

Grade 12 Students

@ETHIO_ENTRANCEG12

join: @ethio_entranceG12

EDUCATIONAL ASSESSMENT AND EXAMINATIONS SERVICE (EAES)
ETHIOPIAN SECONDARY SCHOOL PILOT TEST (ESSPT)
GINBOT, 2016 E.C /MAY, 2024 G.C

Subject Code: 02 **Booklet Code: 006**
Number of Items:60 **Time Allowed: 3 Hours**

1. Which of the following defines a composite number?
   A. It is a natural number which is not prime.
   B. It is a natural number which is an even number.
   C. It is a natural number that has more than two distinct factors.
   D. It is a natural number that has exactly two distinct factors.

2. Which one of the following is an irrational number?
   A. $0.6\overline{15}$
   B. $\frac{3}{7}$
   C. $0.130330333\cdots$
   D. $-7\frac{2}{3}$

3. What is the numerical value of $x-y$ if $x=\sqrt[4]{0.0001}$ and $y=\sqrt[5]{0.00032}$?
   A. -0.1
   B. 1.2
   C. -0.31
   D. 0.22

4. Which of the following is the rationalizing factor of $\frac{12}{\sqrt{6}-3\sqrt{2}}$?
   A. $\frac{\sqrt{6}+3\sqrt{2}}{\sqrt{6}+3\sqrt{2}}$
   B. $\sqrt{6}-3\sqrt{2}$
   C. $-\sqrt{6}+3\sqrt{2}$
   D. $\frac{-\sqrt{6}+3\sqrt{2}}{-\sqrt{6}+3\sqrt{2}}$

5. What is the solution set of the equation $4^x-2^x-12=0$?
   A. $\{-3,4\}$
   B. $\{-3\}$
   C. $\{4\}$
   D. $\{2\}$

6. If one of the roots of the quadratic equation $x^2 - 4x + k = 0$ is less than the other by 3, what is the value of k?
   A. $\frac{1}{2}$ C. $\frac{7}{2}$
   B. $\frac{7}{4}$ D. $-\frac{5}{2}$

7. Which one of the following is the power set of the set $\{\phi, \{1\}\}$?
   A. $\{\phi, \{1\}\}, \{\phi\}, \{\phi, 1\}\}$ C. $\{\phi, \{1\}, \{\phi\}, 1\}$
   B. $\{\phi, \{1\}\}$ D. $\{\{1\}, 1\}$

8. Which of the following is **NOT** true about a relation R?
   A. The set of all second coordinates of the ordered pairs of a relation R is range of R.
   B. The set of all first coordinates of the ordered pairs of a relation R is domain of R.
   C. Two things in a relation are related to each other by a relating phrase.
   D. Any subset of AXB is a relation from A to B for any set A and B.

9. If $f = \{(1,2),(-3,2),(2,5)\}$ and $g = \{(2,4),(1,5),(3,2)\}$, which of the following is true about the combination of f and g?
   A. $f+g = \{(1,7),(2,9),(3,4)\}$ C. $f-g = \{(1,-3),(2,1),(3,0)\}$
   B. $fg = \{(1,10),(2,20)\}$ D. $\frac{f}{g} = \left\{\left(1,\frac{2}{5}\right),\left(2,\frac{5}{4}\right),(3,1)\right\}$

10. What is the maximum value of $f(x) = -6 - 4x - x^2$?
   A. -2 C. 4
   B. 2 D. Has no maximum

11. What is the perimeter of a regular six sided polygon whose radius is 5 units?
   A. 45 units C. 30 units
   B. 15 units D. 12 units

12. Given $\sin 73^\circ = 0.9563$, what is the angle whose cosine value is 0.9563?
   A. 107° C. 20°
   B. 160° D. 17°

13. What is the volume of a regular hexagonal prism whose edge and height is 6cm and 8cm respectively?
   A. $54\sqrt{3}\pi cm^3$ C. $48\sqrt{3}cm^3$
   B. $432\sqrt{3}cm^3$ D. $414\sqrt{3}\pi cm^3$

14. Which of the following statements is **NOT** true about primary and secondary data?
   A. Measuring the height of the students in a given class by your self is a primary data for you.
   B. Reports by MOE about the number of students enrolled in different universities of Ethiopia is a primary data for the ministry itself.
   C. Reports on the number of victims of HIV/AIDS by the ministry of health is secondary data for the ministry itself.
   D. Classifying the employees in a certain school by household income is a primary data for that school.

15. In a mathematics final examination, the scores for students were 36, 18, 54, 48, 12, 12, 30, 42, and 18 out of 60.
   What is the mean score for the students?
   A. 30 C. 45
   B. 36 D. 42

16. In an experiment of selecting students at random, a researcher found 20 boys and 30 girls after 50 trials. What is the probability that a randomly selected student is a boy?

A. 0.60 C. 0.67
B. 0.40 D. 0.50

17. If $\vec{u} = 20m$ due north and $\vec{v} = 10m$ due east. What is the magnitude of $\vec{u} + \vec{v}$?

A. 15 m C. $20\sqrt{5}$ m
B. 25 m D. $10\sqrt{5}$ m

18. If $f(x) = 3x^7 - bx^6 + 5x^3 - x + 11$ is divided by $x + 1$, then the remainder is 15. What is the value of b?

A. -11 C. 3
B. -3 D. -13

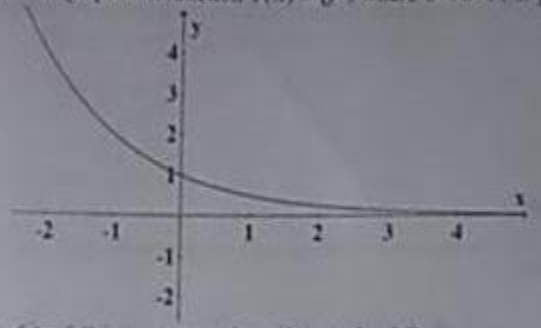
19. Which of the following are all rational zeros of $p(x) = 2x^3 + x^2 - 4x - 3$?

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

20. What is the value of x if $\log_4^{(5x-11)} = 3$?

A. 13 C. 15
B. 14 D. 11

21. Consider the graph of a function $f(x) = b^x$, where $0 < b < 1$ is given below.



Which of the following is true about the graph of f?

A. Its graph lies below the x-axis for all values of x
B. Its graph passes through the point (1, 0).
C. The graph is between 0 and 1 when $x > 0$.
D. Its graph has no asymptotes.

22. Which one of the following is true about the logarithm function $f(x) = \log_c x$?

A. $c > 0$, $c \neq 1$ and $x > 0$ C. $c \neq 1$ and $x < 0$
B. $c > 0$ and $x > 0$ D. $c \in \mathbb{R}$ and $x > 0$

23. What is the solution set of the inequality $|6 - 2x| + 2 > 8$?

A. $\{x: x > 0 \text{ or } x < -6\}$ C. $\{x: x < -6\}$
B. $\{x: x < 0 \text{ or } x > 6\}$ D. $\{x: x > 0 \text{ and } x < -6\}$

24. Which one of the following is the solution set of the quadratic inequality $(x-2)^2 - (2-x) \leq 0$?

A. $(-\infty, 1)$ C. $(2, \infty)$
B. $(-\infty, 1)$ or $(2, \infty)$ D. $\{1, 2\}$

25. What is the coordinates of the point that divides the line segment joining the points P(1, 3) and Q(-4, -3) in the ratio 2 : 3 from P to Q?

A. $(-2, \frac{-3}{5})$ C. $(-1, \frac{3}{5})$

B. $(\frac{-3}{5}, -2)$ D. $(2, \frac{3}{5})$

26. Which of the following pairs of lines are perpendicular?

A. $l_1: x - y = 1$ and $l_2: 2x + y = 3$

B. $l_1: x - 3y = 5$ and $l_2: 4x + \frac{4}{3}y = 12$

C. $l_1: y = \frac{1}{3}x - 5$ and $l_2: 3y = x + 7$

D. $l_1: y - x = 2$ and $l_2: 3y - 3x = 4$

27. Which of the following is true about the algebraic sign of the trigonometric function?

A. $\sin 195°$ is positive C. $\cos 895°$ is negative

B. $\tan 336°$ is positive D. $\sin 455°$ is negative

28. Which one of the following is **NOT** true about the function $y = \sin x$?

A. Its domain is the set of all real numbers.

B. Its range is the set $\{y : -1 \le y \le 1\}$

C. It is periodic function with period 2π.

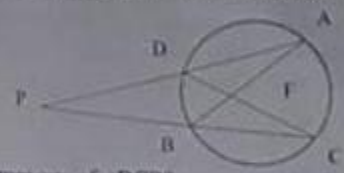
D. It is an increasing function in its domain.

29. If $\cos\theta = -\frac{4}{5}$ and θ is an angle in the second quadrant, what is the value of $\cot\theta$?

A. $-\frac{4}{3}$ C. $\frac{4}{3}$

B. $\frac{3}{4}$ D. $\frac{9}{25}$

30. In the figure below, $m(\angle APC) = 35°$ and $m(\angle AFC) = 85°$.



What is the measure of $\angle DCB$?

A. 50° C. 60°

B. 25° D. 55°

31. What is the surface area of a sphere with radius 5cm?

A. $400\pi cm^2$ C. $100\pi cm^2$

B. $\frac{400}{3}\pi cm^2$ D. $\frac{100}{3}\pi cm^2$

32. A frustum of height 5cm is formed from a right circular cone of height 10cm and base radius 4cm. What is the volume of the frustum?

A. $\frac{160}{3}\pi cm^3$ C. $\frac{28}{3}\pi cm^3$

B. $\frac{20}{3}\pi cm^3$ D. $\frac{140}{3}\pi cm^3$

join: @ethio_entranceG12

33. On an exhibition a sample of candle is made in the form of a circular cylinder (as shown in the figure) of radius 8cm at the bottom and a right circular cone of altitude 6cm. If the overall height of the candle is 20cm, what is the total surface area of the candle?



A. $368\pi\ cm^2$
B. $304\pi\ cm^2$
C. $288\pi\ cm^2$
D. $224\pi\ cm^2$

34. Which of the following is **NOT** true about the modulus function $f(x) = |x|$?
A. Domain of $f = \mathbb{R}$.
B. Range of $f = \mathbb{R}$.
C. Its graph is symmetrical with respect to the y-axis.
D. The graph of f has sharp corner at the origin.

35. Which one of the following conditions assure the existence of inverse for a given function?
A. If its domain is the set of all real numbers.
B. If it is onto function.
C. If it is a one to one function.
D. If its range is the set of all real numbers.

36. What is the decomposition of the expression $\frac{7x^2 - 11x + 6}{(x-1)(2x^2 - 3x + 2)}$ in to partial fraction form?

A. $\frac{2}{x-1} + \frac{3x-2}{2x^2-3x+2}$
B. $\frac{2}{x-1} + \frac{3x+2}{2x^2-3x+2}$
C. $\frac{2}{x-1} - \frac{3x-2}{2x^2-3x+2}$
D. $\frac{2}{x-1} + \frac{7x+2}{2x^2-3x+2}$

37. Which of the following is true about discrete and continuous variables?
A. Discrete variable takes any real number values while continuous variable takes whole number.
B. Discrete variable obtained by measuring while continuous variable obtained by counting.
C. Continuous variables has gap between its consecutive values while discrete variable has no gap between consecutive values.
D. Continuous variable takes all real values between two given real value while discrete variable takes only whole number values.

38. Which one of the following shows the relationship between permutation and combination of n objects taking r objects at a time?

A. $C(n,r) = {}_nP_r$
B. $C(n,r) = \frac{n P_r}{r}$
C. $C(n,r) = \frac{{}_nP_r}{r!}$
D. $C(n,r) = {}_nP_r \times r$

39. If a die is thrown twice, then what is the probability of getting 2 followed by 3?

A. $\frac{1}{3}$
B. $\frac{1}{9}$
C. $\frac{1}{36}$
D. $\frac{1}{6}$

40. What is the determinant of the matrix $\begin{pmatrix} 1 & 2 & 3 \\ 0 & 2 & -1 \\ 1 & 3 & 2 \end{pmatrix}$?

A. -1
B. 1
C. -2
D. 5

41. Which one of the following is the inverse of the matrix $\begin{pmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{pmatrix}$?

A. $\begin{pmatrix} \frac{3}{14} & \frac{-5}{14} & \frac{-1}{14} \\ \frac{-1}{14} & \frac{-3}{14} & \frac{5}{14} \\ \frac{5}{14} & \frac{1}{14} & \frac{3}{14} \end{pmatrix}$

B. $\begin{pmatrix} \frac{3}{14} & \frac{-1}{14} & \frac{5}{14} \\ \frac{5}{14} & \frac{3}{14} & \frac{-1}{14} \\ \frac{-1}{14} & \frac{5}{14} & \frac{3}{14} \end{pmatrix}$

C. $\begin{pmatrix} \frac{3}{14} & \frac{5}{14} & \frac{-1}{14} \\ \frac{-1}{14} & \frac{3}{14} & \frac{5}{14} \\ \frac{5}{14} & \frac{-1}{14} & \frac{3}{14} \end{pmatrix}$

D. $\begin{pmatrix} \frac{3}{14} & \frac{-5}{14} & \frac{1}{14} \\ \frac{1}{14} & \frac{3}{14} & \frac{-5}{14} \\ \frac{-5}{14} & \frac{1}{14} & \frac{3}{14} \end{pmatrix}$

42. Which one of the following is the augmented matrix of the system of linear equations $\begin{cases} 3x+3y+6z=-9 \\ 2x+3y=-2 \\ z=2 \end{cases}$?

A. $\begin{pmatrix} 3 & 3 & 6 & -9 \\ 2 & 3 & 0 & -2 \\ 1 & 0 & 0 & 2 \end{pmatrix}$

B. $\begin{pmatrix} 3 & 3 & 6 & -9 \\ 2 & 3 & 0 & -2 \\ 0 & 0 & 1 & 2 \end{pmatrix}$

C. $\begin{pmatrix} 3 & 3 & 6 \\ 2 & 3 & 0 \\ 1 & 0 & 0 \end{pmatrix}$

D. $\begin{pmatrix} 3 & 3 & 6 & 9 \\ 2 & 3 & 0 & 2 \\ 1 & 0 & 0 & -2 \end{pmatrix}$

43. What is the sixth term of the recursively defined sequence $[b_n]$, where $b_1 = 25$ and $b_{n+1} = b_n - 5$ for $n \geq 1$?

A. 10
B. 15
C. 0
D. 5

44. What is the sum of odd integers from 1 to 999?

A. 500
B. 5000
C. 25,000
D. 250,000

45. What is the tenth partial sum of an arithmetic sequence whose 1st term is 2 and tenth term is 21?

A. 230
B. 113
C. 125
D. 115

46. Which of the following geometric series is convergent?

A. $\sum_{n=1}^{\infty} (\sqrt{3})^n$

B. $\sum_{n=1}^{\infty} \left(\frac{4}{3}\right)^n$

C. $\sum_{n=1}^{\infty} (-3)^n$

D. $\sum_{n=1}^{\infty} \left(\frac{2}{3}\right)^n$

47. What is the average rate of change for the function $f(x) = x^2+3x+1$ over the interval $[1, 6]$?

A. 11
B. 5
C. 10
D. 1

48. What is the area of the region under the graph of the function $f(x) = x^2$ over $[-2, 2]$?

A. $\frac{16}{3}$
B. 0
C. $\frac{8}{3}$
D. $\frac{2}{3}$

49. Which of the following statements is true about integration?
A. If $F'(x) = f(x)$ then $\int f(x)dx = f(x) + C$
B. Integration is the process of finding $f'(x)$ from a function $f(x)$.
C. Integration is the process of obtaining $f(x)$ from its derivative $f'(x)$.
D. The set of all anti derivatives of a function $f(x)$ is called definite integral of $f(x)$.

50. A publishing company finds that the marginal profit, in thousands of birr, from selling a reference book of x in number is given by $f'(x) = \sqrt{x}$. What is the profit when 125 books are sold?
A. 402.83 C. 187.5
B. 468.75 D. 803.3

51. What is the mean deviation about the mean of the data 4, 7, 8, 9, 10, 10, 11, 12, 13 and 16?
A. 2.1 C. 21.1
B. 2.4 D. 24.1

52. Which one of the following statement gives the meaning of coefficient of range?
A. Coefficient of range is absolute measure of dispersion.
B. Coefficient of range measures the variability of two or more data in terms of the same units based on standard deviation.
C. Coefficient of range is used to compare the dispersion of a data set with the dispersion of another data set.
D. Coefficient of range is a measure of relative dispersion that is based on standard deviation.

53. The following data set show the amount of milk sold, in liters, by a farmer over ten days. 31, 38, 45, 45, 0, 40, 36, 42, 47 and 36.
What is the coefficient of variation of the data set about the mean?
A. $\frac{25}{9}\sqrt{166}$ C. $\frac{\sqrt{1660}}{90}$
B. $\frac{\sqrt{575}}{9}$ D. $\frac{\sqrt{575}}{3}$

54. A sample of students is to be taken to participate in a certain study. The researcher wants to ensure that every student has an equal chance of being chosen. Which one of the probability sampling method is most appropriate for this situation?
A. Stratified sampling C. Simple random sampling
B Convenience sampling D. Systematic sampling

55. What are the maximum and minimum values of the function $Z=6x+4y$ subject to $\begin{cases} x+y \le 5 \\ y \ge 2 \\ x \ge 0, y \ge 0 \end{cases}$ respectively?
A. 24 and 8 C. 20 and 8
B. 24 and 20 D. 26 and 8

56. A shop owner sells two types of items A and B. She has at most 100 items in her store. There are at most 30 items of type A and the number of item B is at least twice the number of item A. If x represents the number of items of type A and y is the number of items of type B, then which of the following set of inequalities model the situation?
A. $x+y \le 100; 0 \le y \le 30; x \le 2y$.
B. $x+y \le 100; 0 \le y \le 30; 2y \le x$.
C. $x+y \le 100; 0 \le x \le 30; 2y \le y$.
D. $x+y \le 100; 0 \le x \le 30; 2x \le y$.

Subject Code: 02 **Booklet Code: 006**

57. A company produces two types of products P_1 and P_2. The profit per unit is 30Birr for product P_1 and 50Birr for product P_2.The production time and machine constraints are as follows:
Product P_1 requires 2hours on machine M_1 and 3 hours on machine M_2.
Product P_2 requires 4hours on machine M_1 and 2 hours on machine M_2.
The company has 80 hours of machine time available on M_1 and 60 hours on M_2. Which of the following is the maximum profit?

A. 1050 C. 1000
B. 600 D. 1200

58. A company's revenue is directly proportional to both the quantity of units produced and the selling price per unit. The company determines that when 200 units are produced and sold at 30Birr each, the revenue is 9,000Birr. If the company increases production to 300 units and raises the selling prices to 40Birr each, what will be the new revenue in Birr?

A. 13,500 C. 16,500
B. 18,000 D. 21,000

59. A 50 year old professor is planning to save for retirement. Which one of the following considerations will help him/her to achieve his/her financial goal?

A. Better for him/her to invest in things like stocks and real estate.
B. She/he may be better off putting his/her money away in a saving account.
C. She/he may consider riskier investments focusing on capital appreciation.
D. She/he may be better considering investing in things like bonds, and government securities.

join: @ethio_entranceG12

Subject Code: 02 **Booklet Code: 006**

60. A merchant borrows 10, 000Birr from a credit union at an annual interest rate of 8%. The loan agreement specifies that the interest is compounded annually and the merchant agrees to repay the loan after three years. What will be the total amount the merchant needs to repay at the end of the loan term in Birr?

A. 12,240.12 C. 11,000
B. 12,597.12 D. 12,384

THE END