Q1. Find the value of C-expression "4^4"

(A) 0 (B) 4 (C) 256 (D) Syntax Error

Q2. Find the value of C-expression "4/2/2"

(A) 4 (B) 2 (C) 1 (D) Syntax Error

Q3. Find the value of C-expression "4^(2==2)"

(A) 4 (B) 3 (C) 5 (D) 0

Q4. Find the value assigned to variable `x' in the statement "x = (3>2)?4:5"

(A) 3 (B) 2 (C) 4 (D) Syntax Error

Q5. For any integer variable 'x', the operation "x & (x - 1)" is always

(A) Odd (B) Even (C) 0 (D) Syntax Error

Q6. For the following C code fragment, find the values of the variables 'f1' and 'f2'.

```
float f1, f2;
int x = 5;
f1 = x/2; f2 = x/2.0;
```

(A) f1 = 2.0, f2 = 2.0 (B) f1 = 2.0, f2 = 2.5

(C) f1 = 2.5, f2 = 2.0 (D) f1 = 2.5, f2 = 2.5

Q7. For an integer variable 'x', the value of "~x & x" is

(A) 1 (B) 2 (C) Syntax Error (D) 0

Q8. For the following code fragment, find the value assigned to variable 'f'

```
float f;
int x;
x = 5;
f = x/2 + x/2.0;
```

(A) 4.0 (B) 4.5 (C) 5.0 (D) 5.5

Q9. For any integer variable 'x', value of expression "~(x ^ ~x) | 1" is

(A) 0 (B) 1 (C) 'x' (D) 1

Q10. For the following C code fragment compute the value of 'x'

```
{ int x;
  {
    float x;
    x = 5.5;
  }
  printf("%d", x);
}
```

(A) 5 (B) Syntax Error (C) 0 (D) Not predictable

Q11. Number of different digit symbols in a base-*d* number system is
(A) *d* (B) *d* - 1 (C) *d* + 1 (D) 10

Q12. Find the value of 'x' if $(72)_x = (100)_{10}$
(A) 10 (B) 14 (C) Indeterminate (D) 9

Q13. The minimum values of 'x' and 'y', satisfying the relation $(43)_x = (34)_y$ are
(A) x = 7 y = 9 (B) x = 4 y = 5 (C) x = 10 y = 13 (D) x = 1 y = 1

Q14. Which of the following is true for 1's complement number system?
(A) Cannot represent negative numbers
(B) Has two representations for zero
(C) Difficult to compute compared to 2's complement system
(D) Cannot represent positive numbers

Q15. Find the representation of 5 in 4-bit 2's complement number system
(A) 0101 (B) 1011 (C) Cannot be represented (D) 1001

Q16. Find the representation of -8 in 4-bit 2's complement number system
(A) 0100 (B) 1111 (C) 1000 (D) Cannot be represented

Q17. Find the representation of -9 in 4-bit 2's complement number system
(A) 0111 (B) 1001 (C) Not unique (D) Cannot be represented

Q18. Convert the number $(1010111)_2$ to hexadecimal
(A) 57 (B) AE (C) 5A (D) 7E

Q19. Convert the octal number $(756)_8$ to hexadecimal
(A) F70 (B) 1EE (C) FEE (D) 170

Q20. Represent the decimal number 47 in base 3 number system
(A) Cannot be represented (B) 21221 (C) 1202 (D) 1122

Q21. The number $(676)_9$ in base 7 number system is
(A) 1422 (B) 1242 (C) 2144 (D) 4421

Q22. Operation of first generation computers used to be controlled by

(A) Semiconductor diodes (B) Microprocessors
(C) Vacuum Tubes (D) Liquids

Q23. Nature of data in RAM (Random Access Memory) is
(A) Temporary (B) Permanent (C) Semi-permanent (D) Quasi-permanent

Q24. Which device can act as both input and output
(A) Light Pen (B) Joy Stick (C) Key Board (D) Disk

Q25.Who developed Windows
(A) Charles Babbage (B) Herman Hollerith (C) Steve Jobs (D) Bill Gates

Q26. The first all electric computer was
(A) ENIAC (B) MARK 1 (C) EDVAC (D) SUN

Q27. "BIOS" stands for
(A) Basic Input-Output System (B) Beginners Input-Output System
(C) Big Input-Output System (D) Bold Input-Output System

Q28. Which of the following requires refreshing?
(A) SRAM (B) DRAM (C) ROM (D) All of them

Q29. The full form of EEPROM is
(A) Electrically Erasable Programmable Read Only Memory
(B) Easily Erasable Programmable Read Only Memory
(C) Electronically Erasable Programmable Read Only Memory
(D) None of the above

Q30. MICR stands for
(A) Magnetic Ink Character Reader
(B) Magnetic Ink Code Reader
(C) Magnetic Ink Case Reader
(D) None of the above

Q31. The special symbol allowed in the name of a variable in C language is
(A) * (asterisk) (B) _ (underscore) (C) % (percentage) (D) - (hyphen)

Q32. The statement "extern int k" is a
(A) Function (B) Definition (C) Declaration (D) Syntax error

Q33. Keywords and variable names of C language are

(A) Case-sensitive (B) Case-insensitive (C) Not known (D) Mixed

Q34. Number of "main" functions in a C program

(A) May be 0 (B) Must be 1 (C) May be 2 (D) May be many

Q35. In a "case"-statement, the "case" keyword must be followed by a constant of type

(A) integer (B) character (C) integer or character (D) float

Q36. The loop-index of a "for-loop" statement in C language may be

(A) an integer (B) A character (C) a float (D) All of them

Q37. This loop-body is executed at least once

(A) for (B) while-do (C) do-while (D) All of them

Q38. The "continue" statement within a loop

(A) terminates the loop
(B) starts the loop iteration afresh
(C) starts the next iteration of the loop
(D) starts the next iteration of the outermost loop for nested loops

Q39. The values of the variables 'x', 'y' and 'z' after executing the following code fragment are

```
x = 5;
y = 4;
z = ++x + y++;
```

(A) 5,5,9 (B) 6,5,10 (C) 6,5,11 (D) 5,5,10

Q40. The type of parameter passing in C-language is called

(A) Call-by-value (B) Call-by-name (C) Call-by-reference (D) Call-by-result

Q41. What will be the output of the following program?

```
int main()
{
        int a[5] = {3, 4, 10, 12, 20};
        int i, j, k;
        i = ++a[0];
        j = a[1]++;
        k = a[i++] + a[j++];
        printf ("%d %d %d", i, j, k);
}
```

(A) 5 5 20 (B) 5 5 40 (C) 3 5 20 (D) 5 4 40

Q42. What can you say about the following program?

```
int main()
{
        int a = 45, b = 75, c = 85;
        if (c > b > a)
                printf("TRUE\n");
        else
                printf("FALSE\n");
}
```

(A) Prints "TRUE" (B) Prints "FALSE" (C) Syntax error (D) Output indeterminate

Q43. What will be the output of the following program?

```
int main()
{
        char a[] = "Entrance test";
        a[4] = 0;
        printf("%s", a);
}
```

(A) Entr (B) Entra (C) Entrance (D) Entrance test

Q44. What will be the type and value of variable 'x' after executing the following code fragment?

```
int a[10];
int *p, *q;
____ x;
p = &a[5];
q = a + 8;
p = p + 2;
x = q - p;
```

(A) int, 1 (B) int, 3 (C) pointer, 1 (D) pointer, 3

Q45. What will be the output of the following code fragment for x = 4?

```
switch (x)
{
        default: printf("It is default ");
        case 1:
        case 2: printf("1 or 2 ");
                break;
        case 3: printf("3 ");
}
```

(A) It is default 1 or 2 3 (B) It is default
(C) It is default 1 or 2 (D) Compilation error

Q46. What will be the output of the following code fragment?

```
int increase (int x)
{
        x = x + 1;
        return x;
}
int main()
{
        int y = 5;
        y = increase(y);
        increase(y);
        printf("%d\n", y);
}
```

(A) 5 (B) 6 (C) 7 (D) 8

Q47. What will be the output of the following program?

```
int main()
{
        char s[10] = "abcdefghi";
        s[5] = 0;
        printf("%s%s", s, s+6);
}
```

(A) abcdeghi (B) abcde0ghighi (C) abcdefghighi (D) abcdef0ghighi

Q48. For the variable declaration "float a; double b;", which of the following should be used to read the values?

(A) scanf("%f%lf", &a, &b); (B) scanf("%f%f", &a, &b);
(C) scanf("%f%Lf", &a, &b); (D) scanf("%lf%Lf", &a, &b);

Q49. What will be the output of the following program?

```
# define x 5+2
int main()
{
        int y;
        y = x * x * x;
        printf ("%d", y);
}
```

(A) 343 (B) 125 (C) 13 (D) 27

Q50. What will be the output of the following code fragment?

```
struct my_rec
{ int a, b, c; };
struct my_rec s = {8, 9, 10};
struct my_rec *p = &s;
printf("%d", *((int *)p + 1));
```

(A) 8 (B) 9 (C) 10 (D) 17

Q51. What will be the output of the following code fragment?

```
float a = 0.5;
if (a == 0.5)
        printf("Yes");
else
        printf("No");
```

(A) Yes (B) No (C) Compilation error (D) Syntax error

Q52. What will be the output of the following code fragment?

```
char s[5] = "abcd";
char *p = s;
char *q = s;
while (*p) p++; p--;
while (p != q) { printf("%c", *p); p --;}
```

(A) abcd (B) bcda (C) dcba (D) Syntax error

Q53. What will be the output of the following program?

```
int swap (int a, int b)
{
        a = a + b;
        b = a - b;
        a = a - b;
}
int main()
{
        int x = 10, y = 20;
        swap( x, y );
        printf("%d %d\n", x, y);
}
```

(A) 10 20 (B) 20 10 (C) 10 30 (D) 30 20

Q54. For the following recursive function supposed to add numbers 1 to 'n' what should be T1 and T2?

```
int sum(int n)
{
        if (n > 0) return n + <T1>;
```

```
        else return <T2>;
}
```

(A) sum(n-1) 0 (B) sum(n-2), 1 (C) sum(n+1), 0 (D) sum(n+2), 1

Q55. What will be the output of the following code fragment?

```
{ int *p, *q;
  *p = 5;
  *q = 5;
  if (*p == *q)
        printf("Equal");
  else
        printf("Not equal");
}
```

(A) Equal (B) Not equal (C) Syntax error (D) Runtime error

Q56. For a C program supporting command-line arguments, the first argument is

(A) Name of the program (B) NULL
(C) Second argument passed (D) All arguments together as a string

Q57. For the following code fragment, the amount of space allocated to variable 'x', assuming the size of integer to be 4 bytes and float 6 bytes, is

```
union abc {
        int a;
        float b;
        struct cdf {
                int v;
                float c;
        } f;
} x;
```

(A) 10 bytes (B) 20 bytes (C) 14 bytes (D) 16 bytes

Q58. For the following declarations, which variable requires the maximum amount of storage space?

```
int *p;
float *q;
char *s;
double *r;
```

(A) r (B) q (C) p (D) All require same space

Q59. In C functions, arrays are passed by

(A) Name (B) Reference (C) Value (D) Number

Q60. For the following C function, find the value returned by the call "ackermann(2,3)".

```
int ackermann(int m, int n){
        if (m == 0) return n + 1;
         if (n == 0) return ackermann(m - 1, 1);
```

```
        return ackermann(m - 1, ackermann(m, n - 1));
    }
```

(A) 7 (B) 9 (C) 4 (D) 5

61. The determinant $\begin{vmatrix} 1 & \sin 3\theta & \sin^3\theta \\ 2\cos\theta & \sin 6\theta & \sin^3 2\theta \\ 4\cos^2\theta - 1 & \sin 9\theta & \sin^3 3\theta \end{vmatrix}$ equals

(A) -2 (B) -1 (C) 1 (D) 0

62. If $\begin{vmatrix} x & 1 & 5 \\ 1 & 5 & x \\ 5 & x & 1 \end{vmatrix} = \begin{vmatrix} x & 2 & 4 \\ 2 & 4 & x \\ 4 & x & 2 \end{vmatrix} = \begin{vmatrix} x & -1 & 7 \\ -1 & 7 & x \\ 7 & x & -1 \end{vmatrix} = 0,$ then x equals

(A) 6 (B) -6 (C) 3 (D) -3

63. For a fixed positive integer n, let $D = \begin{vmatrix} (n-1)! & (n+1)! & (n+3)!/\,n(n+1) \\ (n+1)! & (n+3)! & (n+5)!/\,(n+2)(n+3) \\ (n+3)! & (n+5)! & (n+7)!/\,(n+4)(n+5) \end{vmatrix}$. Then $\dfrac{D}{(n-1)!(n+1)!(n+3)!}$ is equals to

(A) -8 (B) -16 (C) -32 (D) -64

64. Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$, where $a, b \in \mathbf{N}$. If $AB = BA,$ then there exists

(A) only one B
(B) infinitely many B's
(C) more than one but finite B's
(D) no such B

65. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $|A^3| = 125,$ then α is

(A) ± 1 (B) ± 2 (C) ± 3 (D) ± 4

66. If a matrix has 13 elements, then the possible dimension (order) it can have are

(A) 1×13 or 13×1 (B) 1×26 or 26×1 (C) 2×13 or 13×2 (D) None

67. If the system of equations

$x-ky-z=0$

$kx-y-z=0$

$x+y-z=0$

has a non-zero solution, then the possible values of k are

(A) -1,2 (B) 1,2 (C) 0,1 (D) -1,1

68. Let $P(6,3)$ be a point on the hyperbola $\frac{x^2}{a^2}-\frac{y^2}{b^2}=1$. If the normal at the point P intersects the x-axis at (9,0), then the eccentricity of the hyperbola is

(A) $\sqrt{\frac{5}{2}}$ (B) $\sqrt{\frac{3}{2}}$ (C) $\sqrt{2}$ (D) $\sqrt{3}$

69. The circle passing through the point (-1,0) and touching the y-axis at (0,2) also passes through the point

(A) $\left(-\frac{3}{2},0\right)$ (B) $\left(-\frac{5}{2},2\right)$ (C) $\left(-\frac{3}{2},\frac{5}{2}\right)$ (D) $(-4,0)$

70. The length of the chard intercepted by the parabola $y^2=8x$ on the straight line $2x-y-3=0$ is

(A) $2\sqrt{5}$ (B) $3\sqrt{5}$ (C) $4\sqrt{5}$ (D) $5\sqrt{5}$

71. If the distance between the plane $Ax-2y+z=d$ and the plane containing the lines $\frac{x-1}{2}=\frac{y-2}{3}=\frac{z-3}{4}$ and $\frac{x-2}{3}=\frac{y-3}{4}=\frac{z-4}{5}$ is $\sqrt{6}$, then $|d|$ is

(A) 4 (B) 6 (C) 8 (D) 10

72. Equation of the plane containing the straight line $\frac{x}{2}=\frac{y}{3}=\frac{z}{4}$ and perpendicular to the plane containing the straight line $\frac{x}{3}=\frac{y}{4}=\frac{z}{2}$ and $\frac{x}{4}=\frac{y}{2}=\frac{z}{3}$ is

(A) $x+2y-2z=0$ (B) $3x+2y-2z=0$

(C) $x-2y+z=0$ (D) $5x+2y-4z=0$

73. Let P,Q,R and S be the points on the plane with position vectors $-2\hat{i}-\hat{j},\ 4\hat{i},\ 3\hat{i}+3\hat{j}$ and $-3\hat{i}+2\hat{j}$ respectively. The quadrilateral $PQRS$ must be a

(A) Parallelogram, which is neither a rhombus nor a rectangle

(B) Square

(C) Rectangle, but not a square

(D) Rhombus, but not a square.

74. The value of sine of the angle between the vectors $\hat{i}-2\hat{j}+3\hat{k}$ and $2\hat{i}+\hat{j}+\hat{k}$ is

(A) $\frac{5}{21}$ (B) $\frac{5}{\sqrt{7}}$ (C) $\frac{5}{\sqrt{14}}$ (D) $\frac{5}{2\sqrt{7}}$

75. A unit vector normal to the plane through the points $\hat{i},\ 2\hat{j},\ 3\hat{k}$ is

(A) $6\hat{i}+3\hat{j}+2\hat{k}$ (B) $\hat{i}+2\hat{j}+3\hat{k}$ (C) $\frac{6\hat{i}+3\hat{j}+2\hat{k}}{7}$ (D) $\frac{6\hat{i}+3\hat{j}+2\hat{k}}{9}$

76. The values of λ and μ for which $-3\hat{i}+4\hat{j}+\lambda\hat{k}$ and $\mu\hat{i}+8\hat{j}+6\hat{k}$ are collinear are

(A) $\mu=3,\ \lambda=-6$ (B) $\mu=-3,\ \lambda=6$ (C) $\mu=-6,\ \lambda=3$ (D) $\mu=-6,\ \lambda=-3$

77. Let $A=\lim_{x\to 1}\sqrt{x^4-4x^3+5x^2-2x}$ and $B=\lim_{x\to -3}\frac{x+1}{(x+3)^2}$. Then

(A) A does not exist and $B=-\infty$

(B) A exists and equals to 0, and $B=-\infty$

(C) A exists and equals to 0, and $B=+\infty$

(D) Both A and B do not exist.

78. Given $f(\theta)=\begin{cases}(\cos\theta-\sin\theta)^{\operatorname{cosec}\theta}, & \text{if } -\frac{\pi}{2}<\theta<0\\ a, & \text{if } \theta=0\\ \frac{e^{1/\theta}+e^{2/\theta}+e^{3/\theta}}{ae^{2/\theta}+be^{3/\theta}}, & \text{if } 0<\theta<\frac{\pi}{2}\end{cases}$

If $f(\theta)$ is continuous at $\theta=0$, then

(A) $a=e,b=e$ (B) $a=\frac{1}{e},b=e$ (C) $a=e,b=\frac{1}{e}$ (D) $a=\frac{1}{e},b=\frac{1}{e}$

79. Let $f(x)=\left[n+p\sin x\right], x\in(0,\pi), n$ is an integer and p is a prime number, where $[.]$ denotes the greatest integer function. Then the number of points where $f(x)$ is not differentiable, is

(A) p (B) $p-1$ (C) $2p$ (D) $2p-1$

80. If $z=x^n f_1\left(\frac{y}{x}\right)+y^{-n} f_2\left(\frac{x}{y}\right)$, then $x^2\frac{\partial^2 z}{\partial x^2}+2xy\frac{\partial^2 z}{\partial x\partial y}+y^2\frac{\partial^2 z}{\partial y^2}+x\frac{\partial z}{\partial x}+y\frac{\partial z}{\partial y}$ is

(A) n^2 (B) n^2x (C) n^2y (D) n^2z

81. Examine for minimum and maximum values of $f(x,y)=\sin x+\sin y+\sin(x+y)$

(A) $f(x,y)$ has maximum at $\left(\frac{\pi}{3},\frac{\pi}{3}\right)$

(B) $f(x,y)$ has minimum at $\left(\frac{\pi}{3},\frac{\pi}{3}\right)$

(C) $f(x,y)$ has neither maximum nor minimum

(D) $f(x,y)$ has maximum at $\left(\frac{\pi}{3},\frac{\pi}{3}\right)$ and has minimum at $\left(\frac{\pi}{3},\frac{\pi}{3}\right)$

82. Let

$$f(x,y)=\begin{cases}\dfrac{x^3+2y^3}{x^2+y^2}, & (x,y)\neq(0,0);\\ 0, & (x,y)=(0,0).\end{cases}$$

Which of the following statements is correct?

(A) $f(x,y)$ is continuous and differentiable at (0,0)

(B) $f(x,y)$ is not continuous at (0,0)

(C) $f(x,y)$ is continuous and not differentiable at (0,0)

(D) $f(x,y)$ is differentiable at (0,0)

83. Let $f(x)$ is a real function not identically zero such that $f(x+y^{2n+1})=f(x)+f(y)^{2n+1}, n\in\mathbf{N}$ and x, y are any real number and $f'(0)\geq 0.$ find the value of $f(5)$ and $f'(10).$

(A) 25 and 100 (B) 5 and 1 (C) 4 and 40 (D) 10 and 5

84. If $y = m\sin(m\sin^{-1}x)$, then the value of $(x^2-1)\frac{d^2y}{dx^2}+x\frac{dy}{dx}$ is

(A) $-m^2y$ (B) $-my$ (C) m^2y (D) my

85. If $y=\sin^{-1}x=a_0+a_1x+a_2x^2+\text{L}$, then $n(n+1)a_{n+1}$ equals

(A) $(n-1)^2a_{n-1}$ (B) n^2a_n (C) n^2a_{n+1} (D) $(n+1)^2a_{n+1}$

86. If the function $f(x)=x^3+e^{x/2}$ and $g(x)=f^{-1}(x)$, then the value of $g'(1)$ is

(A) 1 (B) 2 (C) 0 (D) 3

87. The value of $\int_0^1 \frac{x^4(1-x)^4}{1+x^2}dx$ is

(A) $\frac{22}{7}-\pi$ (B) $\frac{2}{105}$ (C) 0 (D) $\frac{71}{15}-\frac{3\pi}{2}$

88. If $f(x)$ is differentiable and $\int_0^{t^2} xf(x)dx=\frac{2}{5}t^5$, then $f\left(\frac{4}{25}\right)$ equals

(A) 2/5 (B) -5/2 (C) 1 (D) 5/2

89. $\int_0^1 x\sqrt{\frac{1-x^2}{1+x^2}}\,dx=$

(A) $\frac{\pi}{4}$ (B) $\frac{\pi-1}{4}$ (C) $\frac{\pi-2}{4}$ (D) $\frac{\pi}{2}$

90. The value of $\lim_{x\to 0}\frac{1}{x^3}\int_0^x \frac{t\log_e(1+t)}{t^4+4}dt$ is

(A) 0 (B) 1/12 (C) 1/24 (D) 1/64

91. Let $f:[-1,2]\to[0,\infty)$ be a continuous function such that $f(x)=f(1-x)$ for all $x\in[-1,2]$. Let $R_1=\int_{-1}^{2} xf(x)dx$ and R_2 be the area of the region bounded by $y=f(x),\ x=-1,\ x=2$ and the x-axis. Then

(A) $R_1=2R_2$ (B) $R_1=3R_2$ (C) $2R_1=R_2$ (D) $3R_1=R_2$

92. The equation of the curve satisfying the differential equation $(1+x^2)dy+2xydx=4x^2dx$ and passing through the origin is

(A) $4y(1+x^2)=3x^3$ (B) $3y(1+x^2)=4x^3$ (C) $y(1+x^2)=4x^3$ (D) $3y(1+x^2)=x^3$

93. The general solution of $x^2\frac{d^2y}{dx^2}-x\frac{dy}{dx}+4y=x\sin(\log x)$, C_1 and C_2 are constant of integration, is

(A) $y=x[C_1\cos(\sqrt{3}\log x)+C_2\sin(\sqrt{3}\log x)]+\frac{x}{2}\sin(\log x)$

(B) $y=\log x[C_1\cos(\sqrt{3}\log x)+C_2\sin(\sqrt{3}\log x)]+\frac{1}{2}\log x\sin(\log x)$

(C) $y=C_1\cos(\sqrt{3}\log x)+C_2\sin(\sqrt{3}\log x)+\frac{x}{2}\sin(\log x)$

$y=\frac{x}{2}[C_1\cos(\sqrt{3}\log x)+C_2\sin(\sqrt{3}\log x)]+\frac{x}{2}\cos(\log x)$

94. The integrating factor of the differential equation $(2x^2y^2+y)dx+(-x^3y+3x)dy=0$ is

(A) $x^{-11/7}$ (B) $y^{-19/7}$ (C) $x^{-11/7}y^{-19/7}$ (D) $x^{11/7}\ y^{19/7}$

95. The differential equation $x\frac{dy}{dx}-y+1=0$ and $y(0)=1$ has

(A) No solution (B) exactly one solution (C) at most one solution (D) more than one solution

96. The probability of scoring 10 in a single throw with 6 dice is

(A) $\frac{5}{2592}$ (B) $\frac{7}{2592}$ (C) $\frac{9}{2592}$ (D) $\frac{11}{2592}$

97. Let X be a continuous random variable with p.d.f given by

$$f_X(x)=\begin{cases}\frac{x}{2}, & 0\le x\le 1;\\ \frac{1}{2}, & 1<x\le 2;\\ \frac{(3-x)}{2}, & 2<x\le 3;\\ 0, & \text{elsewhere.}\end{cases}$$

The mean of X is

(A) $\frac{9}{2}$ (B) $\frac{1}{2}$ (C) $\frac{3}{2}$ (D) $\frac{3}{4}$

98. Four persons are chosen at random from a group containing 3 men, 2 women and 4 children. The chance that exactly two of them will be children, is

(A) $\frac{12}{21}$ (B) $\frac{13}{21}$ (C) $\frac{10}{21}$ (D) $\frac{11}{21}$

99. Four students have identical umbrellas, which they keep in some definite place while attending class. After the class, each student selects an umbrella at random and goes home. The probability that at least one umbrella goes to the original owner, is

(A) $\frac{3}{8}$ (B) $\frac{5}{8}$ (C) $\frac{4}{8}$ (D) $\frac{1}{8}$

100. If ω is a cube root of unity, then a root of the equation $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix}=0$ is

(A) $x=1$ (B) $x=\omega$ (C) $x=\omega^2$ (D) $x=0$

101. The set $\left\{\mathrm{Re}\left(\frac{2iz}{1-z^2}\right): z \text{ is a complex number, } |z|=1,\ z\neq\pm1\right\}$ is

(A) $(-\infty,-1)\cup[1,\infty)$

(B) $(-\infty,-1)\cup(1,\infty)$

(C) $(-\infty,-1]\cup(1,\infty)$

(D) $(-\infty,-1]\cup[1,\infty)$

102. Let $\omega=e^{\frac{i\pi}{3}}$, and a,b,c,x,y,z be no-zero complex numbers such that

$a+b+c=x$

$a+b\omega+c\omega^2=y$

$a+b\omega^2+c\omega=z$

Then the value of $\frac{|x|^2+|y|^2+|z|^2}{|a|^2+|b|^2+|c|^2}$ is

(A) 1 (B) 2 (C) 3 (D) 4

103. The maximum value of $\left|Arg\left(\frac{1}{1-z}\right)\right|$ for $|z|=1,\ z\neq1$ is given by

(A) $\frac{\pi}{2}$ (B) $\frac{\pi}{4}$ (C) $\frac{\pi}{8}$ (D) $\frac{3\pi}{4}$

104. The co-ordinates of three points P, Q, and R are respectively (1, 8, 4), (2, -3, 1) and (0, -11, 4). The co-ordinates of another point S which is the foot of perpendicular from P on QR is

(A) (4, 5, 2) (B) (4, -5, 2) (C) (-4, 5, 2) (D) (4, 5, -2)

105. The extremities of the diameter of a sphere are the points (3, 4, -2) and (-2, -1, 0). The radius of the sphere is

(A) $2\sqrt{6}$ (B) $\frac{3}{2}\sqrt{6}$ (C) $\frac{5}{2}\sqrt{6}$ (D) $3\sqrt{6}$

106. If α and β are two distinct solutions of $2\cos x+3\sin x=5$, then $\tan\left(\frac{\alpha+\beta}{2}\right)$ is equal to

(A) $\frac{3}{2}$ (B) $\frac{2}{3}$ (C) $\frac{5}{2}$ (D) $\frac{2}{5}$

107. The value of the expression $\cos^2\theta+\cos^2\left(\frac{\pi}{3}+\theta\right)-\cos\theta\cos\left(\frac{\pi}{3}+\theta\right)$ is

(A) 1 (B) $\frac{1}{4}$ (C) $\frac{3}{4}$ (D) $\frac{5}{4}$

108. If the base angles of a triangle are $22\frac{1}{2}^\circ$ and $112\frac{1}{2}^\circ$, then the height of the triangle is equal to

(A) half the base (B) base

(C) twice the base (D) four times the base

109. If $\cos^{-1}\left(\frac{x}{2}\right)+\cos^{-1}\left(\frac{y}{3}\right)=\theta,$ then the value of $9x^2-12xy\cos\theta+4y^2$ at $\theta=\frac{\pi}{4}$ is

(A) 9 (B) 18 (C) 36 (D) 72

110. The equation $\sin^{-1}x=2\sin^{-1}a,$ where a is a real number, has a solution for

(A) all real values of a (B) $a<1$

(C) $-1<a<1$ (D) $-\frac{1}{\sqrt{2}}\le a\le\frac{1}{\sqrt{2}}$

111. If $\cos xy+\cos y=2$ and $\sin x+\sin y=2,$ the value of $\sin(x+y)$ is

(A) 1 (B) 2 (C) 4 (D) 8

112. Given that $A=\{1,2,3,4,5\}$ and that the function $f:A\to A$ is defined by $f(1)=4,$ $f(2)=1,$ $f(3)=4,$ $f(4)=2$ and $f(5)=4.$ Then $f^{-1}(1,2)$ is equal to

(A) $\{1,2\}$ (B) $\{2,1\}$ (C) $\{2,4\}$ (D) $\{4,2\}$

113. Suppose $A_1,A_2,...,A_{30}$ are thirty sets each with five elements and $B_1,B_2,...,B_n$ are n sets each with three elements. Let,

$$\bigcup_{i=1}^{30} A_i = \bigcup_{j=1}^{n} B_j = S.$$

Assume that each element of S belongs to exactly ten of $\mathbf{A_i'}$ s and to exactly nine of the $\mathbf{B_j'}$ s. The value of n is

(A) 5 (B) 15 (C) 30 (D) 45

114. The sum of cubes of three successive natural numbers is always divisible by

(A) 11 (B) 9 (C) 7 (D) 5

115. If $(1+x)^n = c_0 + c_1 x + c_2 x^2 + \ldots + c_n x^n$, then the value of $\frac{c_0}{1} + \frac{c_2}{3} + \frac{c_4}{5} + \ldots$ is equal to

(A) $\frac{2}{n+1}$ (B) $\frac{2^{n-1}}{n+1}$ (C) $\frac{2^n}{n+1}$ (D) $\frac{2^{n+1}}{n+1}$

116. The line $3x + 2y = 24$ meets the y-axis at A and the x-axis at B. The perpendicular bisector of AB meets the line through (0, -1) parallel to the x-axis at C. The area of the triangle ABC is

(A) 91 (B) 13 (C) 7 (D) 1

117. The equation of the bisector of the acute angle between the lines $3x - 4y + 7 = 0$ and $12x + 5y - 2 = 0$ is

(A) $21x + 77y - 101 = 0$ (B) $21x - 77y - 101 = 0$

(C) $11x + 3y + 9 = 0$ (D) $11x - 3y + 9 = 0$

118. The circles $x^2 + y^2 + 2x - 2y + 1 = 0$ and $x^2 + y^2 - 2x - 2y + 1 = 0$

(A) touch each other internally (B) touches each other externally

(C) intersect on the y-axis (D) do not touch each other

119. The points (5, 0), (0, 12) and (-5, 0) are the vertices of an isosceles triangle. The equation of its inscribed circle is

(A) $3x^2 + 3y^2 - 20y = 0$ (B) $3x^2 + 3y^2 + 20y = 0$

(C) $x^2 + y^2 - 20y = 0$ (D) $x^2 + y^2 + 20y = 0$

120. The hexadecimal equivalent of the decimal number 3872 is

(A) F16 (B) F18 (C) F20 (D) F22