

Question Paper of BHU MCA - 2011

- The Boolean expression $(A + C)(AB' + AC)(A'C' + B')$ can be simplified to
(A) $AB + A'C$ (B) $A'B + BC$ (C) $AB + BC$ (D) AB
- Let A be a set having n element. The number of binary operations that can be defined on A is
(A) 2^n (B) n^n (C) n^{2^n} (D) 2^{n^2}
- The Boolean expression $X + X'Y$ equals
(A) $X + Y$ (B) $X + XY$ (C) $Y + YX$ (D) $X'Y + Y'X$
- Which of the following codes uses 7 bits to represent a character?
(A) ASCII (B) BCD (C) EBCDIC (D) GRAY
- C is a
(A) High level language (B) Low level language
(C) High level language with some low level features (D) Machine language
- Ten data item are to be read in a problem. The control structure needed is
(A) Selection or repetition (B) Only sequential
(C) Only selection (D) Sequential or repetition
- The base of the binary number system uses
(A) 2 (B) 16 (C) 8 (D) 10
- The modern digital computer uses
(A) Decimal system (B) Octal system (C) Binary system (D) All of these
- Main memory unit of a computer
(A) Performs arithmetic (B) Stores a small amount of data and instructions
(C) Stores bulk of data and instructions (D) Supervises the working of all the unit
- The heart and the nerve centre of a computer is its
(A) Output unit (B) Input unit (C) C.P.U. (D) Memory
- In the following questions, the first and the last part of the sentence are numbered 1 and 6. The rest of the sentence is split up into four parts and named P, Q, R, and S. These four parts are not given in their proper order. Read the sentence and find out which part of the four combinations is correct. Then find the correct answer and indicate it in the Answer Sheet :

- 1 ; Religion has been used
 P : both as a weapon of isolation
 Q : to dull awareness
 R : about real problems
 S : and as morphia
 6 : like education, health and employment.
 (A) PQRS (B) PSQR (C) QPSR (D) RPQS

Directions :

(Question Nos. 12-13) : In the following questions, choose the word which is most nearly the OPPOSITE in meaning to the **bold** word and mark it in the Answer Sheet :

12. **Day**
 (A) Year (B) Month (C) Night (D) Hour
13. Lucy in a **smart** girl.
 (A) Active (B) Indecent (C) Casual (D) Lazy

Directions :

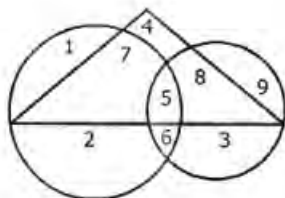
(Question Nos. 14-15) : In the following questions, choose the word which is most nearly the same in meaning to the **bold** word and mark it in the Answer Sheet :

14. **High**
 (A) Tall (B) Short (C) Thin (D) Fat
15. His style is quite **transparent**.
 (A) verbose (B) Involved (C) Lucid (D) Witty
16. The Vikram Sarabhai Space Centre is located at
 (A) Sriharikota (B) Trivandram (C) Trombay (D) Bangalore
17. The first railway line was laid in India in :
 (A) 1836 (B) 1803 (C) 1853 (D) 1860
18. Marketing of agricultural produce in India is through ;
 (A) Co-operatives (B) Businessmen (C) Government (D) Individuals
19. Who was the first Indian to be the President of U.N. General Assembly?
 (A) Natwar Singh (B) Ramesh Bhandari
 (C) Smt. Vijai Lakshmi Pandit (D) Pandit J.L. Nehru
20. The headquarters of the World Health Organization is located at :
 (A) Paris (B) Geneva (C) Peru (D) Chicago
21. In the following question a number-series is given. Which one of the alternatives will replace the question mark (?) ?
 4, 9, 19, 39, 79, _____ ?
 (A) 169 (B) 159 (C) 119 (D) 139
22. Letters of which of the alternative answers when placed at the blank places one after another will complete the given letter-series ?
 a _____ bbc _____ aab _____ cca _____ bbcc
 (A) acba (B) bacb (C) caba (D) abba

23. In the following a missing term is to be find out (?)
DKM, FJP, HIS, JHV, ?
(A) HGY (B) IGZ (C) IGY (D) LGY
24. In the following number series one number is wrong. Find out the wrong number -
9, 15, 22, 30, 40, 49, 60
(A) 15 (B) 30 (C) 40 (D) 49
25. In the following series, find the term in place of question mark (?)
3, 8, 27, 112, 565, ?
(A) 3400 (B) 3396 (C) 1596 (D) 2266
26. If CAT is coded as TC then how will SUN be coded?
(A) UN (B) NJ (C) US (D) NS
27. In a certain code language - 'MTP' is coded as - 'I am happy'. 'CTR' as - 'That black happy' and 'NPS' as - 'I very happily'. Then which word is used for 'am' ?
(A) M (B) T (C) P (D) C
28. If the code word for BOMBAY in a certain code is 58 then, what will be the code word for TROMBAY ?
(A) 89 (B) 94 (C) 95 (D) 84
29. 'MASTER' is written as '412536' and 'SERVANT' is written as '2367185' then how will 'REVERENT' be written in the same code language ?
(A) 6 3 7 3 6 3 8 5 (B) 3 6 7 3 3 6 8 5 (C) 8 5 3 3 6 5 3 8 (D) 6 3 5 3 6 3 8 5
30. If PERILOUS is written as RGTKNQWU in a code language then how will OLYMPIC be written in that language ?
(A) QNOAKRE (B) QONARKE (C) QNAORKE (D) QKNOARE

Directions :

(Question Nos. 31-35) : The following five questions are based on the following diagram in which the triangle represents female graduates, small circle represents self-employed females and the big circle represents self-employed females with bank loan facility. Numbers are shown in the different sections of the diagram. On the basis of these numbers, answer the following :

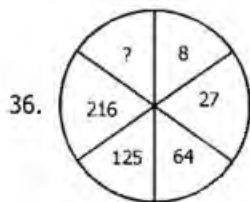


31. How many non-graduate self-employed females are with bank loan facility ?
(A) 3 (B) 8 (C) 9 (D) 12
32. How many self-employed female graduates are with bank loan facility ?
(A) 5 (B) 7 (C) 12 (D) 20

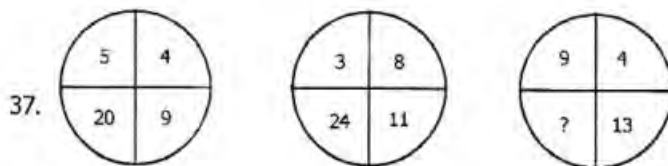
33. How many non-graduate females are self-employed ?
 (A) 9 (B) 11 (C) 12 (D) 21
34. How many female graduates are not self-employed ?
 (A) 4 (B) 10 (C) 12 (D) 15
35. How many female graduates are self-employed ?
 (A) 12 (B) 13 (C) 15 (D) 20

Directions :

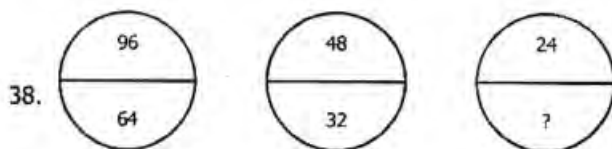
(Question Nos. 36-40) : Which number should come in place of question mark (?) in the following questions:



- (A) 729 (B) 343 (C) 305 (D) 4



- (A) 26 (B) 36 (C) 52 (D) 117

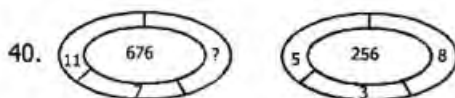


- (A) 8 (B) 10 (C) 16 (D) 21

39.

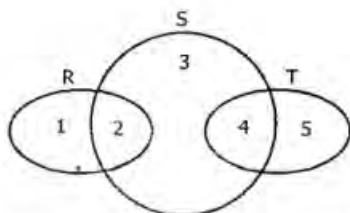
1	7	9
2	14	?
3	105	117

- (A) 12 (B) 26 (C) 16 (D) 20

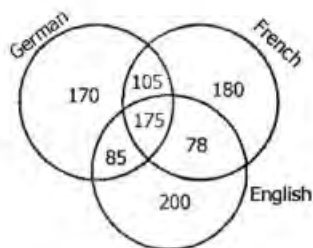


- (A) 8 (B) 7 (C) 6 (D) 4

41. The following diagram, R represents businessmen, S represents rich men, T represents honest men. Which number will represent honest rich men ?



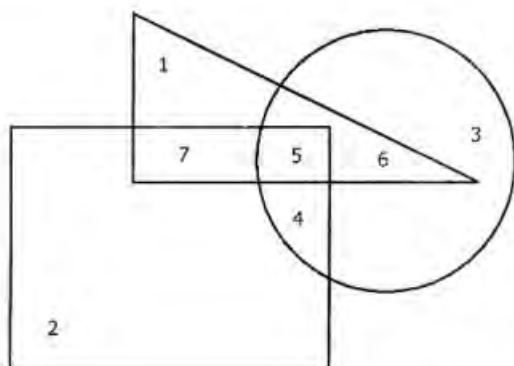
- (A) 2 (B) 3 (C) 5 (D) 4
42. A survey was conducted on a sample of 1000 persons with reference to their knowledge of English, French and German. The result is presented in the Venn Diagram. The ratio of the number of persons who do not know the three languages to those who know all the three languages is



- (A) $\frac{1}{27}$ (B) (C) $\frac{7}{550}$ (D) $\frac{175}{1000}$

Directions :

(Question Nos. 43-45) : These questions are based on the diagram given below. In the diagram, the triangle stands for graduates, square for membership of professional organisations and the circle for membership of social organisations. Read each statement and find out the appropriate numbers to represent the people covered by statement :



43. Number of graduates in professional organisations is represented by
 (A) 5 and 7 (B) 4, 5 and 6 (C) 6 and 7 (D) 5, 6 and 7

44. Number of graduates in social organisations only, is represented by
 (A) 3 (B) 4 (C) 5 (D) 6
45. Number of graduates in social organisations is represented by
 (A) 1 (B) 5 (C) 6 (D) 5 and 6

Directions :

(Question Nos. 46-50) : Data on the candidates, who took an examination in Social Sciences, Mathematics and Science are given below :

Passed in all Subjects	167
Failed in all Subjects	60
Failed in Social Sciences	175
Failed in Mathematics	199
Failed in Science	191
Passed in Social Sciences only	62
Passed in Mathematics only	48
Passed in Science only	52

Answer the following questions based on above data :

46. How many passed in Mathematics and at least in one more subject ?
 (A) 94 (B) 170 (C) 203 (D) 210
47. How many passed at least in one subject ?
 (A) 167 (B) 304 (C) 390 (D) 450
48. How many failed in Social Sciences only ?
 (A) 15 (B) 21 (C) 30 (D) 42
49. How many failed in two subjects only ?
 (A) 56 (B) 61 (C) 144 (D) 162
50. How many failed in one subject only ?
 (A) 56 (B) 61 (C) 144 (D) 152
51. If a particle is projected with a velocity u at an angle $\alpha = 45^\circ$, then
 (A) The range is minimum (B) The range is maximum
 (C) The range is maximum and equals $\frac{u^2}{2g}$ (D) The time to the highest point is $\frac{u}{g\sqrt{2}}$
52. The time of flight of a particle, which is projected with velocity u in a direction making an angle α , is given by
 (A) $2 u g \sin \alpha$ (B) $2 u g \cos \alpha$ (C) $\frac{2 u \sin \alpha}{g}$ (D) $\frac{2 u \cos \alpha}{g}$
53. Masses of 5 kg and 3 kg rest on two inclined planes each of 30° and are connected by a string passing over the common vertex. After 2 seconds the mass of 5 kg is removed. How far up the plane will the 3 kg mass continue to move ?
 (A) $\frac{2}{3}m$ (B) $\frac{3}{5}m$ (C) $\frac{4}{7}m$ (D) $\frac{5}{8}m$

54. A mass m is acted upon by a constant force P lb. wt. under which in t sec it moves a distance of x feet and acquires a velocity v ft/sec. Then x is equal to

- (A) $\frac{gP}{2mt^2}$ (B) $\frac{mg}{2v^2P}$ (C) $\frac{gt^2}{2Pm}$ (D) $\frac{gt^2}{2Pm}$

55. A point moves with uniform acceleration and v_1, v_2, v_3 , denote the average velocities in three successive intervals of time t_1, t_2, t_3 then

- (A) $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 + t_2}{t_2 + t_3}$ (B) $\frac{v_1 + v_2}{v_2 + v_3} = \frac{t_1 + t_2}{t_2 + t_3}$ (C) $\frac{v_1 + v_2}{v_2 + v_3} = \frac{t_1 - t_2}{t_2 - t_3}$ (D) $\frac{v_1 - v_2}{v_2 - v_3} = \frac{t_1 - t_2}{t_2 - t_3}$

56. If a body is falling freely under gravity, then the acceleration

- (A) Is zero (B) Is uniform
(C) Varies as the square of the distance travelled (D) Varies as the inverse of the distance travelled

57. Acceleration of a moving point is

- (A) A negative quantity (B) A vector quantity (C) A single number (D) A positive number

58. To a man walking at 2 km/hr the rain appears to fall vertically when he increases his speed to 4 km/hr it appears to meet him at an angle of 45° . Then the actual velocity of rain is

- (A) $\sqrt{2}$ km/hr (B) $\sqrt{3}$ km/hr (C) $2\sqrt{2}$ km/hr (D) $2\sqrt{3}$ km/hr

59. If the resultant of two forces P and Q acting at a point at an angle α is $(2m + 1)\sqrt{P^2 + Q^2}$ and when they

act at an angle $\left(\frac{\pi}{2} - \alpha\right)$, the resultant becomes $(2m - 1)\sqrt{P^2 + Q^2}$, then

- (A) $\tan \alpha = \frac{1}{m+1}$ (B) $\tan \alpha = \frac{1}{m-1}$ (C) $\tan \alpha = \frac{m+1}{m-1}$ (D) $\tan \alpha = \frac{m-1}{m+1}$

60. Two unlike parallel forces P and Q ($P > Q$), xm apart act at two points of a rigid body. If the direction of P be reversed, then the resultant is displaced through the distance

- (A) $2PQxm$ (B) $(P^2 - Q^2)xm$ (C) $\frac{2QP}{P^2 - Q^2}xm$ (D) $\frac{2PQ}{P^2 + Q^2}xm$

61. P, Q, R are the points on the sides BC, CA, AB of the triangle ABC such that $BP : PC = CQ : QA = AR : RB = m : n$. If Δ denote the area of the triangle ABC , then the forces $\overline{AP}, \overline{BQ}, \overline{CR}$ reduce to a couple whose moment is

- (A) $2\frac{m-n}{m+n}\Delta$ (B) $2\frac{m+n}{m-n}\Delta$ (C) $2(m^2 - n^2)\Delta$ (D) $2(m^2 + n^2)\Delta$

62. A beam whose centre of gravity divides it into two portions, a and b , is placed inside a smooth sphere. If θ be its inclination to the horizon in the position of equilibrium and 2α be the angle subtended by the beam at the centre of the sphere, then

- (A) $\tan \theta = (b - a)(b + a) \tan \theta$ (B) $\tan \theta = \frac{b - a}{b + a} \tan \alpha$

(C) $\tan \theta = \frac{b+a}{b-a} \tan \alpha$

(D) $\tan \theta = \frac{1}{(b-a)(b+a)} \tan \alpha$

63. Two like parallel forces P and Q act on a rigid body at A and B respectively. If P and Q be interchanged in position, then the point of application of the resultant will be displaced through a distance (along AB)

- (A) $\frac{P+Q}{P-Q} AB$ (B) $\frac{P-Q}{P+Q} AB$ (C) $(P-Q) AB$ (D) $(P+Q) AB$

64. Which one of the following is not a force ?

- (A) Tension (B) Attraction (C) Weight (D) Acceleration

65. ABCDE is a pentagon. Forces acting on a particle are represented in magnitude and direction by $\overline{AB}, \overline{BC}, \overline{CD}, 2\overline{DE}, \overline{AD}$ and \overline{AE} . Their resultant is given by

- (A) \overline{AE} (B) $2\overline{AE}$ (C) $3\overline{AE}$ (D) $4\overline{AE}$

66. The resultant of two forces P, Q acting at a certain angle is X ; and that of P, R acting at the same angle is also X. Then the value of P is

- (A) $\sqrt{Q^2 + RX}$ (B) $\sqrt{R^2 + QX}$ (C) $\sqrt{X^2 + QR}$ (D) $\sqrt{QR(Q+R)}$

67. The linear programming problem :

Maximize $z = 4x + y$

subject to

$3x + 5y \leq 15,$

$5x + y \leq 15,$

$-x + y \leq 2,$

$4x + 5y \leq 20,$

$x, y \geq 0,$ has

- (A) No solution (B) One solution (C) Infinite solution (D) Finite solutions

68. In simplex method, when the number of non-zero variables is equal to the number of constraints, the set of values is said to form a

- (A) Feasible solution (B) Basic solution (C) Iso-cost solution (D) Optimal solution

69. The coefficient of regression of X and Y for the data

	Series X	Series Y
Average	25	22
S. D.	4	5

is

(A) 1.00 (B) 0.84 (C) 0.64 (D) 0.31

70. The value of the correlation coefficient between two variables lies between

- (A) 0 and ∞ (B) $-\infty$ and $+\infty$ (C) 0 and 1 (D) -1 and 1

71. For a normal distribution, we have

- (A) mean = median (B) median = mode (C) mode = mean (D) mean = median = mode

72. The standard deviation for Poisson distribution with parameter m is
 (A) m (B) \sqrt{m} (C) $\frac{1}{m}$ (D) $\frac{1}{\sqrt{m}}$
73. In case of binomial distribution, probability of r successes is given by
 (A) ${}^n C_r q^{n-r} p^r$ (B) ${}^n C_r p^{n-r} q^r$ (C) ${}^n C_r p^{n-r}$ (D) ${}^n C_r q^{n-r}$
74. Which one of the following statement is true for a given distribution ?
 (A) Mean deviation $>$ Standard deviation
 (B) Mean deviation $<$ Standard deviation
 (C) Mean deviation = Standard deviation
 (D) Mean deviation and Standard deviation are not related
75. For a frequency distribution standard deviation is computed by using the formula
 (A) $\sigma = \frac{\sum f(x - \bar{x})}{\sum f}$ (B) $\sigma = \frac{\sqrt{\sum f(x - \bar{x})^2}}{\sum f}$ (C) $\sigma = \frac{\sqrt{\sum f(x - \bar{x})}}{\sum f}$ (D) $\sigma = \frac{\sqrt{\sum f(x - \bar{x})}}{\sum f}$
75. The average of n numbers $x_1, x_2, x_3, \dots, x_n$ is A . If x_n is replaced by $(n + 1)x_n$, then the new average is
 (A) $\frac{(n-1)A + nx_n}{n}$ (B) $\frac{nA + (n-1)A + x_n}{n}$ (C) $\frac{(n+1)A + nx_n}{n}$ (D) $\frac{nA + (n+1)A + x_n}{n}$
77. Three coins are thrown together. The probability of getting two or more head is
 (A) $\frac{1}{4}$ (B) $\frac{1}{2}$ (C) $\frac{2}{3}$ (D) $\frac{3}{8}$
78. In a ΔABC ,
 $\operatorname{cosec} A (\sin B \cos C + \cos B \sin C)$
 equals
 (A) $\frac{c}{a}$ (B) $\frac{a}{c}$ (C) 1 (D) 0
79. The value of $\tan 9^\circ - \tan 27^\circ - \tan 63^\circ + \tan 81^\circ$ is
 (A) 1 (B) 2 (C) 3 (D) 4
80. If $\sin \alpha = -\frac{3}{5} \left(\pi < \alpha < \frac{3}{2}\pi \right)$, then the value of $\cos \frac{1}{2}\alpha$ is
 (A) $-\frac{1}{\sqrt{10}}$ (B) $\frac{1}{\sqrt{10}}$ (C) $\frac{3}{\sqrt{10}}$ (D) $\frac{7}{\sqrt{10}}$
81. From the top of a lighthouse 60 metres high with its base at the sea-level, the angle of depression of a boat is 15° . The distance of the boat from the foot of the lighthouse is
 (A) $\left(\frac{\sqrt{3}-1}{\sqrt{3}+1} \right)$ 60 metres (B) $\left(\frac{\sqrt{3}+1}{\sqrt{3}-1} \right)$ 60 metres

(C) $\frac{\sqrt{3}+1}{\sqrt{3}-1}$ metres

(D) $\frac{\sqrt{3}-1}{\sqrt{3}+1}$ metres

82. The general solution of the trigonometrical equation

$$\sin x + \cos x = 1$$

is given by

(A) $x = 2n\pi, n = 0, \pm 1, \pm 2, \dots$

(B) $x = 2n\pi + \frac{\pi}{2}, n = 0, \pm 1, \pm 2, \dots$

(C) $x = n\pi + (-1)^n \frac{\pi}{4} - \frac{\pi}{4}, n = 0, \pm 1, \pm 2, \dots$

(D) $x = n\pi + (-1)^n \frac{\pi}{4}, n = 0, \pm 1, \pm 2, \dots$

83. The value of $\frac{1 - \tan^2 15^\circ}{1 + \tan^2 15^\circ}$ is

(A) $\sqrt{3}$

(B) $\frac{\sqrt{3}}{2}$

(C) 1

(D) 2

84. If $\sin \alpha = \sin \beta$, then the angle α and β are related by

(A) $\alpha = 2n\pi + (-1)^n \beta$

(B) $\alpha = n\pi \pm \beta$

(C) $\beta = n\pi + (-1)^n \alpha$

(D) $\beta = (2n+1)\pi + \alpha$

85. The value of $\cos 10^\circ - \sin 10^\circ$ is

(A) Positive

(B) Negative

(C) 0

(D) 1

86. The vector $2\hat{i} + \hat{j} - \hat{k}$ is perpendicular to $\hat{i} - 4\hat{j} + \lambda\hat{k}$, if λ is equal to

(A) 0

(B) -1

(C) -2

(D) -3

87. If $|\vec{a}| = |\vec{b}|$, then $(\vec{a} + \vec{b}) \cdot (\vec{a} - \vec{b})$ is

(A) +tive

(B) -tive

(C) unity

(D) zero

88. If $\vec{A} = 2\hat{i} + 2\hat{j} - \hat{k}$, $\vec{B} = 6\hat{i} - 3\hat{j} + 2\hat{k}$, then $\vec{A} \times \vec{B}$ will be given by

(A) $2\hat{i} - 2\hat{j} - \hat{k}$

(B) $6\hat{i} - 3\hat{j} + 2\hat{k}$

(C) $\hat{i} - 10\hat{j} - 18\hat{k}$

(D) $\hat{i} + \hat{j} + \hat{k}$

89. If the position vectors of three points are

$$\vec{a} - 2\vec{b} + 3\vec{c}, 2\vec{a} + 3\vec{b} - 4\vec{c}, -7\vec{b} + 10\vec{c},$$

then the three points are

(A) Collinear

(B) Coplanar

(C) Non-coplanar

(D) Neither

90. If $\vec{a} = 4\hat{i} + 2\hat{j} - 5\hat{k}$, $\vec{b} = 12\hat{i} - 6\hat{j} + 15\hat{k}$, then the vectors \vec{a} , \vec{b} are

(A) Parallel

(B) Non-parallel

(C) Orthogonal

(D) Non-coplanar

91. If θ is the angle between vectors \vec{a} and \vec{b} , then $|\vec{a} \times \vec{b}| = |\vec{a} \cdot \vec{b}|$ when θ is equal to

(A) 0

(B) 45°

(C) 135°

(D) 180°

92. If $[\vec{a} \ \vec{b} \ \vec{c}]$ is the scalar triple product of three vectors \vec{a} , \vec{b} and \vec{c} , then $[\vec{a} \ \vec{b} \ \vec{c}]$ is equal to
 (A) $[\vec{b} \ \vec{a} \ \vec{c}]$ (B) $[\vec{c} \ \vec{b} \ \vec{a}]$ (C) $[\vec{b} \ \vec{c} \ \vec{a}]$ (D) $[\vec{a} \ \vec{b} \ \vec{c}]$
93. If θ be the angle between the vectors $4(\hat{i} - \hat{k})$ and $\hat{i} + \hat{j} + \hat{k}$, then θ is
 (A) $\frac{\pi}{2}$ (B) $\frac{\pi}{3}$ (C) $\frac{\pi}{4}$ (D) $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
94. $\vec{a} \cdot \vec{b}$ implies only
 (A) $\vec{a} = 0$ (B) $\vec{b} = 0$
 (C) $\theta = 90^\circ$ (D) either $\vec{a} = 0$ or $\vec{b} = 0$ or $\theta = 90^\circ$
95. Point A is $\vec{a} + 2\vec{b}$, P is \vec{a} and P divides AB in the the ratio 2 : 3. The position vector of B is
 (A) $2\vec{a} - \vec{b}$ (B) $\vec{b} - 2\vec{a}$ (C) $\vec{a} - 3\vec{b}$ (D) \vec{b}
96. If the position vectors of A and B are \vec{a} and \vec{b} respectively, then the position vector of a point P which divides AB in the ratio 1 : 2 is
 (A) $\frac{\vec{a} + \vec{b}}{3}$ (B) $\frac{\vec{b} + 2\vec{a}}{3}$ (C) $\frac{\vec{a} + 2\vec{b}}{3}$ (D) $\frac{\vec{b} - 2\vec{a}}{3}$
97. If \vec{a} and \vec{b} are two unit vectors and θ is the angle between them. Then $\vec{a} + \vec{b}$ is a unit vector if
 (A) $\theta = \frac{\pi}{3}$ (B) $\theta = \frac{\pi}{4}$ (C) $\theta = \frac{\pi}{2}$ (D) $\theta = \frac{2\pi}{3}$
98. If two vectors \vec{a} and \vec{b} are parallel and have equal magnitudes, then
 (A) They are not equal (B) They may or may not be equal
 (C) They have the same serise of direction (D) They do not have the same direction
99. Let ABCD be a parallelogram. If \vec{a} , \vec{b} , \vec{c} be the position vectors of A, B, C respectively with reference to the origin O, then the position vector of D with reference to C is
 (A) $\vec{a} + \vec{b} + \vec{c}$ (B) $\vec{b} + \vec{c} - \vec{a}$ (C) $\vec{c} + \vec{a} - \vec{b}$ (D) $\vec{a} + \vec{b} - \vec{c}$
100. If \vec{a} and \vec{b} represent two adjacent sides \overline{AB} and \overline{BC} respectively of a parallelogram ABCD, then its diagonals \overline{AC} and \overline{DB} are equal to
 (A) $\vec{a} + \vec{b}$ and $\vec{a} - \vec{b}$ (B) $\vec{a} - \vec{b}$ and $\vec{a} + \vec{b}$ (C) $\vec{a} + 2\vec{b}$ and $\vec{a} - 2\vec{b}$ (D) $2\vec{a} + \vec{b}$ and $2\vec{a} - \vec{b}$
101. Let the vectors \vec{a} , \vec{b} , \vec{c} be the position vectors of the vertices P, Q, R of a triangle respectively. Which of the following represents the area of the triangle ?

(A) $\frac{1}{2} |\vec{a} \times \vec{b}|$

(B) $\frac{1}{2} |\vec{b} \times \vec{c}|$

(C) $\frac{1}{2} |\vec{c} \times \vec{a}|$

(D) $\frac{1}{2} |\vec{a} \times \vec{b} + \vec{b} \times \vec{c} + \vec{c} \times \vec{a}|$

102. Solution of the differential equation

$$(1 + y^2) dx + (x - e^{-\tan^{-1} y}) dy = 0$$

is

(A) $y e^{\tan^{-1} x} = \tan^{-1} x + c$

(B) $x = e^{\tan^{-1} y} = \tan^{-1} y + c$

(C) $y = \tan^{-1} x e^{\tan^{-1} x} + c$

(D) $x = y e^{-\tan^{-1} x} + c$

103. The value of $\frac{1}{(D-3)(D-2)} e^{2x}$ is

(A) $x e^{2x}$

(B) $2x e^{2x}$

(C) $-x e^{2x}$

(D) $-2x e^{2x}$

104. The particular integral of the differential equation

$$(D^2 - 2D + 1) y = x e^x \sin x$$

is given by

(A) $e^x \sin(x + 1)$

(B) $x(e^x \cos x + \sin x)$

(C) $e^x(x \cos x + \sin x)$

(D) $-e^x(x \sin x + 2 \cos x)$

105. The degree of the differential equation

$$\left[3 + 4 \left(\frac{dy}{dx} \right)^2 + 5 \left(\frac{d^2y}{dx^2} \right)^2 \right]^{2/3} = \left(\frac{d^3y}{dx^3} \right)^2 \text{ is}$$

(A) 3

(B) 4

(C) 5

(D) 6

106. If l denoted slant height, r_1 and r_2 denote the radii of the frustum of cone, then curved surface of cone is

(A) $\pi l (r_1 + r_2)$

(B) $\frac{1}{2} \pi l (r_1 - r_2)$

(C) $\pi r_1 r_2 [1 + (l^2 - r_1 r_2)]$

(D) $\pi r_1 r_2 [1 + (l^2 + r_1 r_2)]$

107. The volume of a right circular cylinder of height h and radius of base r is

(A) $\frac{1}{3} \pi r^2 h$

(B) $\pi r^2 h$

(C) $\frac{4}{3} \pi r^2 h$

(D) $\frac{1}{2} \pi r^2 h$

108. The value of $\int_0^{\pi/4} \frac{\sin \theta + \cos \theta}{9 + 16 \sin 2\theta} d\theta$ is

(A) $\frac{1}{10} \log 2$

(B) $\frac{1}{20} \log 5$

(C) $\frac{1}{20} \log 3$

(D) $\frac{1}{30} \log 7$

109. The value $\int \frac{x-1}{(x-2)(x-3)} dx$ is

- (a) $2 \log(x-2) + \log(x-3)$ (b) $\log(x-2) - \log(x-3)$
 (c) $\log(x-2) + \log(x-3)$ (d) $-\log(x-2) + \log(x-3)$

110. The value of $\int \frac{\tan^{-1} x}{1+x^2} dx$ is

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

111. The value of $\int \log x dx$ is

- (a) $x(\log x + 1)$ (b) $x(\log x - 1)$
 (c) $\log x(x + \log x)$ (d) $x(x - \log x)$

112. The function $f(x) = 8x^5 - 15x^4 + 10x^2$ has no extreme value at

- (a) $x = -\frac{1}{2}$ (b) $x = \frac{1}{2}$ (c) $x = 1$ (d) $x = -1$

113. The function $f(x) = \sin x(1 + \cos x)$ has a maximum value of when

- (a) $x = \frac{1}{2}\pi$ (b) $\frac{1}{3}\pi$ (c) $\frac{1}{4}\pi$ (d) $\frac{1}{5}\pi$

114. The normal to the curve $x = a(\cos \theta + \theta \sin \theta)$, $y = a(\sin \theta - \theta \cos \theta)$ at any point θ is such that it

- (a) Passes through the origin (b) Makes a constant angle with the x-axis
 (c) Makes a constant angle with the y-axis (d) Is at constant distance from the origin

115. The length of the normal at the point $(2, 4)$ to the parabola $y^2 = 8x$ is

- (a) $4\sqrt{2}$ (b) 4 (c) $\sqrt{6}$ (d) $2\sqrt{3}$

116. The equation of tangent to the curve $y^2 = 2x^3 - x^2 + 3$ at the point $(1, 4)$ is

- (a) $y = 2x$ (b) $x = 2y$ (c) $y = 4x$ (d) $x = 4y$

117. The straight line $\frac{x}{a} + \frac{y}{b} = 1$ touches the curve $y = b e^{-x/a}$ at the point

- (a) where it crosses the y-axis (b) where it crosses the x-axis
 (c) $(0, 0)$ (d) $(1, 1)$

118. The differential coefficient of x^x is

- (a) $x^x \log x$ (b) $x^x \left(\log x + \frac{1}{x} \right)$
 (c) $x(\log x + 1)$ (d) $x x^{x-1}$

119. The derivative of $\sin^{-1}\left(\frac{1-x^2}{1+x^2}\right)$ w.r.t. $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is

- (a) -1 (b) 0 (c) $\frac{1}{x}$ (d) x

120. If $f(x) = \begin{cases} 0 & \text{at } x=0 \\ \frac{1}{2} - x + [x] & \text{if } 0 < x < \frac{1}{2} \\ \frac{1}{2} & \text{if } x = \frac{1}{2} \\ \frac{2}{3} - x & \text{if } \frac{1}{2} < x < 1 \end{cases}$

1 if $x = 1$

Then $f(x)$ is

- (a) Continuous at $x = \frac{1}{2}$ (b) Continuous at $x = 1$
 (c) Continuous at $x = 0$ (d) Discontinuous at $x = 0$

121. The value of

$$\lim_{x \rightarrow -2} \frac{\tan \pi x}{x+2} + \lim_{x \rightarrow \infty} \left(1 + \frac{1}{x^2}\right)^x$$

- (a) $\pi + 1$ (b) $\pi - 1$ (c) π (d) 3

122. Every homogeneous equation of second degree in x and y represent a pair of lines

- (a) Parallel to x - axis (b) Perpendicular to y - axis
 (c) Through the origin (d) Parallel to y -axis

123. The difference of the focal distances of any point on the hyperbola $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$ is

- (a) a (b) $2a$ (c) b (d) $2b$

124. If in ellipse the length of latus rectum is equal to half of major axis, then eccentricity of the ellipse is

- (a) $\frac{\sqrt{3}}{2}$ (b) $\frac{1}{2}$ (c) $\sqrt{2}$ (d) $\frac{1}{\sqrt{2}}$

125. An equilateral triangle is inscribed in the parabola $y^2 = 4ax$ whose vertex is at the vertex of the parabola. The length of its side is

- (a) $a\sqrt{3}$ (b) $2a\sqrt{3}$ (c) $4a\sqrt{3}$ (d) $8a\sqrt{3}$

126. Two circles $x^2 + y^2 = 5$ and $x^2 + y^2 - 6x + 8 = 0$ are given. Then the equation of the circle through their point of intersection and the point $(1, 1)$ is

- (a) $x^2 + y^2 - 6x + 4 = 0$ (b) $x^2 + y^2 - 3x + 1 = 0$
 (c) $x^2 + y^2 - 4x + 2 = 0$ (d) $x^2 + y^2 - 5x + 3 = 0$

127. The equation $\sqrt{(x^2 + 4y^2 - 4xy + 4)} + x - 2y = 1$ represents a
 (a) straight line (b) Circle (c) Parabola (d) Pair of lines
128. The co-ordinates of the orthocentre of the triangle formed by the lines $2x^2 - 2y^2 + 3xy + 3x + y + 1 = 0$ and $3x + 2y + 1 = 0$ are
 (a) $\left(\frac{4}{5}, \frac{3}{5}\right)$ (b) $\left(\frac{-3}{5}, \frac{-1}{5}\right)$ (c) $\left(\frac{1}{5}, \frac{4}{5}\right)$ (d) $\left(\frac{2}{5}, \frac{1}{5}\right)$
129. A straight line passes through the point $P(2, \sqrt{3})$ and makes an angle of 60° with the x-axis. The length of the intercept on it between the point P and the line $x + \sqrt{3}y = 12$.
 (a) 1.5 (b) 2.5 (c) 3.5 (d) 4.5
130. If $f = \{(1, 1), (2, 3), (0, -1), (-1, -3)\}$ be a function described by the formula $f(x) = ax + b$ for some integers a, b, then the value of a, b is
 (a) $a = -1, b = 3$ (b) $a = 3, b = 1$
 (c) $a = -1, b = 2$ (d) $a = 2, b = -1$
131. If $A = \{1, 2, 3\}$, $B = \{4, 5, 6\}$, which of the following are relations from A to B?
 (a) $\{(1, 5), (2, 6), (3, 4), (3, 6)\}$ (b) $\{(1, 6), (3, 4), (5, 2)\}$
 (c) $\{(4, 2), (4, 3), (5, 1)\}$ (d) $B \times A$
132. The number of subsets of an n element set is
 (a) $2n$ (b) n (c) 2^n (d) $\frac{1}{2}2^n$
133. If $A = \{a, b, d, l\}$, $B = \{c, d, f, m\}$ and $C = \{a, l, m, o\}$, then $C \cap (A \cup B)$ is given by
 (a) $\{a, d, l, m\}$ (b) $\{b, c, f, o\}$
 (c) $\{a, l, m\}$ (d) $\{a, b, c, d, f, l, m, o\}$
134. The value of $7 \log \frac{16}{15} + 5 \log \frac{25}{24} + 3 \log \frac{81}{80}$ is equal to
 (a) 0 (b) $\log 2$ (c) $\log 3$ (d) $\log 5$
135. If in G.P. sum of n terms is 255, the last term is 128 and the common ratio is 2, then the value of n is equal to
 (a) 2 (b) 4 (c) 8 (d) 16
136. If the ratio of the sum of m terms and n terms of A.P. be $m^2 : n^2$, then its ratio of its m th and n th terms will be :
 (a) $\frac{m-n}{m+n}$ (b) $\frac{2m-1}{2n-1}$ (c) $\frac{2m+1}{2n+1}$ (d) $\frac{m+n}{m-n}$
137. If $x = \frac{1}{2}(\sqrt{3} + 1)$, then the value of expression $4x^3 + 2x^2 - 8x + 7$ equal to
 (a) 10 (b) 5 (c) 0 (d) -2

138. If $A = \begin{bmatrix} 1 & -2 & -3 \\ 2 & 1 & -2 \\ 3 & 2 & 1 \end{bmatrix}$, then A is

- (a) Symmetric matrix
(b) A skew symmetric matrix
(c) A singular matrix
(d) Non-singular matrix

139. If $A = \begin{bmatrix} 1 & 1 & 1 \\ 3 & 3 & 3 \end{bmatrix}$, $B = \begin{bmatrix} -2 & 3 \\ 1 & -5 \\ 4 & 1 \end{bmatrix}$, then AB is equal to

- (a) $\begin{bmatrix} -3 & -1 \\ -9 & -3 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -1 \\ 9 & -3 \end{bmatrix}$ (c) $\begin{bmatrix} -3 & 1 \\ 9 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 1 \\ -9 & 3 \end{bmatrix}$

140. If $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix} = 0$, where x, y, z are unequal and non-zero real numbers, then xyz is equal to

- (a) 1 (b) 2 (c) -1 (d) -2

141. In the binomial expansion of $(a - b)^n$, $n \geq 5$, the sum of the 5th and 6th terms is zero. Then $\frac{a}{b}$ equals

- (a) $\frac{n-4}{5}$ (b) $\frac{n-5}{6}$ (c) $\frac{5}{n-4}$ (d) $\frac{6}{n-5}$

142. If the coefficient of x^7 in the expansion of $\left(px^2 + \frac{1}{qx}\right)^{11}$ is equal to the coefficient of x^{-7} in the expansion of

$\left(px - \frac{1}{qx^2}\right)^{11}$, then

- (a) $pq = 1$ (b) $\frac{p}{q} = 1$ (c) $p + q = 1$ (d) $p - 1 = 1$

143. There are n numbered seats around a round table. Total number of ways in which n_1 ($n_1 < n$) persons can sit around the round table, is equal to

- (a) ${}^n C_{n_1}$ (b) ${}^n P_{n_1}$ (c) ${}^n C_{n_1-1}$ (d) ${}^n P_{n_1-1}$

144. The number of subsets of a set containing n distinct object is

- (a) ${}^n C_1 + {}^n C_2 + {}^n C_3 + {}^n C_4 + \dots + {}^n C_n$ (b) $2^n - 1$
(c) $2^n + 1$ (d) ${}^n C_0 + {}^n C_1 + {}^n C_2 + \dots + {}^n C_n$

145. If $1, \omega, \omega^2, \dots, \omega^{n-1}$ are nth roots of unity, then $(1 - \omega)(1 - \omega^2) \dots (1 - \omega^{n-1})$ is equal to

- (a) n^2 (b) 0 (c) 1 (d) n

146. The value of $\sum_{p=1}^6 2 \left(\sin \frac{2p\pi}{7} - i \cos \frac{2p\pi}{7} \right)$ is

(a) 1

(b) 2

(c) $2i$

(d) $-2i$

147. The coefficient of x^{15} the product

$$(x-1)(2x-1)(2^2x-1)\dots(2^{15}x-1)$$

is equal to

(a) $2^{120} - 2^{108}$

(b) $2^{105} - 2^{121}$

(c) $2^{120} - 2^{105}$

(d) $2^{120} - 2^{104}$

148. The n th term of the series

$$2\frac{1}{2} + 1\frac{7}{13} + 1\frac{1}{9} + \frac{20}{23} + \dots$$
 is

(a) $\frac{20}{5n+3}$

(b) $\frac{20}{5n-3}$

(c) $20(5n+3)$

(d) $\frac{20}{5n^2+3}$

149. The number of quadratic equations which remain unchanged by squaring their roots, is

(a) zero

(b) Four

(c) Two

(d) Infinite

150. The harmonic mean of the roots of the equation

$$(5+\sqrt{2})x^2 - (4+\sqrt{5})x + 8 + 2\sqrt{5} = 0$$
 is

(a) 2

(b) 4

(c) 6

(d) 8