y): y \leq 4, y > x - 2 \text{ \& } y \geq -x - 2\}$

_____16. What is the length of the side of an equilateral triangle if its radius is $\frac{1}{\sqrt{3}}$ cm?

A. 2cm

B. $\sqrt{2}$ cm

C. $\sqrt{3}$ cm

D. 1cm

_____17. A ladder 10cm long leans against a wall and makes an angle of 60° with the ground. How far from the wall is the foot of the ladder?

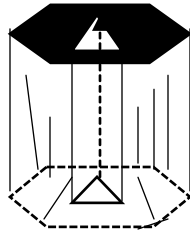
A. 10cm

B. 5cm

C. 2cm

D. 4cm

_____18. Through the center of a regular hexagonal prism whose base edge is 6cm and height 8cm, a hole whose form is a regular triangular prism with base edge is 3cm is drilled as shown in the figure below. What is the volume of the remaining solid?



A. $360\sqrt{3} \text{ cm}^3$

B. 207cm^3

C. $414 \sqrt{3}\text{cm}^3$

D. 540 cm^3

_____19. What is the instantaneous rate of change $f(x)=3x^2-10x+1$ at $x=10$?

A. 30

B. 40

C. 50

D.60

_____20. If $f(x)=ax-b$ and $f^{-1}(x+1)=\frac{1}{2}x+2$, for each $x \in \mathbb{R}$, then what must be the value of a and b?

A. $a=2, b=3$

B. $a=2, b=2$

C. $a=1, b=1$

D. $a=\frac{1}{2}, b=-2$

_____21. A contest will have 5 prizes totally birr 5000 and there will be a 100 birr difference between successive prizes. What is the first prize?

A. 1600 Birr

B. 1200 Birr

C. 1400 Birr

D. 1000 Birr

- _____22. Let $f(x) = \frac{x^2 - x}{2x^2 - x - 1}$, which of the following is not true about f and its graph?
- A. The graph of f has a hole at $(1, \frac{1}{3})$.
 B. $y = \frac{1}{2}$ is a horizontal asymptote.
 C. $x = \frac{-1}{2}$ is a vertical asymptote.
 D. f has an even function.
- _____23. $\sum_{n=1}^8 \log_3 \frac{n+1}{n}$ is equal to
- A. 2 B. 3 C. 6 D. 9
- _____24. The simplification form of $\frac{t}{t^3 - 1} \div \left[2 - \frac{1}{1 + \frac{1}{t-2}} \right]$ is equal to
- A. 1 B. $\frac{1}{t^2 - t - 1}$ C. $\frac{1}{t^2 + t + 1}$ D. t
- _____25. Let $a_n = n + \cos n\pi, n=1, 2, 3, \dots$ be the n^{th} term of the sequence then what is the value of $-(a_7 - a_6)$?
- A. 2 B. -1 C. 1 D. 0
- _____26. Which of the following is not a contradiction?
- A. $(p \wedge \neg p)$ B. $\neg(p \Rightarrow s) \wedge [(p \Rightarrow q) \wedge (q \Rightarrow s)]$
 C. $\neg[p \vee q] \Leftrightarrow [q \vee p]$ D. $(q \Rightarrow \neg p) \vee \neg(\neg p \vee \neg q)$
- _____27. What is the sum of two digit numbers which leave the remainder 2 when divisible by 3?
- A. 1200 B. 1300 C. 1435 D. 1635
- _____28. Which of the following is not true about the ellipse given by the equation $\frac{x^2}{25} + \frac{y^2}{49} = 1$?
- A. The vertices are $(0, 7)$ and $(0, -7)$ C. $e = \frac{2\sqrt{6}}{7}$
 B. $C = \sqrt{6}$ D. The foci are $(0, 2\sqrt{6})$ and $(0, -2\sqrt{6})$
- _____29. When m -arithmetic means are inserted between 11 and 19, the sum of the resulting term is 150. What is the value of m ?
- A. 6 B. 8 C. 9 D. 11
- _____30. In a right circular cone has base radius 5 cm and slant height 8cm, the volume of this cone is equal to
- A. $\frac{65\sqrt{39}}{3} \pi \text{cm}^3$ B. $\frac{25\sqrt{39}}{3} \pi \text{cm}^3$ C. $\frac{100}{3} \pi \text{cm}^3$ D. $\frac{200}{3} \pi \text{cm}^3$

_____31. What is the derivative of $f(x) = \frac{x^4}{x^3+2}$ at $x=1$?

- A. 2 B. 12 C. 1 D. 9

_____32. If $z_1 = 3+4i$ and $z_2 = 4-6i$ then $\overline{z_1 + z_2}$ is equal to

- A. $-7+2i$ B. $-7-2i$ C. $7-2i$ D. $7+2i$

_____33. The bio mass of a bacteria culture in milligrams as a function of time in minutes is given by $f(t) = 60t^3 + 100$. What is the instantaneous rate of growth of culture when $t=2$ minutes?

- A. 720 mg/min B. 180mg/min C. 360 mg/min D. 420mg/min

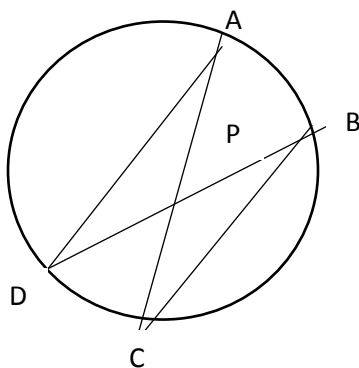
_____34. What is the surface area of a spherical gas balloon with a diameter of 10cm?

- A. $100\pi \text{ cm}^2$ B. $50\pi \text{ cm}^2$ C. $25\pi \text{ cm}^2$ D. $75\pi \text{ cm}^2$

_____35. What is the sum of the first 150 consecutive natural numbers?

- A. 11,020 B. 12,120 C. 10,240 D. 11,325

_____36. In the figure given below, chords AC and BD intersect at a point p inside the circle, if $m(\angle DAC) = 35^\circ$ and $m(\angle ACB) = 30^\circ$, then $m(\angle APB)$ is equal to



- A. 55°
B. 65°
C. 60°
D. 70°

_____37. What is the value of t if $\sum_{k=1}^{\infty} 6^{tk} = \frac{1}{5}$?

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

- _____38. What is the slope of a secant line to the graph of $f(x) = 2x^2 + 3x - 1$ over the interval $[1, 2]$?
- A. 8 B. 15 C. 9 D. 11
- _____39. For the vector given by $\vec{v} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$, what is the magnitude and the direction of the vector?
- A. The magnitude is $\sqrt{2}$ and the direction is 90°
 B. The magnitude is 1 and the direction is 45°
 C. The magnitude is $\sqrt{2}$ and the direction is 45°
 D. The magnitude is 1 and the direction is 90°
- _____40. What is the arithmetic mean between 2 and 12?
- A. 6 B. 7 C. 8 D. 9
- _____41. If a polynomial function p is given by $p(x) = (3x+2)(1-5x)(1-x^2)$, then which one of the following statement is correct about $p(x)$?
- A. The constant term of $p(x)$ is -2 C. $p(x)$ is a polynomial over integer
 B. The leading coefficient of $p(x)$ is -15 D. The degree of $p(x)$ is 3
- _____42. A motor cycle is now worth birr 100,000 and losses 10% of its value each year. What will it worth after 2 years?
- A. 60,000 B. 81,000 C. 91,000 D. 70,000
- _____43. What is the solution set of the inequality $2x(4-x) \geq 0$?
- A. $[-4, 0]$ B. $(-\infty, 0] \cup [4, \infty)$ C. $(-\infty, -4] \cup [0, \infty)$ D. $[0, 4]$
- _____44. Let $f(x) = x^3 - 3x^2 - 24x + 7$. What is the interval on which f is increasing?
- A. $(-\infty, -2]$ and $[4, 8)$ B. $(-\infty, -2)$ and $(4, \infty)$ C. $[-2, 4]$ D. $(-2, 4)$
- _____45. Let ℓ be the line through $A(-4, 5)$ and $B(3, t)$ that is perpendicular through $P(1, 3)$ and $Q(-4, 2)$. What is the value of t ?
- A. -25 B. 30 C. -30 D. 25
- _____46. The local maximum value of $f(x) = 2x^4 - 16x^2$ is equal to
- A. -32 B. 0 C. 2 D. -16

- _____47. Which one of the following is true about a second quadrant angle θ in standard position whose terminal side lies on the line $2x+y=0$?
- A. $\cos \theta = \frac{1}{\sqrt{5}}$ B. $\sin \theta = \frac{2}{\sqrt{5}}$ C. $\cos \theta = \frac{2}{\sqrt{5}}$ D. $\sin \theta = \frac{1}{\sqrt{5}}$
- _____48. The equation of the tangent line to the graph of $f(x) = \frac{3x}{x-1}$ at $(2, f(2))$ is equal to
- A. $y = -3x + 12$ B. $y = -3x - 12$ C. $y = 3x - 12$ D. $y = 3x + 12$
- _____49. If $P(-1, 2)$ and $Q(5, -3)$ are points on the coordinate plane, so that Q is the midpoint of $\overline{PR}$, then what the coordinate of point R ?
- A. $(2, -6)$ B. $(-2, 5.5)$ C. $(3.5, -2)$ D. $(11, -8)$
- _____50. If x and y are non-negative integers, then which of the following is not true?
- A. $(\forall x)(\exists y)(y > x^2 - 1)$ C. $(\exists y)(\forall x)(y \leq x^2 - 1)$
 B. $(\exists x)(\forall y)(y > x^2 - 1)$ D. $(\exists y)(\exists x)(y \leq x^2 - 1)$
- _____51. If the third term of a geometric progression is 9 and the common ratio is $\frac{3}{2}$, then the fifth term is equal to
- A. $\frac{81}{4}$ B. $\frac{4}{81}$ C. $\frac{27}{2}$ D. $\frac{2}{27}$
- _____52. The radius of a right circular cylinder of height 10cm increase at a rate of 3cm/min. what is the rate of change of the value of cylinder when the radius is 8cm?
- A. $8\pi \text{ cm}^3/\text{min}$ B. $320\pi \text{ cm}^3/\text{min}$ C. $480\pi \text{ cm}^3/\text{min}$ D. $640\pi \text{ cm}^3/\text{min}$
- _____53. Which one of the following is the set of critical numbers of $f(x) = \sqrt{x}(1-x)$?
- A. $\left\{1, \frac{1}{3}\right\}$ B. $\left\{-1, \frac{1}{3}\right\}$ C. $\left\{0, \frac{-1}{3}\right\}$ D. $\left\{0, \frac{1}{3}\right\}$
- _____54. If $A = \begin{pmatrix} 3 & -2 & 8 \\ 0 & 6 & 7 \\ 0 & 4 & 5 \end{pmatrix}$, then $\det(A^T A)$ is equal to
- A. 12 B. 36 C. 30 D. 15
- _____55. What is the total number of integer between 100 and 1000 that is divisible by 7?
- A. 896 B. 994 C. 223 D. 128
- _____56. What is the solution set of $1 - \frac{5}{x^2+4} = \frac{x-1}{x^2-x} - \frac{1}{x}$?
- A. $\{-1\}$ B. $\{1\}$ C. $\{2\}$ D. $\{-1, 1\}$

_____ 57. Water is flowing in to vertical cylindrical tank of radius 2m at the rate of $3\text{m}^3/\text{min}$. how fast the water level rising?

- A. $\frac{3}{2\pi}$ m/min B. $\frac{3}{4\pi}$ m/min C. $\frac{4}{3\pi}$ m/min D. $\frac{2}{3\pi}$ m/min

_____ 58. If $a_1=1, a_2=3, a_3=5, a_4=7$ ----then $\sum_{n=1}^{50} an=$ _____

- A. 3500 B. 1500 C. 2500 D. 7500

_____ 59. What is the standard deviation of the data given below?

x	3	4	5	6	7
f	2	1	3	3	1

- A. s.d= $\sqrt{1.6}$ B. s.d= $\sqrt{1.22}$ C. s.d= $\sqrt{1.66}$ D. s.d= $\sqrt{1.02}$

_____ 60. In how many ways can 5 people be seated around circular table?

- A. 30 B. 60 C. 24 D. 12

_____ 61. Let $f(x)=g(\sqrt{4x+1})$. If $g'(3)=\frac{1}{2}$ then $f'(2)$ is equal to

- A. $\frac{2}{3}$ B. $\frac{1}{3}$ C. $\frac{\sqrt{5}}{2}$ D. $\frac{\sqrt{3}}{2}$

_____ 62. If $p(A)=\frac{1}{2}, p(B)=\frac{1}{3}, p(A \cap B)=\frac{1}{4}$, then $p(A/B)$ is equal to

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

_____ 63. The motion of a car travels along a straight road and assume that we can measure the distance traveled by the car (in meter) at 1- second intervals as in the following chart.

T(s)	0	1	2	3	4	5
S(m)	0	4	10	30	50	100

What is the average velocity during the time $2 \leq t \leq 5$?

- A. 10m/s B. 20m/s C. 30m/s D. 40m/s

_____64. What is the solution set of the equation given below?

$$\begin{cases} 3x + 2y + z = -5 \\ x - y + z = -5 \\ 2x + 3y + z = 0 \end{cases}$$

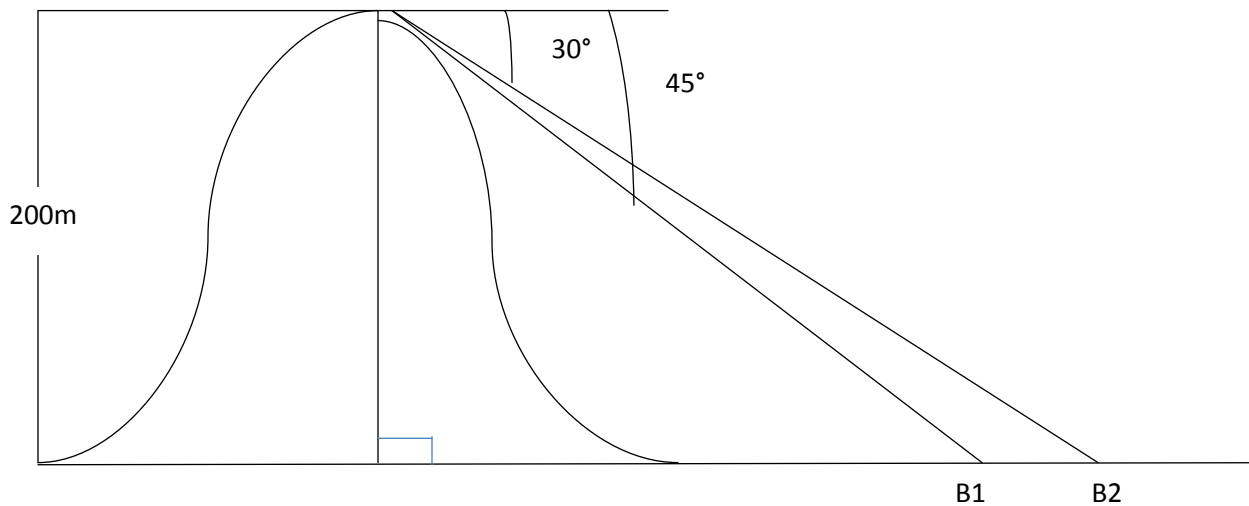
A. $\{(0, 2, -3)\}$

B. $\{(0, -3, 2)\}$

C. $\{(-3, 2, 0)\}$

D. $\emptyset$

_____65. From the top of a cliff 200 meters above sea level the angle of depression to two fishing boats are 30° and 45° respectively. How far apart are the boats?



A. $\frac{200(\sqrt{3}-3)}{3}$ m

B. $\frac{300(\sqrt{3}-3)}{3}$ m

C. $200\left(3 - \frac{\sqrt{3}}{3}\right)$ m

D. $200\left(3 + \frac{\sqrt{3}}{3}\right)$ m

-THE END-