

ENTRANCE TRICKS PRIVATE **SCHOOL ETHIOPIAN UNIVERSITY** **ENTRANCE MODEL EXAMINATION** **MATHEMATICS, SENE 2016/ JUNE** **2024**

ENTRANCE TRICKS PRIVATE SCHOOL ETHIOPIAN UNIVERSITY ENTRANCE MODEL
EXAMINATION MATHEMATICS, SENE 2016/ JUNE 2024

BOOKLET CODE: 02

SUBJECT CODE: 02

Time Allowed: 3 HOURS

GENERAL DIRECTIONS

THIS BOOKLET CONTAINS **MATHEMATICS** EXAMINATION. THE CODE FOR THIS EXAMINATION IS **02** AND THE CODE FOR THIS PARTICULAR BOOKLET IS **02**.

IN THIS EXAMINATION, THERE ARE A TOTAL OF 65 **QUESTIONS**. EACH QUESTIONS CONTAINS **MULTIPLE CHOICE QUESTIONS** CONSISTING IF FOUR POSSIBLE ANSWERS. CAREFULLY SELECT THE BEST ANSWER. YOU ARE ALLOWED TO WORK ON THE EXAM FOR 3 **HOURS**. BEFORE TIME IS CALLED, YOU MUST SUBMIT YOUR RESPONSES.

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

DO NOT FORGET SUBMIT YOUR ANSWERS BEFORE THE GIVEN TIME IS FINISHED

** Indicates required question*

1. Email *

Directions

choose the correct answer for the given questions

2. 1) The following table shows the amount of meat consumed by 20 households in the month of March. *

Amount of meat(in Kg)	5	8	10	15
Number of households	3	5	7	5

For the given months, what was the arithmetic mean amount of meat consumed by the 20 households.

A. 10 Kg

B. 7.6 Kg

C. $20/3$ Kg

D. 9.5 kg

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

3. 2) The rational root of the polynomial equation $6x^4 + x^3 + 2x - 24 = 0$ is *

Mark only one oval.

☐ A. $7/3$

☐ B. $5/2$

☐ C. $-3/2$

☐ D. $-1/3$

4. 3) The solution set of $\log(2x + 1) - \log(x + 2) = \log x$ is equal to *

Mark only one oval.

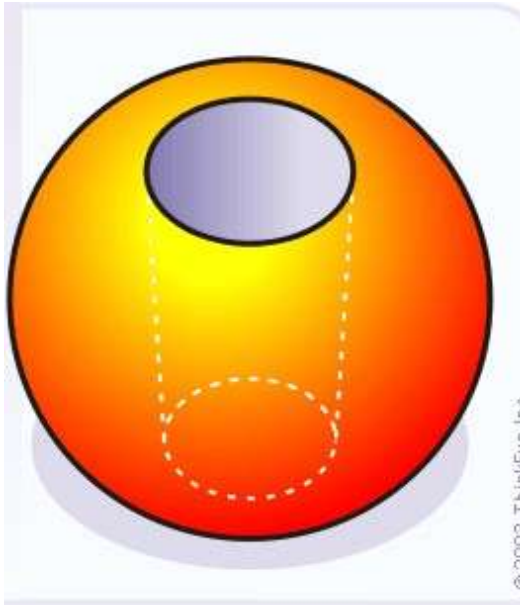
☐ A. $\{-1\}$

☐ B. $\{-1, 1\}$

☐ C. $\{2\}$

☐ D. $\{1\}$

5. 4) A wooden sphere of radius 3 cm is drilled along its diameter by a metal driller. The driller has a shape of right circular cylinder of radius 1 cm. After the drilling in the volume of the remaining part of the sphere? *



Mark only one oval.

- ☐ A. $24\pi \text{ cm}^3$
- ☐ B. $35\pi \text{ cm}^3$
- ☐ C. $30\pi \text{ cm}^3$
- ☐ D. $42\pi \text{ cm}^3$

6. 5) Which of the following is the solution set of the equation $|3 - 2X| = |X - 6|$? *

Mark only one oval.

- ☐ A. $\{4, -3\}$
- ☐ B. $\{4, 3\}$
- ☐ C. $\{-3, 3\}$
- ☐ D. $\{-3\}$

7. 6) A school requires students to have an average score of at least 85 on three exams to be eligible for a scholarship. If a student's score 80 and 90 on the first two exams, the inequality to represent the minimum score(x) that the students need on the third exam is *

Mark only one oval.

- ☐ A. $(80 + 90 - X)/3 \geq 85$
☐ B. $(80 + 90 - X)/3 \leq 85$
☐ C. $(80 + 90 + X)/3 \geq 85$
☐ D. $(80 + 90 + X)/3 \leq 85$

8. 7) Which one of the following ordered pair is a solution to the inequality $X < Y - 2$. *

Mark only one oval.

- ☐ A. (1,4)
☐ B. (4,1)
☐ C. (0,2)
☐ D. (0,0)

9. 8) What is the range of a function $f(x) = x^2 + 2x + 3$, on $[-2, 2]$ *

Mark only one oval.

- ☐ A. $[-2, 15]$
☐ B. $[1, 9]$
☐ C. $[2, 2]$
☐ D. $[-5, 0]$

10. 9) The variance of 20 observations is 5. If each observation is multiplied by 2, then what is the variance of the resulting observation? *

Mark only one oval.

- ☐ A. 20
☐ B. 40
☐ C. 10
☐ D. 5

11. 10) The marks of 50 students is given below. *

Marks	0 – 10	10 - 20	20 - 30	30 - 40	40 - 50
Number of students	5	8	F1	10	F2

If the median of the data is 26, what are the value of F1 and F2?

- A. F1=12 , F2= 15
B. F1=20 , F2= 7
C. F1=15, F2= 12
D. F1=7 , F2= 20

Mark only one oval.

- ☐ A
☐ B
☐ C
☐ D

12. 11) Fatuma can solve 90% of the problems given in a book and Mesfin can solve 70% what is the probability that at least one of them will solve the problem. Selected at random from the book? *

Mark only one oval.

- ☐ A. 0.77
☐ B. 0.07
☐ C. 0.87
☐ D. 0.97

13. 12) What is the maximum value of the function $f(x)=x^4-2x^2$ on $[-2,1]$? *

Mark only one oval.

- ☐ A. 24
☐ B. 12
☐ C. 8
☐ D. 40

14. 13) If $2 \leq f'(x) \leq 4$ for all values of x , then the value of $f'(8) - f(2)$ is between which of the following numbers? *

Mark only one oval.

- ☐ A. 8 and 10
☐ B. 12 and 18
☐ C. 12 and 24
☐ D. 12 and 14

15. 14) The graph of $y=5x^4-x^5$ has a point of inflection at *

Mark only one oval.

- ☐ A. (0,0) only
☐ B. (0,0) and (3,162) only
☐ C. (4,256) only
☐ D. (3,162) only

16. 15) If $f(x)=2+|x-3|$ for all x , then the value of the derivative $f'(x)$ at $x=3$ is? *

Mark only one oval.

- ☐ A. 1
☐ B. 2
☐ C. -1
☐ D. Does not exist

17. 16) Which one of the following sequences is a null? *

Mark only one oval.

- ☐ A. $\{n/n+1\}$
☐ B. $\{\cos n/n\}$
☐ C. $\{1-1/n\}$
☐ D. $\{n \sin(1/n)\}$

18. 17) If the radius r of a sphere is increasing at the rate of 2cm/min , then the rate of change of the volume when $r=1$ centimeters is *

Mark only one oval.

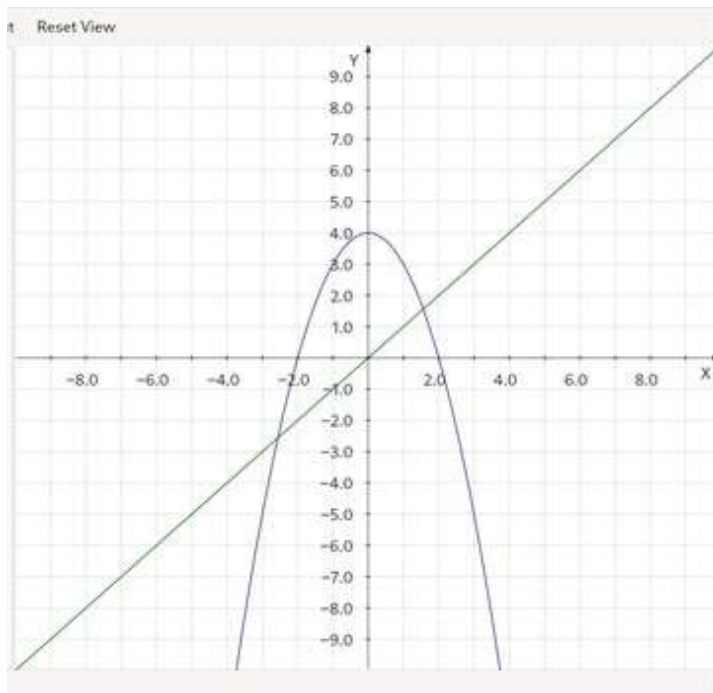
- ☐ A. $12\pi \text{ cm}^3/\text{min}$
☐ B. $8\pi \text{ cm}^3/\text{min}$
☐ C. $6\pi \text{ cm}^3/\text{min}$
☐ D. $4\pi \text{ cm}^3/\text{min}$

19. 18) What is the number that satisfies Rolle's Theorem $f(x)=x^2-3x+1$ on $[0,3]$? *

Mark only one oval.

- ☐ A. 1
☐ B. $3/2$
☐ C. 2
☐ D. -1

20. 19) What is the area of the region bounded by $y=0$ and the graph of $f(x)=4-x^2$ on the interval $[-1,1]$? *



Mark only one oval.

- ☐ A. $26/3$
- ☐ B. 8
- ☐ C. $22/3$
- ☐ D. $2/3$

21. 20) What is the seventh term of an arithmetic sequence whose third term is -4 and common difference is 5? *

Mark only one oval.

- ☐ A. 16
- ☐ B. -16
- ☐ C. -15
- ☐ D. 15

22. 21) A factory that produces electric cable had sales Birr 1,000,000 the first day. During each successive day the sales increased by Birr 10,000 every day. What is the total sales of the factory in the first 10 days? *

Mark only one oval.

- ☐ A. Birr 1,090,000
- ☐ B. Birr 20,900,000
- ☐ C. Birr 10,000,000
- ☐ D. Birr 10,450,000

23. 22) The population of a certain city is increasing at a rate of 3% per year. The population was 100,000 in 2016. then what will be the population in 2026? *

Mark only one oval.

- ☐ A. 130,000
- ☐ B. 1,060,000
- ☐ C. 1,378,000
- ☐ D. 134,000

24. 23) *

If the inverse of the matrix $\begin{bmatrix} x & 2x \\ -x & x \end{bmatrix}$ is $\begin{bmatrix} -1 & -2 \\ 1 & 1 \end{bmatrix}$, Then which one of the following is the value of x?

- A. -1 B. 1 C. 1/3 D. -1/3

Mark only one oval.

- ☐ A
- ☐ B
- ☐ C
- ☐ D

25. 24) *

If A is 3 x 3 matrix which $\det(A) =$, then what is $\begin{bmatrix} 1 & -7 \\ 6 & 5 \end{bmatrix}$ inate of $2A^T$?

A. 30

B. 10

C. 40

D. 25

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

26. 25) *

Which of the following is equal to $\int 3\cos 3x \, dx$?

A. $\sin 3x + c$

B. $(1/3)\sin 3x + c$

C. $\sin x + c$

D. $-\sin x + c$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

27. 26) *

If θ is a fourth quadrant angle and $\sec\theta = \sqrt{2}$ then what is $\csc\theta$ equals to?

A. $-\sqrt{2}$

B. $-1/\sqrt{2}$

C. $1/\sqrt{2}$

D. $\sqrt{2}$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

28. 27) The standard deviation for the number of absentees in the given week was *

On a given week the number of students who were absent from six kindergarten schools were recorded as follows.

10

13

6

9

12

4

Mark only one oval.

☐ A. 9

☐ B. $\sqrt{10}$

☐ C. 9.5

☐ D. 10

29. 28) *

If a translation T take a point $(-1,1)$ to a point $(3,2)$, then the image of the circle $X^2 + Y^2 - 2X + 4Y + 1 = 0$ under T is

A. $(X-3)^2 + (Y-3)^2 = 4$

B. $(X-2)^2 + (Y+3)^2 = 4$

C. $(X-5)^2 + (Y+1)^2 = 4$

D. $(X+3)^2 + (Y+3)^2 = 4$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

30. 29) The distance from the point P (3,4) to the line L with equation $3x + 4y - 5 = 0$ is *

Mark only one oval.

- ☐ A. 4 unit
☐ B. 6 unit
☐ C. 5 unit
☐ D. 7 unit

31. 30) What is the locus all point in the plane in Which the sum of the distance from two fixed points is constant? *

Mark only one oval.

- ☐ A. Ellipse
☐ B. Circle
☐ C. Hyperbola
☐ D. Parabola

32. 31) What is the product of the two complex number $Z = 2 - 3i$ and $W = 5 + 2i$? *

Mark only one oval.

- ☐ A. 29
☐ B. $16 - 11i$
☐ C. $16 + 11i$
☐ D. $4 - 11i$

33. 32) *

Let p and q be propositions, which one of the following compound statement is a tautology?

A. $(p \Rightarrow q) \Leftrightarrow (\neg p \vee q)$

B. $(p \wedge q) \Leftrightarrow p$

C. $(p \Rightarrow q) \Leftrightarrow p$

D. $(p \vee q) \Leftrightarrow p$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

34. 33) Which of the following is true about the zero of a function? *

Mark only one oval.

☐ A. It is the x- intercept of the function.

☐ B. It is the y- intercept of the function.

☐ C. It is the critical point of the function.

☐ D. It is the concavity point of the function.

35. 34) In a certain health center there are 3 doctor, 8 nurses and 2 physicians. In how many ways one can form a group of 5 members consisting of 1 doctor, 3 nurses and 1 physician? *

Mark only one oval.

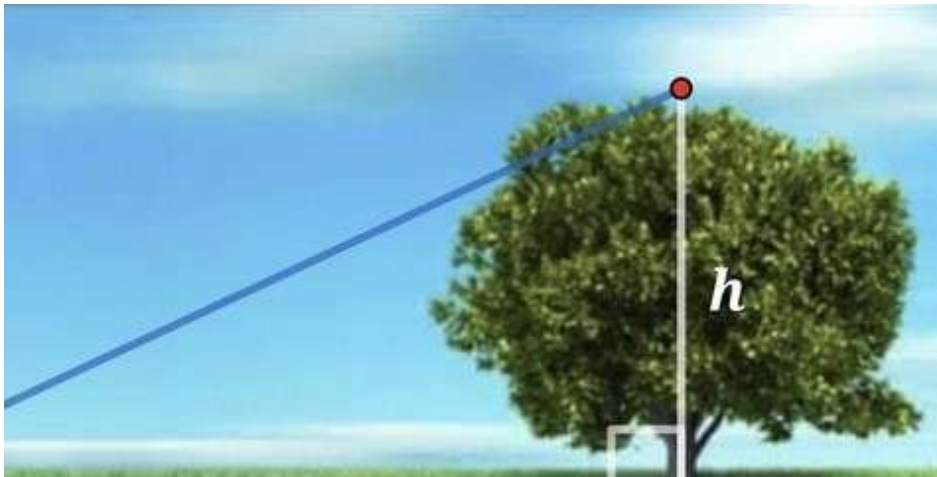
☐ A. 330

☐ B. 336

☐ C. 168

☐ D. 112

36. 35) The angle of elevation of the top of a tree is found to be 60° as measured from a point on a level ground. What is the height of the tree if the angle of elevation of a point on the tree that is 8 meters below the top is 30° as measured from the same point on the ground?



Mark only one oval.

- ☐ A. 8 meter
- ☐ B. 4 meter
- ☐ C. 12 meter
- ☐ D. 14 meter

37. 36) *

Let p and q be propositions with truth value True and False respectively. Then which of the following is correct?

A. $\neg p \Rightarrow q$ is false

B. $(p \vee \neg q) \Rightarrow q$ is true

C. $p \vee (q \wedge \neg p)$ is true

D. $(p \Rightarrow q) \wedge p$ is true

Mark only one oval.

- ☐ A
- ☐ B
- ☐ C
- ☐ D

38. 37) Let $f(x) = 3 - 2x$. What is the inverse of f ? *

A. $f^{-1}(x) = 3 + 2x$

B. $f^{-1}(x) = 2x - 3$

C. $f^{-1}(x) = (x/2) - 3/2$

D. $f^{-1}(x) = 3/2 - (x/2)$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

39. 38) If $U = 2j - k$ and $V = i - 8j + 3k$, then what is the unit vector in the direction of $5U + V$? *

Mark only one oval.

☐ A. $i + 2j - 2k$

☐ B. $(1/3)i + (2/3)j - (2/3)k$

☐ C. $3i + 3j - 2k$

☐ D. $-i + 2j + 3k$

40. 39) *

What is the value of $\cot 270^\circ + 2\cos 90^\circ + 4\sec^2 180^\circ$?

A. 8

B. 4

C. 7

D. -2

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

41. 40) Which one of the following is an equation of the circle whose end points of a diameter are (0,-2) and (2,2) *

Mark only one oval.

- ☐ A. $x^2 + y^2 = 4$
- ☐ B. $x^2 + y^2 - 2y - 4 = 0$
- ☐ C. $x^2 + y^2 - 2x - 4 = 0$
- ☐ D. $(x - 1)^2 + y^2 = 4$

42. 41) On a certain test nine students scored 6, 10, 7, 15, 9, 17, 20, 14 and 19. What is the median score? *

Mark only one oval.

- ☐ A. 12
- ☐ B. 13
- ☐ C. 14
- ☐ D. 20

43. 42) In how many more ways can 4 people be arranged in a row than if they were arranged in a circle? *

Mark only one oval.

- ☐ A. 12
- ☐ B. 18
- ☐ C. 6
- ☐ D. 1

44. 43) *

If $A = \begin{bmatrix} -3 & 11 \\ 1 & -3 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$ the. $(AB)^{-1}$ is equal to

A.

$$\begin{bmatrix} -2 & 5 \\ 2 & -4 \end{bmatrix}$$

B.

$$\begin{bmatrix} 4 & -3 \\ 4 & -5 \end{bmatrix}$$

C.

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

D.

$$\begin{bmatrix} 2 & 7 \\ 1 & 3 \end{bmatrix}$$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

45. 44) Which one of the following is true about the horizontal asymptotes of the graph $y = (|x| + 2)/x$? *

Mark only one oval.

☐ A. $Y=1$ is the only horizontal asymptote of the graph.

☐ B. $Y=1$ and $Y=-2$ are the horizontal asymptote of the graph.

☐ C. $Y=1$ and $Y=-1$ are the horizontal asymptote of the graph.

☐ D. $Y=2$ is the only horizontal asymptote of the graph.

46. 45) When $\cot(-340^\circ)$ is expressed in terms of an acute angle. It is equal to *

Mark only one oval.

- ☐ A. $\sin 20^\circ$
☐ B. $\cot 20^\circ$
☐ C. $\cos 20^\circ$
☐ D. $\tan 20^\circ$

47. 46) A fair coin will be tossed three times. What is the probability of getting exactly two heads? *

Mark only one oval.

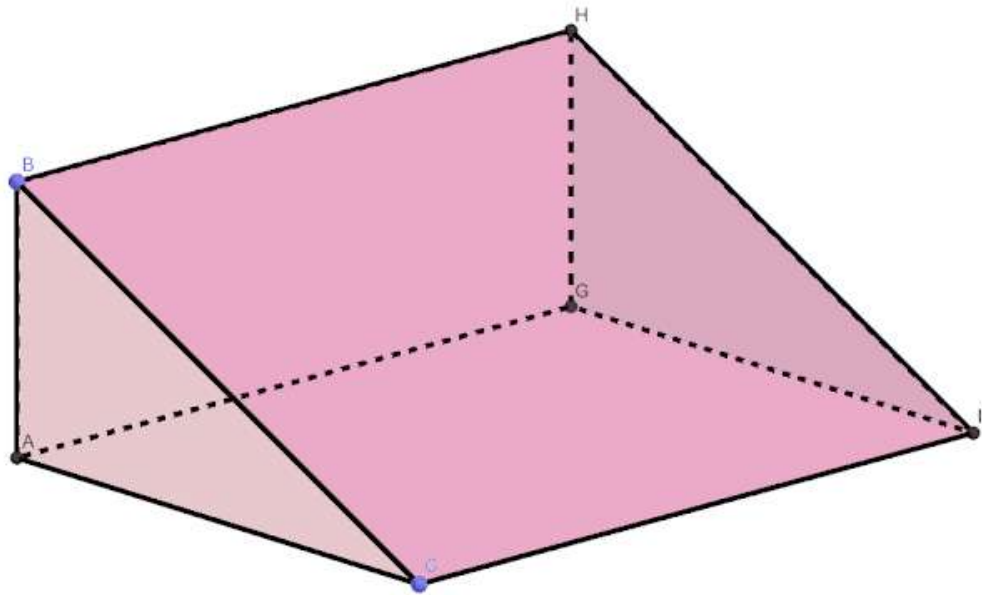
- ☐ A. $\frac{3}{8}$
☐ B. $\frac{1}{4}$
☐ C. $\frac{1}{2}$
☐ D. $\frac{5}{8}$

48. 47) A right triangle has vertices $P(-1,1)$, $Q(3,4)$ and $R(-1,4)$. Which one of the following is the gradient of the hypotenuse of this triangle? *

Mark only one oval.

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

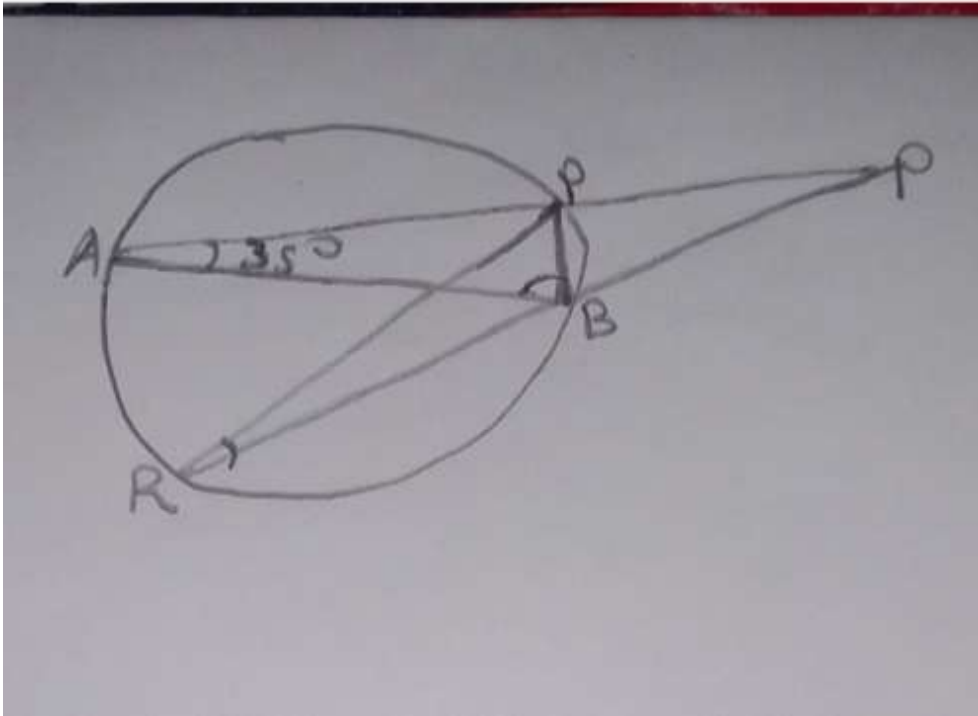
49. 48) The base of a right prism is right angled triangle with legs 6 centimeters and 8 centimeters. If the altitude of the prism is 7 centimeters, then its total surface area is? *



Mark only one oval.

- ☐ A. 182 cm²
- ☐ B. 216 cm²
- ☐ C. 48 cm²
- ☐ D. 158 cm²

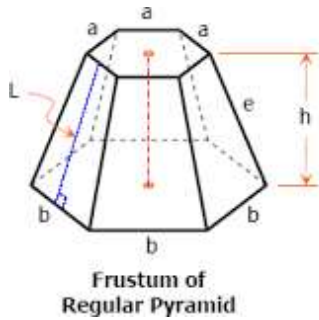
50. 49) In the figure shown below, Line AB is a diameter of the circle, where APQ and RBQ are straight lines. What is the degree measure of $\angle RPB$?



Mark only one oval.

- ☐ A. 25°
- ☐ B. 20°
- ☐ C. 30°
- ☐ D. 40°

51. 50) If a frustum is formed from a regular pyramid, then which one of the following * statement is true about its lateral faces?



Mark only one oval.

- ☐ A. They are isosceles trapezium.
- ☐ B. Their altitudes are not equal.
- ☐ C. They are rhombus.
- ☐ D. Their areas are not equal.

52. 51) A right circular cylinder with radius of the base 5 centimetre and height 8 * centimeter is open from the top. What is the total surface area of this cylinder?

Mark only one oval.

- ☐ A. $105\pi \text{ cm}^2$
- ☐ B. $200\pi \text{ cm}^2$
- ☐ C. $130\pi \text{ cm}^2$
- ☐ D. $80\pi \text{ cm}^2$

53. 52) Triangle ABC and triangle DEF are similar and the area of triangle ABC = 125 * sq.units. If DE is twice of AB, then the area of triangle DEF is

Mark only one oval.

- ☐ A. 24 sq.unit
- ☐ B. 6 sq.unit
- ☐ C. 36 sq.unit
- ☐ D. 48 sq.unit

54. 53) If $M = \{1, a, 2, b\}$, then how many sub sets does M have? *

Mark only one oval.

- ☐ A. 12
☐ B. 16
☐ C. 4
☐ D. 8

55. 54) Among the 250 regular customers of a shop 149 of them regularly buy product of A, 131 customers regularly buy product B. If 20 of the customers buy neither of the products, then what is the number of customers that regularly buy only product A? *

Mark only one oval.

- ☐ A. 83
☐ B. 99
☐ C. 50
☐ D. 70

56. 55) What is the area of a regular octagon whose radius is 8 centimeter? *

Mark only one oval.

- ☐ A. $162\sqrt{2}$ cm
☐ B. $92\sqrt{2}$ cm
☐ C. $128\sqrt{2}$ cm
☐ D. $64\sqrt{2}$ cm

57. 56) The value of $\sec 420^\circ$ is equal to? *

Mark only one oval.

☐ A. $\sqrt{3}/2$

☐ B. 2

☐ C. $\sqrt{3}$

☐ D. $2/\sqrt{3}$

58. 57) Between which two consecutive integers does $f(x) = x^5 - 2x^3 - 1$ has a zero? *

Mark only one oval.

☐ A. 3 and 4

☐ B. 2 and 3

☐ C. 1 and 2

☐ D. 0 and 1

59. 58) Let $V_1 = (\sqrt{3}, -1)$ and $V_2 = (-2\sqrt{3}, 2)$ be vectors. Then the vector $V_1 + V_2$ is equal to? *

Mark only one oval.

☐ A. $(3\sqrt{3}, 1)$

☐ B. $(-\sqrt{3}, -1)$

☐ C. $(2\sqrt{3}, -1)$

☐ D. $(-\sqrt{3}, 1)$

60. 59). What is the variance of the data given as 1,2,3,4,5? *

Mark only one oval.

- ☐ A. 2
- ☐ B. 3
- ☐ C. $\sqrt{3}$
- ☐ D. $\sqrt{2}$

61. 60). In the afternoon at a certain time of the day a tree casts a 25 meter shadow. *
At the same time a 1.8 meter body casts a shadow of 1.5 meter. What is the height of the tree?

Mark only one oval.

- ☐ A. 35 meter
- ☐ B. 50 meter
- ☐ C. 30 meter
- ☐ D. 40 meter

62. 61)When solving $\sqrt{x+3} = 6$, which one of the following is the universal set ? *

Mark only one oval.

- ☐ A. $[-3, 33) \cup (33, \infty)$
- ☐ B. $(-\infty, -3]$
- ☐ C. $[-3, \infty)$
- ☐ D. $(-\infty, -3] \cup [33, \infty)$

63. 62) Given three sets A, B, C and a universal set U, Which one of the following is true about these three sets? *

A. $A \subseteq A \cap B$

B. $A \cap (B \cap C) = (A \cap B) \cap C$

C. $A \cap U = U$

D. $A \cap (B \cap C)' = (A \cap B') \cap C'$

Mark only one oval.

☐ A

☐ B

☐ C

☐ D

64. 63) If a and b are the two roots of the quadratic equation $2x^2 + 3x - 5 = 0$, then what is the value of $(a-1)(b-1)$? *

Mark only one oval.

☐ A. -1

☐ B. 1

☐ C. 3

☐ D. 0

65. 64) On the number line, what are the first two consecutive integers between which $3 + \sqrt{2}$ is located? *

Mark only one oval.

☐ A. 5 and 6

☐ B. 3 and 4

☐ C. 4 and 5

☐ D. 2 and 3

66. 65. The graph of a quadratic function F given by $f(x) = ax^2 + b$ lies above the x -axis, whenever? *

Mark only one oval.

- ☐ A. Both a and b are positive
- ☐ B. Both a and b are negative
- ☐ C. a is greater than b
- ☐ D. a and b have opposite signs

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