INDUS RANGERS DEFENCE ACADEMY

4TH Floor Shakumbhari Complex, Chetmani Near: IP Vijaya Mall Bhelupur Varanasi, (U.P.– 221010)

NDA [MATHEMATICS]
PRACTICE SHEET – 3

Time: 02:30 Hr **M. M.: 480**

General Instructions:

- There are 120 questions
- All questions have 4 marks for correct and –1 mark for wrong answer as a penalty.
- The name, date, and exam must be filled in OMR sheet otherwise the result will not be published.
- OMR fill should be properly.

1. If the roots of the quadratic equation $x^2 + 2x + k = 0$ are real, then
   A. $k < 0$ B. $k \leq 0$ C. $k < 1$ D. $k \leq 1$
2. If α and β are the roots of the equation $4x^2 + 2x - 1 = 0$, then which one of the following is correct?
   A. $\beta = -2\alpha^2 - 2\alpha$ B. $\beta = 4\alpha^2 - 3\alpha$
   C. $\beta = \alpha^2 - 3\alpha$ D. $\beta = -2\alpha^2 + 2\alpha$
3. If one root of $5x^2 + 26x + k = 0$ is reciprocal of the other, then what is the value of k?
   A. 2 B. 3 C. 5 D. 8
4. If $f(x + 1) = x^2 - 3x + 2$, then what is f(x) equal to?
   A. $x^2 - 5x + 4$ B. $x^2 - 5x + 6$
   C. $x^2 + 3x + 3$ D. $x^2 - 3x + 1$
5. If k is one of the roots of the equation $x(x + 1) + 1 = 0$, then what is its other root?
   A. 1 B. –k C. k^2 D. $-k^2$
6. If $x^2 + x + 1 = 0$, then what is the value of $x^{199} + x^{200} + x^{201}$?
   A. –1 B. 0 C. 1 D. 3
7. The quadratic equation $3x^2 - (k^2 + 5k)x + 3k^2 - 5k = 0$ has real roots of equal magnitude and opposite sign. Which one of the following is correct?
   A. $0 < k < \frac{5}{3}$ B. $0 < k < \frac{3}{5}$ only
   C. $\frac{3}{5} 0 \leq k < \frac{5}{3}$ D. No such value of k exists
8. If p and q are the non-zero roots of the equation $x^2 + px + q = 0$, then how many possible values can q have?
   A. Nil B. One C. Two D. Three
9. If $\sin\theta$ and $\cos\theta$ are the roots of the equation $ax^2 + bx + c = 0$, then which one of the following is correct?
   A. $a^2 + b^2 - 2ac = 0$ B. $-a^2 + b^2 - 2ac = 0$
   C. $a^2 - b^2 + 2ac = 0$ D. $a^2 + b^2 + 2ac = 0$
10. Consider all the real roots of the equation $x^4 - 10x^2 + 9 = 0$. What is the sum of the absolute values of the roots?
    A. 4 B. 6 C. 8 D. 10

11. Let p, q (p > q) be the roots of the quadratic equation $x^2 + bx + c = 0$ where c > 0. If $p^2 + q^2 - 11pq = 0$, then what is p – q equal to?
    A. $3\sqrt{c}$ B. 3c C. $9\sqrt{c}$ D. 9c
12. If $2 - i\sqrt{3}$ where $i = \sqrt{-1}$ is a root of the equation $x^2 + ax + b = 0$, then what is the value of (a + b)?
    A. –11 B. –3 C. 0 D. 3
13. For how many integral values of k, the equation $x^2 - 4x + k = 0$, where k is an integer, has real roots and both of them lie in the interval (0, 5)?
    A. 3 B. 4 C. 5 D. 6
14. α and β are distinct real roots of the quadratic equation $x^2 + \alpha x + b = 0$. Which of the following statement(s) is/are sufficient to find α?
    (a) $\alpha + \beta = 0$, $\alpha^2 + \beta^2 = 2$
    (b) $\alpha\beta^2 = -1$, a = 0
    Select the correct answer using the code given below.
    A. (a) only B. (b) only
    C. Both (a) and (b) D. Neither (a) nor (b)

Question (15 – 16): Consider the following for the next two (02) items that follow.

A quadratic equation is given by $(a + b)x^2 - (a + b + c)x + k = 0$, where a, b, c are real.

15. If $k = \frac{c}{2}$ ($c \neq 0$), then the roots of the equation are:
    A. Real and equal B. Real and unequal
    C. Real if a > c D. Complex but not real
16. If k = c, then the roots of the equation are:
    A. $\frac{a+c}{a+b}$ and $\frac{b}{a+b}$ B. $\frac{a+c}{a+b}$ and $-\frac{b}{a+b}$
    C. 1 and $\frac{c}{a+b}$ D. -1 and $-\frac{c}{a+b}$
17. If $-\sqrt{2}$ and $\sqrt{3}$ are roots of the equation $a_0 + a_1x + a_2x^2 + a_3x^3 + x^4 = 0$ where a_0, a_1, a_2, a_3 are integers, then which one of the following is correct?
    A. $a_2 = a_3 = 0$ B. $a_2 = 0$ and $a_3 = -5$
    C. $a_0 = 6$, $a_3 = 0$ D. $a_1 = 0$ and $a_2 = 5$
18. If $x^2 + mx + n$ is an integer for all integral values of x, then which of the following is/are correct?
    (a) m must be an integer
    (b) n must be an integer
    Select the correct answer using the code given below.
    A. (a) only B. (b) only
    C. Both (a) and (b) D. Neither (a) nor (b)
19. Under which one of the following conditions does the equation $(\cos\beta - 1)x^2 + (\cos\beta)x + \sin\beta = 0$ in x have a real root for $\beta \in [0, \pi]$?
    A. $1 - \cos\beta < 0$ B. $1 - \cos\beta \leq 0$
    C. $1 - \cos\beta > 0$ D. $1 - \cos\beta \geq 0$

20. If tanα and tanβ are the roots of the equation $x^2 - 6x + 8 = 0$, then what is the value of $\cos(2\alpha + 2\beta)$?
    A. $\frac{13}{75}$ B. $\frac{13}{85}$ C. $\frac{17}{85}$ D. $\frac{19}{85}$
21. If n is a root of the equation $x^2 + px + m = 0$ and m is a root of the equation $x^2 + px + n = 0$, where $m \neq n$, then what is the value of p + m + n?
    A. –1 B. 0 C. 1 D. 2
22. What is the number of real roots of the equation $(x - 1)^2 + (x - 3)^2 + (x - 5)^2 = 0$?
    A. None B. Only one C. Only two D. Three
23. If $f(x) = [x]^2 - 30[x] + 221 = 0$, where [x] is the greatest integer function, then what is the sum of all integer solutions?
    A. 13 B. 17 C. 27 D. 30
24. If $f(x) = 9x - 8\sqrt{x}$ such that g(x) = f(x) – 1, then which one of the following is correct?
    A. g(x) = 0 has no real roots
    B. g(x) = 0 has only one real root which is an integer
    C. g(x) = 0 has two real roots which are integers
    D. g(x) = 0 has only one real root which is not an integer
25. If one root of the equation $x^2 - kx + k = 0$ exceeds the other by $2\sqrt{3}$, then which one of the following is a value of k?
    A. 3 B. 6 C. 9 D. 12
26. If $x + \frac{5}{y} = 4$ and $y + \frac{5}{x} = -4$, then what is (x + y) equal to?
    A. 0 B. 1 C. 4 D. 5
27. If $x^2 - x + 1 = 0$, then what is $\left(x - \frac{1}{x}\right)^2 + \left(x - \frac{1}{x}\right)^4 + \left(x - \frac{1}{x}\right)^8$ equal to?
    A. 81 B. 85 C. 87 D. 90
28. If $k < \left(\sqrt{2} + 1\right)^3 < k + 2$, where k is a natural number, then what is the value of k?
    A. 11 B. 13 C. 15 D. 17

Question (29 – 30): Consider the following for the next two (02) items that follow.

Let $f(x) = ax^2 + bx + c$ be a quadratic polynomial such that f(1) = f(4) = 2. Further, 2 is a root of f(x) = 0.

29. What is the other root of f(x) = 0?
    A. 1 B. 2
    C. 3 D. Cannot be determined
30. What is (a + b + c) equal to?
    A. 0 B. 1
    C. 2 D. Cannot be determined

31. Let A = {1, 2, {a, b}, 3, 4} which among the following statements is incorrect?
    A. $\{a, b\} \subset A$ B. $\{a, b\} \in A$ C. $\{\{a, b\}\} \subset A$ D. $\{1, 2\} \subset A$
32. The set $(A \mid B) \cup (B \mid A)$ is equal to
    A. $[A \mid (A \cap B)] \cap [B \mid (A \cap B)]$ B. $(A \cup B) \mid (A \cap B)$
    C. $A \mid (A \cap B)$ D. $\overline{(A \cap B)} \mid (A \cup B)$
33. Set A and B have 2 and 6 elements respectively. What can be the minimum number of elements in $(A \cup B)$?
    A. 18 B. 9 C. 6 D. 3
34. There is a group of 265 persons who like either singing or dancing or painting. In this group 200 like singing, 110 like dancing and 55 like painting. If 60 persons like both singing and dancing, 30 like both singing and painting and 10 like all three activities, then the number of persons who like only dancing and painting is
    A. 10 B. 20 C. 30 D. 40
35. Let A and B be finite sets such that n(A) = 3. If the total number of relations that can be defined from A to B is 4096, then n(B) =
    A. 5 B. 4 C. 6 D. 8
36. Let A = {1, 2, 3, 4} and R be the relation on A defined by {(a, b): a, b $\in$ A, a $\times$ b is an even number}, then find the range of R
    A. {1, 2, 3, 4} B. {2, 4} C. {2,3, 4} D. {1, 2, 4}
37. On R, the set of real numbers, a relation ρ is defined as 'apb' if and only if 1 + ab > 0. Then
    A. ρ is an equivalence relation
    B. ρ is reflexive and transitive but not symmetric
    C. ρ is reflexive and symmetric but not transitive
    D. ρ is symmetric
38. Let R be a relation defined on the set Z of all integers and xRy when x + 2y is divisible by 3. Then
    A. R is not transitive B. R is symmetric only
    C. R is an equivalence relation D. R is not an equivalence relation
39. If the imaginary part of $\frac{2+i}{ai-1}$ is zero, where a is real number, then the value of a is equal to
    A. $\frac{1}{2}$ B. 2 C. $-\frac{1}{2}$ D. – 2
40. If $\left|z - \frac{3}{z}\right| = 2$, then the greatest value of |z| is
    A. 1 B. 2 C. 3 D. 4
41. The locus of z such that $\left|\frac{1+iz}{z+i}\right| = 1$ is
    A. y – x = 0 B. y + x = 0 C. y = 0 D. xy = 1
42. If $\left(\sqrt{5} + \sqrt{3}i\right)^{33} = 2^{49}z$, then modulus of the complex number z is equal to
    A. 1 B. $\sqrt{2}$ C. $2\sqrt{2}$ D. 4

43. The value of $\left|\sqrt{4+2\sqrt{3}}\right| - \left|\sqrt{4-2\sqrt{3}}\right|$ is

A. 1 B. 2 C. 4 D. 3

44. If the equations $x^2 + bx - 1 = 0\ and\ x^2 + x + b = 0$ have a common root different from – 1, then |b| is equal to

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

45. If the equations $x^2 + 2x + 3 = 0\ and\ ax^2 + bx + c = 0$, a, b, c ∈ R have a common root, then a : b : c is

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

46. If the equation $(a+1)x^2 - (a+2)x + (a-3) = 0$ has roots equal in magnitude, but opposite in signs, then the roots of the equation are

A. $\pm\, a$ B. $\pm\frac{1}{2}\, a$ C. $\pm\frac{3}{2}\, a$ D. $\pm\, 2a$

47. The sum of the coefficients in the binomial expansion of $\left(\frac{1}{x} + 2x\right)^6$ is equal to

A. 1024 B. 729 C. 243 D. 512

48. If A = {4n – 3n – 1 : n ∈ N} and B = {9(n – 1) : n ∈ N} , then

A. B ⊂ A B. A ∪ B = N C. A ⊂ B D. N.O.T

49. If the number of terms in the expansion of $\left(1 - \frac{2}{x} + \frac{4}{x^2}\right)^n$, x ≠ 0 is 28, then the sum of the coefficients of all the of all the terms in this expansion is

A. 64 B. 2187 C. 243 D. 729

50. The coefficients of x^2 in the expansion of $(1 + x + x^2 + x^3)^{10}$ is

A. 42 B. 43 C. 44 D. 55

51. If in the expansion $(a - 2b)^n$, the sum of the 5th and 6th term is zero, then the value of $\frac{a}{b}$ is

A. $\frac{n-4}{5}$ B. $\frac{2(n-4)}{5}$ C. $\frac{5}{n-4}$ D. $\frac{5}{2(n-4)}$

52. Which term of the sequence {9 – 8i, 8 – 6i, 7 – 4i, …} is a real number?

A. 4th term B. 5th term C. 6th term D. 7th term

53. Three numbers are in arithmetic progression. Their sum is 21 and the product of the first number and the third number is 45. Then the product of these three numbers is

A. 315 B. 90 C. 180 D. 270

54. Which of the following is purely Imaginary term of the sequence of 8 – 6i, 7 – 4i, 6 – 2i, …?

A. 9th term B. 2nd term C. 4th term D. 8th term

55. $1 + 3 + 5 + 7 + \cdots + 29 + 30 + 31 + 32 + \cdots + 60 =$

A. 1611 B. 1620 C. 1609 D. 1600

56. The first four terms of an A.P. are a, 9, 3a – b, 3a + b. The 2011th term of the A.P. is

A. 2015 B. 4025 C. 5030 D. 8045

57. In a G.P. series consisting of positive terms, each term is equal to the sum of next two terms. Then the common ratio of this G.P. series is

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

58. If m is A.M. of two distinct real numbers l and n (n, l > l) and $G_1, G_2\ and\ G_3$ are three geometric mean between l and n then $G_1^4 + 2G_2^4 + G_3^4$ equals

A. 4 lmn^2 B. 4 $l^2m^2n^2$ C. l^2mn D. 4 lm^2n

59. $\begin{pmatrix}7 & 1 & 5\\ 8 & 0 & 0\end{pmatrix}\begin{pmatrix}2\\3\\1\end{pmatrix} + 5\begin{pmatrix}1\\0\end{pmatrix}$ is equal to

A. $\begin{pmatrix}16\\27\end{pmatrix}$ B. $\begin{pmatrix}27\\16\end{pmatrix}$ C. $\begin{pmatrix}15\\16\end{pmatrix}$ D. $\begin{pmatrix}16\\15\end{pmatrix}$

60. If A and B are two square matrices such that AB = A and BA = B, then

A. A and B are idempotent B. Only A is idempotent

C. Only B is idempotent D. N.O.T.

61. If $A = \begin{bmatrix}x & 1\\1 & 0\end{bmatrix}$ and A^2 is the unit matrix, then the value of $x^3 + x - 2$ is equal to

A. – 8 B. – 2 C. 0 D. 1

62. If A and B are two matrices such that A + B and AB are both defined, then

A. A and B can be any matrices

B. A, B are square matrices not necessarily of the same order.

C. A, B are square matrices of the same order

D. Number of columns of A = number of rows of B

63. If ω be the complex cube root of unity and matrix $H = \begin{bmatrix}\omega & 0\\0 & \omega\end{bmatrix}$, then H^{70} is equal to

A. 0 B. –H C. H D. H^2

64. If A and B are two square matrices of same order such that AB = B, BA = A and if matrices A is called idempotent if $A^2 = A$, then

A. A is idempotent but not B

B. B is idempotent but not A

C. Neither A nor B is idempotent

D. Both A and B are idempotent

65. If A is skew-symmetric and n is odd positive integer, then A^n is

A. a skew-symmetric matrix B. a symmetric matrix

C. a diagonal matrix D. None of the above

66. If A is a square matrix. Then

A. $A + A^T$ is symmetric B. AA^T is skew-symmetric

C. $A^T + A$ is skew-symmetric D. A^TA is skew-symmetric

67. If $A^2 - A + I = 0$, then the inverse of the matrix A is

A. A – I B. I – A C. A + I D. A

68. If $A = \begin{bmatrix}8 & 27 & 125\\2 & 3 & 5\\1 & 1 & 1\end{bmatrix}$, then the value of A^2 is equal to

A. 3 B. 36 C. 64 D. 3600

69. If α, β, γ are the roots $x^3 + a^2x + b = 0$ then the value of $\begin{vmatrix}\alpha & \beta & \gamma\\ \beta & \gamma & \alpha\\ \gamma & \alpha & \beta\end{vmatrix}$ is

A. $-a^3$ B. $a^3 - 3b$ C. a^3 D. 0

70. The coefficients of x in $f(x) = \begin{vmatrix} x & 1+\sin x & \cos x \\ 1 & \log(1+x) & 2 \\ x^2 & 1+x^2 & 0 \end{vmatrix}$, $-1 < x \leq 1$, is

A. 1 B. –2 C. –1 D. 0

71. If a, b and c are in A.P. then the value of $\begin{vmatrix} x+2 & x+3 & x+a \\ x+4 & x+5 & x+b \\ x+6 & x+7 & x+c \end{vmatrix}$ is

A. 0 B. x – (a + b + c)

C. a + b + c D. $9x^2 + a + b + c$

72. The system of equations x + 4y – z = 3, x – y + 7z = 11, 2x + 8y – 6z = 7 have

A. unique solution B. infinitely many solution

C. no solution D. only finite number of solutions

73. If the system of equations x + ky – z = 0, 3x – ky – z = 0 and x – 3y + z = 0 has non-zero solutions, then k is equal to

A. –1 B. 0 C. 1 D. 2

74. A single letter is selected from the word TRICKS. The probability that it is either T or R is

A. $\frac{1}{36}$ B. $\frac{1}{4}$ C. $\frac{1}{2}$ D. $\frac{1}{3}$

75. Two fair dice are rolled. The probability of getting a composite number as the sum of face values is equal to

A. $\frac{7}{12}$ B. $\frac{5}{12}$ C. $\frac{1}{12}$ D. $\frac{3}{4}$

76. Two distinct numbers x and y are chosen from 1, 2, 3, 4, 5. The probability that the arithmetic mean of x and y is an integer is

A. 0 B. $\frac{1}{5}$ C. $\frac{3}{5}$ D. $\frac{2}{5}$

77. There are 5 positive numbers and 6 negative numbers. Three numbers are chosen at random and multiplied. The probability that the product being a negative number is

A. $\frac{11}{34}$ B. $\frac{17}{33}$ C. $\frac{16}{35}$ D. $\frac{16}{33}$

78. 6 boys & 6 girls sit in row at random. The probability that all the girls sit together is

A. $\frac{1}{432}$ B. $\frac{12}{431}$ C. $\frac{1}{132}$ D. N.O.T

79. The letters of the word “Question” are arranged in a row at random. The probability that there are exactly two letters between Q and S is

A. $\frac{1}{14}$ B. $\frac{5}{7}$ C. $\frac{1}{7}$ D. $\frac{5}{28}$

80. There are 7 horses in a race. Mr. X selected 2 horses at random and bet on them. The probability that Mr. X selected the winning horse, is

A. $\frac{1}{7}$ B. $\frac{4}{7}$ C. $\frac{3}{7}$ D. $\frac{2}{7}$

81. A four-digit number is formed by the digits 1, 2, 3, 4 with no repetition. The probability that the number is odd, is

A. zero B. $\frac{1}{3}$ C. $\frac{1}{4}$ D. N.O.T

82. Five dice are tossed. What is the probability that the five numbers shown will be different?

A. $\frac{5}{34}$ B. $\frac{5}{18}$ C. $\frac{5}{27}$ D. $\frac{5}{81}$

83. The probability that at least one of the events A and B occurs is 0.6. If A and B occur simultaneously with probability 0.2, then $P(\bar{A}) + P(\bar{B})$ is

A. 0.4 B. 0.8 C. 1.2 D. 1.4

84. If A and B are mutually exclusive events and if $P(B) = \frac{1}{3}$, $P(A \cup B) = \frac{13}{21}$, then P(A) is equal to

A. $\frac{1}{7}$ B. $\frac{4}{7}$ C. $\frac{2}{7}$ D. $\frac{5}{7}$

85. In an assembly of 4 persons the probability that at least 2 of them have the same birthday, is

A. 0.293 B. 0.24 C. 0.0001 D. 0.016

86. Given that P(A) = 0.1, P(A|B) = 0.6 and P(B|A^C) = 0.3 what is P(A|B)?

A. $\frac{2}{11}$ B. $\frac{4}{11}$ C. $\frac{7}{11}$ D. $\frac{9}{11}$

87. If $P(A) = \frac{1}{12}$, $P(B) = \frac{5}{12}$ and $P(B|A) = \frac{1}{15}$, $then$ $P(A \cup B)$ is equal to

A. $\frac{89}{180}$ B. $\frac{90}{180}$ C. $\frac{91}{180}$ D. $\frac{92}{180}$

88. P speaks truth in 70% cases and Q speaks in 80% of the cases. In what percentage of cases are they likely to contradict each other in stating the same fact?

A. 25% B. 38% C. 42% D. 48%

89. A candidate takes three tests in succession and the probability of passing the first test is p. The probability of passing each succeeding test is p or $\frac{p}{2}$ according as he passes or fails in the preceding one. The candidate is selected if he; passes at least two tests. The probability that the candidate is selected is

A. p(2 – p) B. p + p^2 + p^3 C. p^2(1 – p) D. p^2(2 – p)

90. A certain item is manufactured by Machine M_1 and M_2. It is known that machine M_1 turns out twice as many items as machine M_2. It is also known that 4% of the items produced by machine M_1 and 3% of the items produced by machine M_2 are defective. All the items produced are put into one stock pile and then one item is selected at random. The probability that the selected item is defective is equal to

A. $\frac{10}{300}$ B. $\frac{11}{300}$ C. $\frac{10}{200}$ D. $\frac{11}{200}$

91. There are two coins, one unbiased with probability $\frac{1}{2}$ of getting heads and the other one is biased with probability $\frac{3}{4}$ of getting heads. A coin is selected at random and tossed. It shows heads up. Then the probability that the unbiased coin was selected is

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

92. A fair coin is tossed n number of times. If the probability of having at least one head is more than 90%, then n is greater than or equal to

A. 2 B. 3 C. 4 D. 5

93. If (x, y) is equidistant from (a + b, b – a) and (a – b, a + b), then

A. x + y = 0 B. bx – ay = 0

C. ax – by = 0 D. ax + by = 0

94. The area of the triangle whose vertices are the points $(a(a+1),\ a+1), (a(a+1),\ (a+2),\ a+2)\ and\ ((a+2), (a+3),\ a+3)$ is equal to

A. –1 B. 1

C. $\frac{1}{2}$ D. a(a + 1)(a + 2)(a + 3)

95. If the points (0, 1), (0, –1) and (x, 0) are vertices of an equilateral triangle, then the values of x are

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

96. A line passes through (2, 2) and is perpendicular to the line 3x + y = 3. What is its y – intercept.

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

97. If the three points A(1, 6), B(3, –4) and C(x, y) are collinear then the equation satisfying by x and y is

A. 5x + y – 11 = 0 B. 5x + 13y + 5 = 0

C. 5x – 13y + 5 = 0 D. 13x – 5y + 5 = 0

98. A ray of light is incident along a line which meets another line, 7x – y + 1 = 0, at the point (0, 1). The ray is then reflected from this point along the line, y + 2x = 1. Then the equation of the line of incidence of the ray of light is

A. 41x – 25y + 25 = 0 B. 41x + 25y – 25 = 0

C. 41x – 38y + 38 = 0 D. 41x + 38y – 38 = 0

99. If the image of $\left(-\frac{7}{5}, -\frac{6}{5}\right)$ in a line is (1, 2), then the equation of the line is

A. 3x – y = 0 B. 4x – y = 0

C. 3x + 4y = 1 D. 4x + 3y = 1

100. If the straight-line ax + by + c = 0 always passes through (1, –2), then a, b, c are in

A. H.P. B. A.P. C. G.P. D. N.O.T

101. The lines (a + 2b)x + (a – 3b)y = a – b for different values of a and b pass through the fixed points6 whose coordinates are

A. $\left(\frac{2}{5}, \frac{2}{5}\right)$ B. $\left(\frac{3}{5}, \frac{3}{5}\right)$ C. $\left(\frac{1}{5}, \frac{1}{5}\right)$ D. $\left(\frac{2}{5}, \frac{3}{5}\right)$

102. If p_1 and p_2 are respectively lengths of perpendicular from the origin to the straight line $x\sec\theta + y\csc\theta = a\ \ and\ x\cos\theta - y\sin\theta = a\cos 2\theta\ \ , then\ 4p_1^2 + p_2^2$ is

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

103. The equation of the line perpendicular to the line 2x – 3y + 5 = 0 and making an intercept 3 with y – axis is

A. 3x + 2y – 6 = 0 B. 3x + 2y – 12 = 0

C. 3x – 2y – 6 = 0 D. 3x + 2y + 6 = 0

104. If a point P has co-ordinates (0, –2) and Q is any point on the circle, $x^2 + y^2 - 5x - y + 5 = 0$, then the maximum value of $(PQ)^2$ is

A. $\frac{25+\sqrt{6}}{2}$ B. $8 + \sqrt{3}$ C. $14 + 5\sqrt{3}$ D. $\frac{47+10\sqrt{6}}{2}$

105. If one of the diameters of the curve $x^2 + y^2 - 4x - 6y + 9 = 0$ is a chord of a circle with centre (1, 1), the radius of the circle is

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

106. In the family of concentric circles $2(x^2 + y^2) = k$, the radius of the circle passing through (1, 1) is

A. $\sqrt{2}$ B. 4 C. $2\sqrt{2}$ D. 1

107. The centre of the circle whose radius is 5 and which touches the circle $x^2 + y^2 - 2x - 4y - 20 = 0$ at (5, 5) is

A. (10, 5) B. (5, 8) C. (5, 10) D. (9, 8)

108. If one end of a diameter of the circle $3x^2 + 3y^2 - 9x + 6y + 5 = 0$ is (1, 2), then the other end is

A. (2, 1) B. (2, 4) C. (2, –4) D. (–4, 2)

109. The equation of the parabola with focus at (0, 1) and x + 2 = 0 as its directrix, is

A. $y^2 + 3x + 6 = 0$ B. $y^2 - 6x + 3$

C. $y^2 - 4x - 2y - 3 = 0$ D. $y^2 + 6x - 3 = 0$

110. An equilateral triangle is inscribed in the parabola $y^2 = 8x$, with one of its vertices is the vertex of the parabola. Then, the length of the side of that triangle is

A. $24\sqrt{3}$ B. $16\sqrt{3}$ C. $8\sqrt{3}$ D. $4\sqrt{3}$

111. If the straight-line y = 4x + c touches the ellipse $\frac{x^2}{4} + y^2 = 1$ then c is equal to

A. 0 B. $\pm\sqrt{65}$ C. $\pm\sqrt{62}$ D. $\pm\sqrt{2}$

112. The distance between the foci of the ellipse $x = 3\cos\theta, y = 4\sin\theta$ is

A. $2\sqrt{7}$ B. $7\sqrt{2}$ C. $\sqrt{7}$ D. $3\sqrt{7}$

113. Area of the ellipse $\frac{x^2}{25} + \frac{y^2}{16} = 1$ is given by

A. 25π sq. units B. 20π sq. units C. 4π sq. units D. 5π sq. units

114. The eccentricity of the hyperbola whose length of the latus rectum is equal to 8 and the length of its conjugate axis is equal to half of the distance between its foci, is

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

115. The distance between the directrices of the hyperbola $x^2 - y^2 = 9$ is

A. $\frac{9}{\sqrt{2}}$ B. $\frac{5}{\sqrt{3}}$ C. $\frac{3}{\sqrt{2}}$ D. $3\sqrt{2}$

116. A point moves in such a way that the differences of its distance from two points (8, 0) and (–8, 0) always remains 4. Then the locus of the point is

A. a circle B. a parabola C. an ellipse D. a hyperbola

117. If a line makes an angle α, β, γ and δ with the four diagonals of a cube, then the value of $sin^2\alpha + sin^2\beta + sin^2\gamma + sin^2\delta$ is

A. $\frac{4}{3}$ B. $\frac{8}{3}$ C. $\frac{7}{3}$ D. $\frac{5}{3}$

118. The angle between two lines whose direction cosines satisfy the equation n = l + m and m = 2l + 3n is

A. 0° B. 90° C. 60° D. N.O.T

119. If a straight line makes angles α, β, γ with the coordinate axes, then $\frac{1-tan^2\alpha}{1+tan^2\alpha}+\frac{1}{\sec 2\beta}-2sin^2\gamma =$

A. –1 B. 1 C. –2 D. 2

120. Lines make equal angles with the coordinate axes. The direction cosines are

A. $< 0, 0, 0 >$ B. $< \pm 1, \pm 1, \pm 1 >$

C. $< \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, \pm\frac{1}{\sqrt{3}}, >$ D. $< \pm\frac{1}{3}, \pm\frac{1}{3}, \pm\frac{1}{3} >$