

Kombolcha General and Preparatory Secondary

School Grade 12th Maths Work sheet. May 2014

TIME ALLOWED 3:00 Hr.

INSTRUCTION I: CHOOSE THE CORRECT ANSWER FORM THE GIVEN ALTERNATIVES AND WRITE THE ANSWER IN THE APPROPRIATE ANSWER SHEET.

1. Which relation is correct about signum, absolute value and greatest integer function?

A. $|x|=x\text{sgn}x, \forall x \in R,$ C. $x\text{sgn}x \leq [x], \forall x \in R$
 B. $\text{sgn}x = \pm|x|, \forall x \in R$ D. $x\text{sgn}x$ is odd function

Given $h(x)=\ln(1+x^2)$ and $f(x)=\sqrt{2+x}$, then what is the value of $(h \circ f)(x)$ at $x=-1$?

A) 4 B) $\ln 2$ C) 1 D) $-4\ln 2$.

2. The inverse of the function defined by $f(x) = \frac{3x}{x+5}$ is equal to?

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

3. If $\{A_n\}_{n=1}^{\infty}$ is an arithmetic sequence with first term -5 and the fifth term 15, then what is the eleventh term? A. 40 B. 50 C. 45 D. 55

4. What is the sum of all multiples 3 that are between 37 and 401?

A. 264990 B. 2699 C. 26499 D. 2649900

5. Which of the following is the sum of the series: $5 - \frac{10}{3} + \frac{20}{9} - \frac{40}{27} + \dots$?

A) -5 B) 3 C) -5 D) -3

6. A ball is thrown vertically from a ground up to a height of 16m. Each time it drops h meters, it rebounds 0.80m. Nothing that the ball travels every height of h twice.

What is the total vertical distance travelled by the ball before it comes to rest? A.

40m B. 80m C. 160m D. 320m

7. What is the solution set of $1 - \frac{5}{x^2+4} = \frac{x-1}{x^2-x} - \frac{1}{x}$? A) $\{2\}$ B) $\{1, -1\}$ C) $\{-1\}$ D) $\{1, 2, -1\}$

8. Which one of the following is not true about $f(x) = \frac{2x^2-3x+2}{x^2+1}$?

A. The graph of f has no vertical asymptote B. its graph has y-intercept at (0,2)

C. $y = 2$ is a horizontal asymptote to the graph of f D. $y = x+2$ is an oblique asymptote to the graph of f

9. What is the greatest lower bound and least upper bound of the sequence $a_n = (-1)^n$

$\sin \frac{\pi}{2n}$ respectively? A. 0.5 and 1 B. -1 and 0 C. -1 and $\frac{\sqrt{2}}{2}$ D. -1 and 1

10. What is the value of $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{\frac{-x}{2}}$? A. ∞ B. $\sqrt{e}$ C. e^{-2} D. $\frac{1}{\sqrt{e}}$
11. Given the equation of the line $l: 2x - 3y = 30$, what point on the line is equidistant to the point A(1,3) and B(1,9)?
A) (24,6) B) (-6,-24) C) (6,24) D) (-2,-6)
12. Find the equation of the Circle If two of its diameters are $x + 4y = 5$ and $7x - y = 6$, and whose radius is $\sqrt{7}$.
A. $(x-2)^2 + (y-1)^2 = 7$ B. $(x+2)^2 + (y+1)^2 = 7$
C. $(x-2)^2 + (y-1)^2 = 7$ D. $(x-1)^2 + (y-1)^2 = 7$
13. The length of the major axis of the ellipse $x^2 + 9y^2 - 2x + 18y + 1 = 0$ is? A) 3 B) 9 C) $6\sqrt{10}$ D) $\sqrt{10}$
14. A parabola with focus at (-5, -1) has directrix $x = 3$, then the equation of the parabola is?
A. $(y+1)^2 = 16(x-1)$ B. $(x-1)^2 = -16(y+1)$
C. $(y+1)^2 = -16(x+1)$ D. $(y-1)^2 = -16(x+1)$
15. $\lim_{x \rightarrow 0} \frac{\sin(3x)}{x^2 - x}$ is equal to A. -3 B. -1 C. $\frac{1}{3}$ D. 3
16. What is the $\lim_{x \rightarrow 0} \frac{\sqrt{1+x} - \sqrt{1-x}}{x}$? A. $\frac{5}{3}$ B. 1 C. -1 D. 0
17. For what value of the constant c is the function f continuous on $(-\infty, \infty)$, where $f(x) = \begin{cases} cx^2 + 2x, & x < 2 \\ 2x + 4, & x \geq 2 \end{cases}$ A. 0 B. 1 C. 4 D. 2
18. Given a function $f(x) = \sqrt{2 - \sqrt{5 - x^2}}$. On which interval is f continuous?
A. $[-\sqrt{5}, -1] \cup [1, \infty)$ B. $(-\infty, -1] \cup [1, \infty)$ C. $[-\sqrt{5}, \sqrt{5}]$ D. $[-1, 1]$
19. What is the negation of the compound proposition of $[\neg q(x) \implies \neg P(x)]$?
A) $(\exists x)[p(x) \wedge \neg q(x)]$ B) $(\exists x)[q(x) \implies p(x)]$
C) $(\exists x)[p(x) \implies q(x)]$ D) $(\exists x)[\neg p(x) \implies q(x)]$
20. Let p, q and r be propositions such that p is false and q is true, then which of the following has a true truth value? A. $r \wedge \neg q$ B. $r \implies q$ C. $\neg p \vee r$ D. none
21. In the argument $\neg R, P \square Q$, are premises which one is valid?
A. PS B. $\neg S$ C. $p \square R$ D. $\neg P$
22. Which one of the following is the equation of the line tangent to the graph of $f(x) = \frac{1}{x+1} + \cos x$ at $(0, f(0))$? A. $x + y = 1$ B. $x + 4y = 2$ C. $x + y = 2$ D. $x - y = -2$
23. let $f(x) = x|x|$, then which one of the following is not true? A) $f'(x) = 2|x|$ B) $f''(0) = 0$ C) f is differentiable on $(-\infty, \infty)$ D) f is differentiable at $x=0$

24. Let $f(x) = e^x \sin x$. Then what is $f'(0)$? A. e B. 0 C. 1 D. 2
25. Let $f(x) = \frac{x}{\sqrt{x^2+1}}$ then what is $f''(1)$? A. $\frac{-3\sqrt{2}}{8}$ B. $\frac{-3}{\sqrt{2}}$ C. $\frac{-\sqrt{2}}{8}$
D. $-\sqrt{2}$
26. Let $f(x) = e^{3x-1}$ and $g(x) = \tan x$. If $F(x) = x f(x) + f(g(x))$ then $F'(0)$ equal to?
A) $3e^{-1}$ B) e^{-1} C) 4 D) $4e^{-1}$
27. If $f(x) = \ln(\sqrt{x^2-5})$, which one of the following is equal to $f'(x)$?
A. $\frac{x}{x^2-5}$ B. $\frac{-x}{\sqrt{x^2-5}}$ C. $\frac{2x}{\sqrt{x^2-5}}$ D. $\frac{-x}{x^2-5}$
28. There are three children in a room, ages four, five and six. If a five years old child enters the room. Then which one of the following is true?
A) Mean age will stay the same but the standard deviation will increase.
B) Mean age will stay the same but the standard deviation will decrease.
C) mean age and the standard deviation will increase.
D) Mean age and the standard deviation stay the same
29. If the standard deviation of $x_1, x_2, \dots, x_n$ is 3 then the standard deviation of $2x_1 + 3, 2x_2 + 3, \dots, 2x_n + 3$ is equal to? A. 3 B. 6 C. 4 D. 8
30. If the expansion of $(3x+2y)^5$. What is the coefficient of the term x^2y^3 ? A. 540
B. 970 C. 720 D. none
31. For two independent events A and B with $p(A) = \frac{1}{4}$ and $p(A \cap B) = \frac{1}{6}$ then $p(B)$ is?
A. $\frac{5}{12}$ B. $\frac{7}{12}$ C. $\frac{2}{3}$ D. $\frac{1}{3}$
32. How many possible 3 member committees can be selected from an organization that contains 10 members? A) 120 B) 360 C) 240
D) 720
33. A box contains 10 white and 6 red balls, if two balls are drawn one after the other without replacement. what is the probability of that first ball is white and the second ball is red?
A) $\frac{15}{64}$ B) $\frac{1}{4}$ C) $\frac{25}{128}$ D) $\frac{1}{8}$
34. Which one of the following is the set of critical numbers of $f(x) = |x^2-9|$?
A) $\{3\}$ B) $\{-3\}$ C) $\{-3, 0, 3\}$ D) $\{0\}$
35. In which one of the following intervals does $f(x) = x^4 + 4x$ increase?
A. $(-\infty, -1)$ B. $(-1, 0)$ C. $(-1, \infty)$ D. $(-\infty, \infty)$
36. The total cost for ordering and storing x units given by $C(x) = 3x + \frac{30,000}{x}$ birr.
How many units must be ordered to produce a minimum cost? A) 100 B) 200 C) 300 D) 1000

37. . let $x^2y + xy = 6$, then what is the rate of change of x with respect to y ?
- A. $\frac{-2xy-y}{x^2+x}$ B. $\frac{2xy+y}{x^2+x}$ C. $\frac{-x^2-x}{2xy+y}$ D. $\frac{x^2+x}{2xy+y}$
38. Air is being pumped in to a spherical balloon so that its volume increases at rate of $50 \frac{cm^3}{sec}$. how fast is the radius of the balloon increasing when the diameter is 5cm.
- A $\frac{5}{\pi} \frac{cm}{sec}$ B) $\frac{1}{2\pi} \frac{cm}{sec}$ C) $\frac{2}{\pi} \frac{cm}{sec}$ D) $\frac{1}{50\pi} \frac{cm}{sec}$
39. Suppose $A = \begin{pmatrix} 1 & 2 \\ 2 & 3 \end{pmatrix}$. if X is a 2×2 matrix such that $AX - A^T = 2A$, then what is the value of X ?
- A) $\begin{pmatrix} 3 & 1 \\ 1 & 3 \end{pmatrix}$ B) $\begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$ C) $\begin{pmatrix} 3 & 6 \\ 6 & 9 \end{pmatrix}$ D) $\begin{pmatrix} 3 & 3 \\ 3 & 3 \end{pmatrix}$
40. If $A = \begin{bmatrix} x & 0 \\ \frac{1}{x} & 1 \end{bmatrix}$ for $x \neq 0$ for what non-zero value of x is the $\det(3A) = x^2$
- A. 9 B. 81 C. -9 D. 0
41. Suppose that A and B are 3×3 matrices, I is identity matrix of order 3 such that $AB = 2I$.
- If $\det B = 6$. What is $\det(A^T)$? A) $\frac{4}{3}$ B) $\frac{1}{3}$ C) 12 D) 48
42. Find a quadratic function $y = ax^2 + bx + c$ contains the point $(1, 3)$, $(2, 3)$ and $(0, 1)$
- A. $x^2 + 6x + 4 = 0$ B. $-x^2 + 3x + 1 = 0$ C. $x^2 + 3x + 1 = 0$ D. $x^2 - 3x + 1 = 0$
43. The value of $\int_0^1 (x+1)e^{(x^2+2x)} dx$ is? A. $e^4 - e$ B. $\frac{e^3 - 1}{2}$ C. $\frac{e^3 + 1}{2}$ D. $e^3 + 2$
44. $\int e^{2x} \cos x dx$ is equal to? A. $\frac{1}{5} e^{2x} (\cos x + \sin x) + c$ B. $e^{2x} (2 \cos x + \sin x) + c$
- C. $e^{2x} (\cos x + \sin x) + c$ D. $\frac{1}{5} (2 \cos x + \sin x) + c$
45. . An anti-derivative of $f(x) = \frac{x^2 - x + 2}{x^2 - 1}$ is?
- A. $\ln|x-1| - \ln|x+1| + c$ B. $x + \ln|x-1| - 2 \ln|x+1| + c$
- C. $\frac{1}{2} x + \ln \left| \frac{x+1}{x-1} \right| + c$ D. $\ln|x+1| - \ln|x-1| + c$
46. Which one of the following is equal to $\int_0^{\frac{\pi}{3}} \frac{\tan x}{\cos x} dx$? A. $\frac{1}{2}$ B. -1 C. $\frac{2\sqrt{3}}{3} - 1$ D. 1

47. If $f(0)=-1$, $f(1)=2$ and $f'(x)$ is continuous on $[0,1]$ then $\int_1^0 f'(x)\sqrt{2+f(x)} dx$ is equal to?
 A) $\frac{14}{3}$ B) $-\frac{14}{3}$ C) $\frac{16}{3}$ D) $-\frac{16}{3}$
48. Which one is the volume of the solid obtained by rotating the region bounded by $y = x^2$ and x -axis between at $x = 1$ and $x = 4$ about the x -axis?
 A) $\frac{126}{5}\pi$ B) $\frac{1023}{5}\pi$ C) $\frac{1046}{5}\pi$ D) $\frac{1025}{5}\pi$
49. The simplify form of $\frac{3-2i}{2+3i} + \overline{1-2i}$ A) $1-3i$ B) $2-i$ C) $1+i$ D) $2-3i$
50. If $Z = (1+i)^{10}$, then which of the following is equal to Z ? A) $1+32i$ B) $32i$ C) $10i$ D) $1+10i$

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51. If $A = (1, 2)$ and $B = (3, 5)$ be two points, then the unite vector along $\overrightarrow{BA}$ is?
 A) $(\frac{-3}{\sqrt{13}}, \frac{-2}{\sqrt{13}})$ B) $(\frac{-2}{\sqrt{13}}, \frac{-3}{\sqrt{13}})$ C) $(\frac{-2}{\sqrt{13}}, \frac{3}{\sqrt{13}})$ D) $(\frac{2}{\sqrt{13}}, \frac{-3}{\sqrt{13}})$
52. If $\vec{a}=2i-3j$, $\vec{b}=3i-j$ and $\vec{c}=i-j$, then which of the following is equals $(\vec{a} \cdot \vec{c})$?
 A) -10 B) 13 C) 7 D) 10
53. Let $(x, y) = (2, 5) + t(1, -2)$ is vector equation of L. What is the standard equation of L?
 A. $y + 2x = 9$
 B. $3y - 4x = 3$ C. $y = 3x - 5$ D. $-2y + x = 3$
54. What is the image of the line given by $(x, y) = (2, 1) + t(3, 4)$ under a translation that takes $(1, 0)$ to $(0, 1)$?
 A. $y = \frac{4}{3}x + \frac{2}{3}$ B. $y = \frac{3}{4}x - \frac{2}{3}$ C. $y = \frac{-4}{3}x - \frac{2}{3}$ D. $y = \frac{4}{3}x + \frac{3}{2}$
55. If one of the end point of the line segment is $(3, 2, -4)$ and the mid-point is $(4, 1, -2)$. Then the coordinate of the other end point is ----. A) $(5, 0, 0)$ B) $(2, 0, 5)$ C) $(5, 1, 2)$ D) $(3, 1, 0)$
56. A sphere with center $(0, 1, 1)$ intersects the z -axis at point $p(0, 0, 3)$ then the radius of the sphere is?
 A. 5 B. 3 C. $\sqrt{3}$ D. $\sqrt{5}$
57. Let $\vec{a} = -\vec{i} + 3\vec{k}$ and $\vec{b} = -\vec{i} + \vec{j}$ be vector in space which one is the cosine of the angle between $\vec{a}$ and $(\vec{a} \cdot \vec{b})$?
 A. $\frac{9}{10}$ B. $\frac{9}{\sqrt{10}}$ C. $\frac{9}{\sqrt{10}}$
 D. $-\frac{9}{10}$
58. If $\sin\theta = \frac{5}{13}$, for $\frac{\pi}{2} < \theta < \pi$, then $\sin 2\theta$ is equal to? A) $\frac{120}{169}$ B) $\frac{169}{120}$ C) $\frac{10}{3}$
 D) $-\frac{120}{169}$

59. The exact value of $\cos(\sin^{-1}(\frac{3}{5}) + \cos^{-1}(\frac{-4}{5}))$ is? A. $\frac{1}{2}$ B. $\frac{-1}{2}$ C. -1 D.

1

60. Which one of the following is false about a function $f(x) = -3 \sin(\frac{1}{2}x)$.

A. Period = 4π C. decrease in $\{-2\pi, 0\}$

B. Amplitude = 3 D. Increase in $\{\pi, 3\pi\}$

61. What is the amplitude and period, respectively, of the graph $f(x) = 4 \sin(\frac{x}{3}) \cos(\frac{x}{3})$?

A) $4, \frac{\pi}{3}$ B) $2, 3\pi$ C) $2, \frac{2\pi}{3}$ D) $4, 3\pi$

62. If the universal set is the set of real number which one has a true truth value?

A. $(\exists x)(x^2 = -2)$ B. $(\exists x)(\exists y)(x^2 - y^2 = -2)$ C. $(\forall x)(x^2 - 2 \geq -1)$ D. $(\forall x)(x^2 \geq 1)$

63. Which of the following is not a tautology?

A. $p(qp)$ B. $(p \wedge q) \Rightarrow (p \vee q)$ C. $(p \Rightarrow q) \Rightarrow \neg(p \wedge \neg q)$ D. $p \Rightarrow (p \wedge q)$

64. Which one of the following is valid assertion that can be proved by the principle of mathematical induction?

A. The sum of any two positive real numbers is positive

B. $r^2 \geq 1$ for every real number $r \geq 1$

C. $n^2 \geq 4n$ for every integer $n \geq 4$

D. $2^n \leq 4^n$ for every integer $n \leq 100$

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52. let $R = \{(x, y): 2x + 3y \leq 24, x - y \leq 7, y \leq 6, x \geq 0, y \geq 0\}$ which one of the following points is in R? A. (-2, 2) B. (2, 2) C. (2, -2) D. (8, -1)

53. what is the maximum value of $z = 3x + 2y$,

Subject to: $x + 2y \leq 4$

$$x - y \leq 1$$

$$x \geq 0$$

$$y \geq 0$$

A. 6

B. 10

C. 8

D. 12

54. Which one of the following is different from the rest?

- A. Histogram B. Bar chart C. Frequency polygon D. Frequency curve

55. consider the following data on the mean and standard derivation of the gross in comes of two schools A and B

School	Mean income(in birr)	Standard deviation
A	5000	100
B	5000	150

Which of the measured values (school A or school B) has the higher variability?

- A. School A have greater variability
B. School B have greater variability
C. School A and school B have the same variability
D. The coefficient of variation of school A greater than the coefficient of variation of school B.

56. Which one of the following is not an absolute measure of variation?

- A. Mean deviation B. Range C. standard deviation D. Coefficient of quartile deviation

57. if the mean, median and mode of the data are 2, 3 and 4 respectively then which of the following is true about the distribution.

- A. the distribution is positively skewed
B. the distribution is negatively skewed
C. the distribution is symmetrical
D. the coefficient of variation is 30, if standard deviation of the data is 0.5

58. If 25% of a number is 70. What is the number? A) 180 B) 600 C) 280 D) 495

59. Calculate the regular price of a television set, assuming that a 20% discount would have been worth birr400? A. 1000 B. 2000 C. 3000 D. 4000

60. If Alemitu bought a shoe for Birr 400 and wants to sell it at 20% mark-up retail. What is the selling price of the shoe? A. 480 B. 420 C. 500
D. 440

61. Allocate Birr 1500 in the ratio 2:3:7 respectively.

- A. 250,370 &375 B. 250, 375 & 875 C. 255, 875 & 370 D.250, 385 &375

62. The fixed rate of annual depreciation changes of the car is 8%. If the original cost of the car 15,000 birr. Find the depreciated value of the car at the end of 10 years? $((0.92)^{10} = 0.43439)$.

- A. 6515.85 birr B. 6015.83 C. 5515.83 D. 15,000.83

63. The population snow town was 4500 in 1990. In 1994, it had decrease to 3600. Find the percent decrease in population during those four years? A. 80% B. 90% C. 16.2% D. 20%

64. A mobile phone is bought for birr 1,400 and sold for birr 1,900. What is the percentage profit?

- A) 36.7% B) 36.8% C) 45.5 % D) 35.7%

65. W/o Belainesh bought a house from Ayat real estate by paying 30% of purchase, which is Birr 450,000 Then which of the following is correct?

- A. down payment is 585,000 C. it's closing cost is 3375
B. Mortgage is 315,000 D. loan origination fee is 135,000

