

No of Questions: 120

Time: 2 ½ hours

- Let $A = \{(n, 2n) : n \in N\}$ and $B = \{(2n, 3n) : n \in N\}$. What is $A \cap B$ equal to?
 - $\{(n, 6n) : n \in N\}$
 - $\{(2n, 6n) : n \in N\}$
 - $\{(n, 3n) : n \in N\}$
 - ϕ
- If $F(n)$ denotes the set of all divisors of n except 1, what is the least value of y satisfying $[F(20) \cap F(16)] \subseteq F(y)$?
 - 1
 - 2
 - 4
 - 8
- If μ is the universal set and P is a subset of μ , then what is $P \cap (P - \mu) \cup (\mu - P)$ equal to?
 - ϕ
 - P'
 - μ
 - P
- What is the value of $\frac{\log_{27} 9 \times \log_{16} 64}{\log_2 \sqrt{2}}$?
 - 1/6
 - 1/4
 - 8
 - 4
- Which one of the following is correct?
 - $A \cup P(A) = P(A)$
 - $A \cap P(A) = A$
 - $A - P(A) = A$
 - $P\{A\} - \{A\} = P(A)$
- Which one of the following is correct?
 - $A \times (B - C) = (A - B) \times (A - C)$
 - $A \times (B - C) = (A \times B) - (A \times C)$
 - $A \cap (B \cup C) = (A \cap B) \cup C$
 - $A \cup (B \cap C) = (A \cup B) \cap C$
- If $P(A)$ denotes the power set of A and A is the void set, then what is number of elements in $P\{P\{P(A)\}\}$?
 - 0
 - 1
 - 4
 - 16
- What is the value of $\frac{(0.101)_2^{(11)_2} + (0.011)_2^{(11)_2}}{(0.101)_2^{(10)_2} - (0.101)_2^{(01)_2} (0.011)_2^{(01)_2} + (0.011)_2^{(10)_2}}$?
 - $(0.01)^2$
 - $(0.01)^2$
 - $(0.1)^2$
 - $(1)^2$
- Consider the following with regard to a relation R on a set of real numbers defined by xRy if and only if $3x + 4y = 5$
 - $0R1$
 - $1R\frac{1}{2}$
 - $\frac{2}{3}R\frac{3}{4}$
 - I and II
 - I and III
 - II and III only
 - I, II and III
- Let $U = \{x \in N : 1 \leq x \leq 10\}$ be the universal set, N being the set of natural numbers. If $A = \{1, 2, 3, 4\}$ and $B = \{2, 3, 6, 10\}$ then what is the complement of $(A - B)$?
 - $\{6, 10\}$
 - $\{1, 4\}$
 - $\{2, 3, 5, 6, 7, 8, 9, 10\}$
 - $\{5, 6, 7, 8, 9, 10\}$
- The binary representation of the decimal number 45 is
 - 110011
 - 101010
 - 1101101
 - 101101
- If $0 < x < y < \pi$, then which one of the following is correct?
 - $x - \cos x > y - \cos y$
 - $x - \cos x < y - \cos y$
 - $x + \cos x > y + \cos y$
 - $x + \cos x < y + \cos y$
- If α and β are the roots of the equation $x^2 + x + 1 = 0$, then what is the equation whose roots are α^{19} and β^7 ?
 - $x^2 - x - 1 = 0$
 - $x^2 - x + 1 = 0$
 - $x^2 + x - 1 = 0$
 - $x^2 + x + 1 = 0$
- One root of the equation $x^2 = px + q$ is reciprocal of the other and $p \neq 1$. What is the value of q ?
 - $q = -1$
 - $q = 1$
 - $q = 0$
 - $q = 1/2$
- What is the value of x satisfying the equation $16 \left(\frac{a-x}{a+x} \right)^3 = \frac{a+x}{a-x}$?
 - $a/2$
 - $a/3$
 - $a/4$
 - 0
- If p and q are the roots of the equation $x^2 - px + q = 0$, then what are the values of p and q respectively?
 - 1, 0
 - 0, 1
 - 2, 0
 - 2, 1
- If sum of squares of the roots of the equation $x^2 + kx - b = 0$ is $2b$, what is k equal to?

- a) 1 b) b
c) -b d) 0
18. If α and β are the roots of the equation $x^2 - q(1+x) - r = 0$ then what is $(1+\alpha)(1+\beta)$ equal to?
a) $1-r$ b) $q-r$
c) $1+r$ d) $q+r$
19. $(x+1)^2 - 1 = 0$ has
a) one real root
b) two real roots
c) two imaginary roots
d) four real roots
20. a, b, c are in G.P. with $1 < a < b < n$, and $n > 1$ is an integer. $\log_a n, \log_b n, \log_c n$ form a sequence. This sequence is which one of the following?
a) Harmonic progression
b) Arithmetic progression
c) Geometric progression
d) None of these
21. What is the value of $9^{1/3}, 9^{1/19}, 9^{1/27}, \dots, \infty$
a) 9 b) 3
c) $9^{1/3}$ d) 1
22. The harmonic mean of two numbers is 21.6. If one of the numbers is 27, then what is the other number?
a) 16.2 b) 17.3
c) 18 d) 20
23. The arithmetic mean of two numbers exceeds their geometric mean by 2 and the geometric mean exceeds their harmonic mean by 1.6. What are the two numbers?
a) 16, 4 b) 81, 9
c) 256, 16 d) 625, 25
24. What is the geometric mean of 10, 40 and 60 (approx)?
a) 10 b) 28
c) 29.6 d) 70
25. What is the geometric mean of the sequence 1, 2, 4, 8, ..., $2n$?
a) $2n/2$ b) $2(n+1)/2$
c) $2(n+1)-1$ d) $2(n-1)$
26. If $1, \omega, \omega^2$ are the three cube roots of unity, then what is $\frac{(a\omega^6 + b\omega^4 + c\omega^2)}{(b + c\omega^{10} + a\omega^8)}$ equal to?
a) a/b b) b
c) ω d) ω^2
27. What is the modulus of $\frac{1+2i}{1-(1-i)^2}$ equal to?
a) 5 b) 4
c) 3 d) 1
28. What is modulus of $\frac{1}{1+3i} - \frac{1}{1-3i}$?
a) $3/5$ b) $9/25$
c) $3/25$ d) $5/3$
29. What is $\sqrt{-i}$ where $i = \sqrt{-1}$ equal to?
a) $\pm \frac{1-i}{\sqrt{2}}$ b) $\pm \frac{1+i}{\sqrt{2}}$
c) $\pm \frac{1-i}{2}$ d) $\pm \frac{1+i}{2}$
30. What is the coefficient of x^4 in the expansion of $(1+2x+3x^2+4x^3+\dots)^{1/2}$?
a) $1/4$ b) $1/16$
c) 1 d) $1/128$
31. There are four chairs with two chairs in each row. In how many ways can four persons be seated on the chairs, so that no chair remains unoccupied?
a) 6 b) 12
c) 24 d) 48
32. From 7 men and 4 women a committee of 6 is to be formed such that the committee contains at least two women. What is the number of ways to do this?
a) 210 b) 371
c) 462 d) 5544
33. 5 books are to be chosen from a lot of 10 books. If m is the number of ways of choice when one specified book is always included and n is the number of ways of choice when a specified book is always excluded, then which one of the following is correct?
a) $m > n$ b) $m = n$
c) $m = n - 1$ d) $m = n - 2$
34. If the points A(1, 2), B(2, 4) and C(3, a) are collinear, what is the length BC?
a) $\sqrt{2}$ unit b) $\sqrt{3}$ unit
c) $\sqrt{5}$ unit d) 5 unit
35. The line through the points (4, 3) and (2, 5) cuts off intercepts of lengths λ and μ on the axes. Which one of the following is correct?
a) $\lambda > \mu$ b) $\lambda < \mu$
c) $\lambda > -\mu$ d) $\lambda = \mu$
36. A square is drawn by joining mid points of the sides of a square. Another square is drawn inside the second square in the same way and the process is continued in definitely. If the side of the first square is 16 cm, then what is the sum of the areas of all the squares?
a) 256 sq cm b) 512 sq cm
c) 1024 sq cm d) $512/3$ sq cm
37. For what value of k, are the lines $x + 2y - 9 = 0$ and $kx + 4y + 5 = 0$ parallel?
a) 2 b) -1
c) 1 d) 0

38. The line $y = 0$ divides the line joining the points $(3, -5)$ and $(-4, 7)$ in the ratio:
 a) 3:4 b) 4:5
 c) 5:7 d) 7:9
39. An equilateral triangle is inscribed in the circle $x^2 + y^2 = a^2$ with one of the vertices at $(a, 0)$. What is the equation of the side opposite to this vertex?
 a) $2x - a = 0$ b) $x + a = 0$
 c) $2x + a = 0$ d) $3x - 2a = 0$
40. The circle $x^2 + y^2 + 4x - 4y + 4 = 0$ touches
 a) Only the x-axis
 b) Only the y-axis
 c) Both the axes
 d) Neither of the axes
41. Equation of the hyperbola with eccentricity $3/2$ and foci at $(\pm 2, 0)$ is $5x^2 - 4y^2 = k$. What is the value of k ?
 a) $4/3$ b) $3/4$
 c) $(4/3)\sqrt{5}$ d) $(3/4)\sqrt{5}$
42. What is the area of the triangle formed by the lines joining the vertex of the parabola $x^2 = 12y$ to the ends of the latus rectum?
 a) 9 square units
 b) 12 square units
 c) 14 square units
 d) 18 square units
43. What is the value of $\sqrt{3} \operatorname{cosec} 20^\circ - \sec 20^\circ$?
 a) 4 b) 2
 c) 1 d) 0
44. What is the value of $\operatorname{cosec}(13\pi/12)$?
 a) $\sqrt{6} + \sqrt{2}$ b) $-\sqrt{6} + \sqrt{2}$
 c) $\sqrt{6} - \sqrt{2}$ d) $-\sqrt{6} - \sqrt{2}$
45. Which one of the following is correct?
 $\left(1 + \cos 67\frac{1^\circ}{2}\right)\left(1 + \cos 112\frac{1^\circ}{2}\right)$ is
 a) an irrational number and is greater than 1
 b) a rational number but not an integer
 c) an integer
 d) an irrational number and is less than 1
46. $x = \sin \theta \cos \theta$ and $y = \sin \theta \cos \theta$ are satisfied by which one of the following equations?
 a) $y^2 - 2x = 1$ b) $y^2 + 2x = 1$
 c) $y^2 - 2x = -1$ d) $y^2 + 2x = -1$
47. If $\cot \theta = 5/12$ and θ lies in the third quadrant, then what is $(2 \sin \theta + 3 \cos \theta)$ equal to?
 a) -4
 b) $-p^2$ for some odd prime p
 c) $(-q/p)$ where p is an odd prime and q a positive integer with (q/p) not an integer
 d) $-p$ for some odd prime p
48. If $\cos A + \cos B = m$ and $\sin A + \sin B = n$, where $m, n \neq 0$, then what is $\sin(A + B)$ equal to?
 a) $\frac{mn}{m^2 + n^2}$ b) $\frac{2mn}{m^2 + n^2}$
 c) $\frac{m^2 + n^2}{2mn}$ d) $\frac{mn}{m + n}$
49. If $\tan A = 1/2$ and $\tan B = 1/3$, then what is the value of $4A + 4B$?
 a) $\pi/4$ b) $\pi/2$
 c) π d) 2π
50. Which one of the following is positive in the third quadrant?
 a) $\sin \theta$ b) $\cos \theta$
 c) $\tan \theta$ d) $\sec \theta$
51. If $\sin A = \frac{2}{\sqrt{5}}$ and $\cos B = \frac{1}{\sqrt{10}}$ where A and B are Acute angles, then what is $A+B$ equal to?
 a) 135° b) 90°
 c) 75° d) 60°
52. What are the values of (x, y) satisfying the simultaneous equation $\sin^{-1} x + \sin^{-1} y = \frac{2\pi}{3}$ and $\cos^{-1} x - \cos^{-1} y = \frac{\pi}{3}$?
 a) $(0, 1)$ b) $(1/2, 1)$
 c) $(1, 1/2)$ d) $(\sqrt{3}/2, 1)$
53. In a triangle ABC , $b = \sqrt{3}\text{cm}$, $c = 1\text{cm}$, $\angle A 30^\circ$, what is the value of a ?
 a) $\sqrt{2}\text{cm}$ b) 2cm
 c) 1cm d) $1/2\text{cm}$
54. If $\sin^{-1} \frac{5}{x} + \sin^{-1} \frac{12}{x} = \frac{\pi}{2}$, then what is the value of x ?
 a) 1 b) 7
 c) 13 d) 17
55. In a triangle ABC , if $A = \tan^{-1} 2$ and $B = \tan^{-1} 3$, then C is equal to
 a) $\pi/3$ b) $\pi/4$
 c) $\pi/6$ d) $\pi/2$
56. What should be the height of a flag where a 20 feet long ladder reaches 20 feet below the flag (The angle of elevation of the top of the flag at the foot of the ladder is 60°)?
 a) 20 feet b) 30 feet
 c) 40 feet d) $20\sqrt{2}$ feet
57. Two poles are 10 m and 20 m high. The line joining their tips makes an angle of 15° with the horizontal. What is the distance between the poles?
 a) $10(\sqrt{3} - 1)\text{m}$ b) $5(4 + 2\sqrt{3})\text{m}$
 c) $20(\sqrt{3} + 1)\text{m}$ d) $10(\sqrt{3} + 1)\text{m}$
58. What is the value of $\lim_{x \rightarrow 0} \frac{x \sin 5x}{\sin^2 4x}$

- a) 0 b) 5/4
c) 5/16 d) 25/4
59. If $f(x) = \begin{cases} 1 & x \text{ is a rational number} \\ 0 & x \text{ is an irrational number} \end{cases}$, what is/are the value(s) of $f(\sqrt{3})$?
- a) 0 b) 1
c) Both 0 and 1 d) None of these
60. Let $f(x) = \frac{1}{1-|1-x|}$. Then, what is $\lim_{x \rightarrow 0} f(x)$ equal to?
- a) 0 b) ∞
c) 1 d) -1
61. If $f: R \rightarrow R$, $g: R \rightarrow R$ and $g(x) = x + 3$ and $(f \circ g)(x) = (x + 3)^2$, then what is the value of $f(-3)$?
- a) -9 b) 0
c) 9 d) 3
62. If $f(x) = \frac{2}{3}x + \frac{3}{2}$, $x \in R$, then what is $f^{-1}(x)$ equal to?
- a) $\frac{3}{2}x + \frac{2}{3}$ b) $\frac{3}{2}x - \frac{9}{4}$
c) $\frac{2}{3}x - \frac{4}{9}$ d) $\frac{2}{3}x - \frac{2}{3}$
63. Consider the following statements:
1. If $f(x) = x^3$ and $g(y) = y^3$ then $f = g$.
2. Identity function is not always a bijection.
Which of the above statements is/are correct?
- a) 1 only
b) 2 only
c) Both 1 and 2
d) Neither 1 nor 2
64. From a pack of 52 cards, two cards are drawn, the first being replaced before the second is drawn. What is the probability that the first is a diamond and the second is a king?
- a) 1/4 b) 4/13
c) 1/52 d) 4/15
65. In a school there are 40% science students and the remaining 60% are arts students. It is known that 5% of the science students are girls and 10% of the arts students are girls. One student selected at random is a girl. What is the probability that she is an arts student?
- a) 1/3 b) 3/4
c) 1/5 d) 3/5
66. Two dice are thrown. What is the probability that the sum of the faces equals or exceeds 10?
- a) 1/12 b) 1/4
c) 1/3 d) 1/6
67. Two balls are selected from a box containing 2 blue and 7 red balls. What is the probability that at least one ball is blue?
- a) 2/9 b) 7/9
c) 5/12 d) 7/12
68. There is a point inside a circle. What is the probability that this point is close to the circumference than to the centre?
- a) 3/4 b) 1/2
c) 1/4 d) 1/3
69. Two dice each numbered from 1 to 6 are thrown together. Let A and B be two events given by A: even number on the first die. B: number on the second die is greater than 4. Q. What is $P(A \cap B)$ equal to?
- a) 1/2 b) 1/4
c) 2/3 d) 1/6
70. Consider the following statements:
1. Equations $ax + by + cz + d = 0$, $a'x + b'y + c'z + d' = 0$ represent a straight line
2. Equation of the form $\frac{x-\alpha}{\ell} = \frac{y-\beta}{m} = \frac{z-\gamma}{n}$ represent a straight line passing through the point (α, β, γ) and having direction ratios proportional to ℓ, m, n . Which of the statements given above is/are correct?
- a) 1 only b) 2 only
c) Both 1 and 2 d) Neither 1 nor 2
71. If the centre of the sphere $ax^2 + by^2 + cz^2 - 2x + 4y + 2z - 3 = 0$ is $(1/2, -1, -1/2)$, what is the value of b?
- a) 1 b) -1
c) 2 d) -2
72. What is the equation of the plane passing through (x_1, y_1, z_1) and normal to the line with $\langle a, b, c \rangle$ as direction ratios?
- a) $ax + by + cz = ax_1 + by_1 + cz_1$
b) $a(x - x_1) + b(y - y_1) + c(z - z_1) = 0$
c) $ax + by + cz = 0$
d) $ax + by + cz = x_1 + y_1 + z_1 = 0$
73. If the radius of the sphere $x^2 + y^2 + z^2 - 6x - 8y + 10z + \lambda = 0$ is unity, what is the value of λ ?
- a) 49 b) 7
c) -49 d) -7
74. The planes $px + 2y + 2z - 3 = 0$ and $2x - y + z + 2 = 0$ intersect at an angle $4/\pi$. What is the value of p^2 ?
- a) 24 b) 12
c) 6 d) 3

75. What is the equation of the plane passing through the point $(1, -1, -1)$ and perpendicular to each of the planes $x - 2y - 8z = 0$ and $2x + 5y - z = 0$?

- a) $7x - 3y + 2z = 14$
 b) $2x + 5y - 3z = 12$
 c) $x - 7y + 3z = 4$
 d) $14x - 5y + 3z = 16$

76. What is the area of the triangle whose vertices are $(0, 0, 0)$, $(1, 2, 3)$ and $(-3, -2, 1)$?

- a) $3\sqrt{5}$ square unit
 b) $6\sqrt{5}$ square unit
 c) 6 square unit
 d) 12 square unit

77. If we join the mid points of the upper horizontal sides of each rectangle of a histogram by straight lines, what is the figure so obtained known as?

- a) Frequency curve
 b) Frequency polygon
 c) Ogive ($>$)
 d) Ogive ($<$)

78. If in a frequency distribution table with 12 classes, the width of each class is 2.5 and the lowest class boundary is 6.1, then what is the upper class boundary of the highest class?

- a) 30.1
 b) 27.6
 c) 30.6
 d) 36.1

79.

The marks scored by two students A and B in six subjects are given below

A	71	56	55	75	54	49
B	55	74	83	54	38	52

Which one of the following statements is most appropriate?

- a) The average scores of A and B are same but A is consistent
 b) The average scores of A and B are not same but A is consistent
 c) The average scores of A and B are same but B is consistent
 d) The average scores of A and B are not same but B is consistent

80. A set of n values x_1, x_2, \dots, x_n has standard deviation σ . What is the standard deviation of n values $x_1 + k, x_2 + k, \dots, x_n + k$?

- a) σ
 b) $\sigma + k$
 c) $\sigma - k$
 d) $k\sigma$

81. Which one of the following is the mean of the data given below?

x_i	6	10	14	18	24	28	30
f_i	2	4	7	12	8	4	3

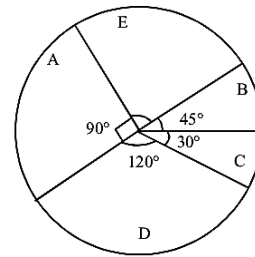
- a) 17
 b) 18
 c) 19
 d) 20

82.

DIRECTIONS- Note : Study the pie chart given below and answer the questions that follow :

The following pie chart gives the distribution of funds in a five year plan under the major heads of development expenditures: Agriculture (A), Industry (B), Education (C), Employment (D) and Miscellaneous (E)

The total allocation is 36,000 (in crores of rupees).



Q. How much money (in crores) is allocated to Education?

- a) 3000
 b) 6000
 c) 9000
 d) 10800

83.

The monthly family expenditure (in percentage) on different items are as follows :

Food	Rent	Cloth	Transport	Education	Others
38	19	18	—	9	6

If the total monthly expenditure is ₹ 9000, then what is the expenditure on transport ?

- a) Rs. 180
 b) Rs. 1000
 c) Rs. 900
 d) Rs. 360

84. If $y = x + e^x$, what is $\frac{d^2x}{dy^2}$ equal to?

- a) e^x
 b) $-\frac{e^x}{(1+e^x)^3}$
 c) $-\frac{e^x}{(1+e^x)}$
 d) $-\frac{e^x}{(1+e^x)^2}$

85. If $f(x) = e^{\sin(\log \cos x)}$ and $g(x) = \log \cos x$, then what is the derivative of $f(x)$ with respect to $g(x)$?

- a) $f(x) \cos [g(x)]$
 b) $f(x) \sin [g(x)]$
 c) $g(x) \cos [f(x)]$
 d) $g(x) \sin [f(x)]$

86. Let $g(x) = x^3 - 4x + 6$. $f'(x) = g'(x)$ and $f(1) = 2$, then what is $f(x)$ equal to?

- a) $x^3 - 4x + 3$
 b) $x^3 - 4x + 6$
 c) $x^3 - 4x + 1$
 d) $x^3 - 4x + 5$

87. If $x^m + y^m = 1$ such that $\frac{dy}{dx} = -\frac{x}{y}$, then what should be the value of m ?

- a) 0
 b) 1
 c) 2
 d) None of the above

88. Which one of the following statements is correct in respect of the curve $4y - x^2 - 8 = 0$?

- a) The curve is increasing in $(-4, 4)$
 b) The curve is increasing in $(-4, 0)$

- c) The curve is increasing in $(0, 4)$
 d) The curve is decreasing in $(-4, 4)$
89. What is the equation of the curve whose slope at any point is equal to $2x$ and which passes through the origin?
 a) $y(1-x)=x^2$ b) $y^2(1+x^2)=x^4$
 c) $Y^2=(x+1)$ d) $y=x^2$
90. What is the maximum point on the curve $x=e_x y$?
 a) $(1, e)$ b) $(1, e^{-1})$
 c) $(e, 1)$ d) $(e^{-1}, 1)$
91. The point in the interval $(0, 2\pi)$ where $f(x) = e_x \sin x$ has maximum slope is
 a) $\pi/4$ b) $\pi/2$
 c) π d) $3\pi/2$
92. If $\int \sec x \cos ec x dx = \log |g(x)| + c$, then what is $g(x)$ equal to?
 a) $\sin x \cos x$ b) $\sec^2 x$
 c) $\tan x$ d) $\log |\tan x|$
93. What is $\int \frac{x^4+1}{x^2+1} dx$ equal to?
 a) $\frac{x^3}{3} - x + 4 \tan^{-1} x + c$
 b) $\frac{x^3}{3} + x + 4 \tan^{-1} x + c$
 c) $\frac{x^3}{3} - x + 2 \tan^{-1} x + c$
 d) $\frac{x^3}{3} - x - 4 \tan^{-1} x + c$
94. What is $\int e^{\ln x} dx$ equal to?
 a) $xe^{\ln x} + c$ b) $-xe^{-\ln x} + c$
 c) $x + c$ d) $\frac{x^2}{2} + c$
95. What is the value of $\int_0^1 xe^{x^2} dx$?
 a) $\frac{(e-1)}{2}$ b) $e^2 - 1$
 c) $2(e-1)$ d) $e - 1$
96. What is the area of the region bounded by the curve $f(x) = 1 - \frac{x^2}{4}$, $x \in [-2, 2]$, and the x -axis?
 a) $8/3$ sq unit b) $4/3$ sq unit
 c) $2/3$ sq unit d) $1/3$ sq unit
97. What is $\int_0^{\frac{\pi}{2}} \sin 2x \ln(\cot x) dx$ equal to?
 a) 0 b) $\pi \ln 2$
 c) $-\pi \ln 2$ d) $\frac{\pi \ln 2}{2}$
98. What is the equation of the curve passing through the origin and satisfying the differential equation $dy = (y \tan x + \sec x)dx$?
 a) $y = x \cos x$ b) $y \cos x = x$
 c) $xy = \cos x$ d) $y \sin x = x$
99. What is the solution of the differential equation $x dy - y dx = xy^2 dx$?
 a) $yx^2 + 2x = 2cy$ b) $y^2x + 2y = 2cx$
 c) $y^2x^2 + 2x = 2cy$ d) None of these
100. What is the general solution of $(1 + e^x) y dy = e^x dx$?
 a) $y^2 = \ln [c^2 (e^x + 1)^2]$
 b) $y = \ln [c (e^x + 1)]$
 c) $y^2 = \ln [c (e^x + 1)]$
 d) None of these
101. Consider a differential equation of order m and degree n . Which one of the following pairs is not feasible?
 a) $(3, 2)$ b) $(2, 3/2)$
 c) $(2, 4)$ d) $(2, 2)$
102. Let $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & x \\ 0 & 1 \end{bmatrix}$ If $AB=BA$, then what is the value of x ?
 a) -1 b) 0
 c) 1 d) Any real number
103. If A is a non-null row matrix with 5 columns and B is a non null column matrix with 5 rows, how many rows are there in $A \times B$?
 a) 1 b) 5
 c) 10 d) 25
104. If $A = \begin{bmatrix} 2 & 2 \\ 2 & 2 \end{bmatrix}$, then what is A^n equal to?
 a) $\begin{bmatrix} 2^n & 2^n \\ 2^n & 2^n \end{bmatrix}$ b) $\begin{bmatrix} 2n & 2n \\ 2n & 2n \end{bmatrix}$
 c) $\begin{bmatrix} 2^{2n-1} & 2^{2n-1} \\ 2^{2n-1} & 2^{2n-1} \end{bmatrix}$ d) $\begin{bmatrix} 2^{2n+1} & 2^{2n+1} \\ 2^{2n+1} & 2^{2n+1} \end{bmatrix}$
105. If $adj A = \begin{bmatrix} a & 0 \\ -1 & b \end{bmatrix}$ and $ab \neq 0$, then what is the value of $|A^{-1}|$?
 a) 1 b) ab
 c) $1/\sqrt{ab}$ d) $1/ab$
106. If a matrix A is symmetric as well as anti-symmetric, then which one of the following is

correct?

- a) A is a diagonal matrix
 b) A is a null matrix
 c) A is a unit matrix
 d) A is a triangular matrix

107. If $x + iy = \begin{bmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{bmatrix}$, then what is $x - iy$

equal to?

- a) $3 + i$ b) $1 + 3i$
 c) $3i$ d) 0

108. The simultaneous equations $3x + 5y = 7$ and $6x + 10y = 18$ have

- a) no solution
 b) infinitely many solutions
 c) unique solution
 d) any finite number of solutions

109. What is the order of the product

$$\begin{bmatrix} x & y & z \end{bmatrix} = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} ?$$

- a) 3×1 b) 1×1
 c) 1×3 d) 3×3

110. If D is determinant of order 3 and D' is the determinant obtained by replacing the elements of D by their cofactors, then which one of the following is correct?

- a) $D' = D^2$ b) $D' = D^3$
 c) $D' = 2D^2$ d) $D' = 3D^3$

111. If $\vec{m}, \vec{n}, \vec{r}$ are three vectors, θ is the angle between the vectors \vec{m} and \vec{n} , what is $mnr \cos \theta$ equal to?

- a) $(\vec{m} \cdot \vec{n})(\vec{r} \cdot (\vec{r}/r))$ b) $(\vec{m} \cdot \vec{n})(\vec{r} \cdot \vec{r})$
 c) $(\vec{m} \cdot \vec{n})(\vec{n} \cdot (\vec{n}/n))$ d) $(\vec{m} \cdot \vec{n})\vec{r}$

112. If $\vec{a}, \vec{b}, \vec{c}$ are non-zero vectors and

$|\vec{a} \times \vec{b} \cdot \vec{c}| = |\vec{a}| |\vec{b}| |\vec{c}|$, then which one of the following is correct?

- a) $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} \neq 0$ b) $\vec{a} \cdot \vec{b} = 0$ only
 c) $\vec{b} \cdot \vec{c} = \vec{b} \cdot \vec{a} = \vec{c} \cdot \vec{a} = 0$ d) $\vec{a} \cdot \vec{b} = \vec{b} \cdot \vec{c} = \vec{c} \cdot \vec{a} = 0$

113. Two forces are equal to $20\vec{A}$ and $3\vec{B}$, their resultant being $\lambda\vec{BO}$, where G is the point on AB such that $\frac{BG}{AG} = -\frac{2}{3}$, what is the value of λ

- a) 2 b) -1
 c) 2 d) None of the above

114. Given $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ and \vec{b} is a unit vector co-directional with \vec{a} . If m is a scalar such that $\hat{b} = m\vec{a}$, then what is the value of m?

- a) $1/5$ b) $1/\sqrt{5}$
 c) $1/29$ d) $1/\sqrt{29}$

115. What is the vector equally inclined to the vectors $\hat{i} + 3\hat{j}$ and $3\hat{i} + \hat{j}$?

- a) $\hat{i} + \hat{j}$ b) $2\hat{i} - \hat{j}$
 c) $2\hat{i} + \hat{j}$ d) None of these

116. The points with position vectors

$10\hat{i} + 3\hat{j}, 12\hat{i} - 5\hat{j}, a\hat{i} + 11\hat{j}$ are collinear, if the value of a is

- a) -8 b) 4
 c) 8 d) 12

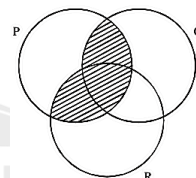
117. If $|\vec{a}| = 10, |\vec{b}| = 2$ and $\vec{a} \cdot \vec{b} = 12$, then what is the value of $|\vec{a} \times \vec{b}|$?

- a) 12 b) 16
 c) 20 d) 24

118. If θ is the angle between the vectors $4(\hat{i} - \hat{k})$ and $\hat{i} + \hat{j} + \hat{k}$, then what is $(\sin \theta + \cos \theta)$ equal to?

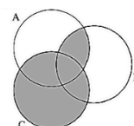
- a) 0 b) $1/2$
 c) 1 d) 2

119. What does the shaded region represent in the figure given below?



- a) $(P \cup Q) - (P \cap Q)$
 b) $P \cap (Q \cap R)$
 c) $(P \cap Q) \cap (Q \cap R)$
 d) $(P \cap Q) \cup (Q \cap R)$

120. What does the shaded region represent in the figure given below?



- a) $(C \cap (A' \cap B'))$
 b) $C \cup (C' \cap A \cap B)$
 c) $C \cup (C \cap A) \cup (C \cap B)$
 d) $C \cup (A/B)$

