Q.1 A child possesses 2 pencils and 3 erasers. How many ways can he choose one pencil and one eraser?
(a) 5 (b) 6 (c) 8 (d) 9

Q.2 A father, accompanied by his 8 children, visits the zoo in groups of 3 at a time, ensuring that he doesn't take the same set of 3 children together more than once. The number of visits he will make to the garden is:
(a) 336 (b) 112 (c) 56 (d) None of these

Q.3 Determine the count of 4-letter words that can be created from the letters in the word "PULSE" while allowing for repetition.
(a) 120 (b) 125 (c) 625 (d) 3125

Q.4 Determine the count of 4-letter words that can be formed from the letters in the word "PULSE" without repetition.
(a) 20 (b) 60 (c) 120 (d) 240

Q.5 Determine the count of 5-letter words that can be created from the letters in the word "PULSE" with the allowance of repetition.
(a) 25 (b) 120 (c) 125 (d) 3125

Q.6 Calculate the quantity of 5-letter words that can be constructed from the letters in the word "PULSE" without allowing repetition.
(a) 20 (b) 60 (c) 120 (d) 240

Q.7 Determine the count of 5-digit numbers that can be generated without repeating any digits.
(a) 27216 (b) 50400 (c) 100000 (d) 90000

Q.8 If an event can occur in 'm' different ways, followed by another event that can occur in 'n' different ways, then the total number of occurrences of the events in the given order is _____.
(a) $m + n$ (b) m-n (c) mn (d) $\frac{m}{n}$

Q.9 If there are 4 paths to travel from Delhi to Kanpur, then the number of ways a person can travel from Delhi to Kanpur and come back to Delhi via a different path is _____.
(a) 4 (b) 8 (c) 12 (d) 16

Q.10 If there are four paths for traveling from Delhi to Kanpur, then in how many ways can a person travel from Delhi to Kanpur and return to Delhi via the same path?
(a) 4 (b) 8 (c) 12 (d) 16

Q.11 If there are four distinct paths for traveling from Delhi to Kanpur, then how many different ways can a person travel from Delhi to Kanpur and then return to Delhi?
(a) 4 (b) 8 (c) 12 (d) 16

Q.12 If $(1 + x)^{15} = C_0 + C_1x + C_2x^2 + \cdots + C_{15}x^{15}$, then $C_2 + 2C_3 + 3C_4 + \cdots + 14C_{15}$ Is equal to.
(a) 14.2^{14} (b) $13.2^{14} + 1$ (c) $13.2^{14} - 1$ (d) None of these

Q.13 If the binomial expansion of $(a + bx)^{-2}$ is $\frac{1}{4} - 3x + \cdots$, then find (a, b)
(a) (2, 12) (b) (2, 8) (c) (-2,-12) (d) None of these

Q.14 If a_1, a_2, a_3, a_4 are the coefficients of any four consecutive terms in the expansion of $(1 + x)^n$, then $\frac{a_1}{a_1+a_2} + \frac{a_3}{a_8+a_4}$ is equal to.
(a) $\frac{a_2}{a_2+a_3}$ (b) $\frac{1}{2}\frac{a_2}{(a_2+a_m)}$ (c) $\frac{2a_2}{a_2+a_8}$ (d) $\frac{2a_3}{a_2+a_8}$

Q.15 Let n be an odd integer. If $\sin n\theta = \sum_{r=0}^{n} b_r \sin^r \theta$ for every value of θ, then
(a) $b_0 = 1, b_1 = 3$ (b) $b_0 = 0, b_1 = n$
(c) $b_0 = -1, b_1 = n$ (d) $b_0 = 0, b_1 = n^2 - 3n + 3$

Q16 If n is odd, then $C_0^2 - C_1^2 + C_2^2 - C_3^2 + \cdots + (-1)^n C_n^2$ is equal to
(a) 0 (b) 1 (c) ∞ (d) $\frac{n!}{(\frac{n}{2})^2!}$

Q.17 ${C_0}^{15} \cdot {C_5}^{.5} + {C_1}^{15}{C_4}^{.5} + {C_2}^{15}{C_3}^{.5} + {C_3}^{15}{C_2}^{5} + {C_4}^{15}{C_1}^{.5}$ is equal to
(a) $2^{20} - 2^5$ (b) $\frac{20!}{5!15!} - 1$ (c) $\frac{20!}{5!15!} - 1$ (d) $\frac{20!}{5!15!} - \frac{15!}{5!10!}$

Q.18 $\frac{1}{1!(n-1)!} + \frac{1}{3!(n-3)!} + \frac{1}{5!(n-5)!} + \cdots$ is equal to
(a) $\frac{2^n}{n!}$ (b) $\frac{2^{n-1}}{n!}$ (c) 0 (d) None of these

Q.19 If the value of x is sufficiently small that x^3 and higher powers of x can be neglected, then $\frac{(1+x)^{3/2} - (1+\frac{1}{2}x)^3}{(1-x)^{1/2}}$ can be approximated as.
(a) $\frac{x}{2} - \frac{3}{8}x^2$ (b) $-\frac{3}{8}x^2$ (c) $3x + \frac{3}{8}x^2$ (d) $1 - \frac{3}{8}x^2$

Q.20 If $(1 + 2x + x^2)^5 = \sum_{k=0}^{15} a_k x^k$, then $\sum_{k=0}^{7} a_{2k}$ is equal to
(a) 128 (b) 156 (c) 512 (d) 1024

Q.21 If x^{2r} occurs in $\left(x + \frac{2}{x^2}\right)^n$, then $n - 2r$ must be of the form
(a) 3k-1 (b) 3k (c) 3k+1 (d) 3k+2

Q22 The coefficient of x^{53} in the following expansion $\sum_{m=0}^{100} {}^{100}C_m (x-3)^{100-m} \cdot 2^m$ is
(a) ${}^{100}C_{47}$ (b) ${}^{100}C_{53}$ (c) ${}^{-100}C_{53}$ (d) ${}^{-100}C_{100}$

Q.23 The term independent of x in the expansion of $\left(\sqrt{\frac{x}{3}} + \frac{3}{2x^2}\right)^{10}$ will be
(a) $\frac{3}{2}$ (b) $\frac{5}{4}$ (c) $\frac{5}{2}$ (d) None of these

Q.24 The coefficient of t^{24} in the expansion of $(1 + t^2)^{12}(1 + t^{12})(1 + t^{24})$ is
(a) ${C_6}^{12} + 2$ (b) ${C_5}^{12}$ (c) ${C_6}^{12}$ (d) ${C_7}^{12}$

Q.25 In the expansion of $(x + \sqrt{x^2 - 1})^6 + (x - \sqrt{x^2 - 1})^6$, the number of terms, is
(a) 7 (b) 14 (c) 6 (d) 4

Q.26 In the binomial expansion of $(a - b)^n, n \geq 5$, the sum of 5th and 6th term is zero, then $\frac{a}{b}$ equal
(a) $\frac{5}{n-4}$ (b) $\frac{6}{n-5}$ (c) $\frac{n-5}{6}$ (d) $\frac{n-4}{5}$

Q.27 The coefficient of x^n in the expansion of $\frac{(1+x)^2}{(1-x)^3}$, is
(a) $n^2 + 2n + 1$ (b) $2n^2 + n + 1$ (c) $2n^2 + 2n + 1$ (d) $n^2 2 + 2n + 2$

Q.28 The middle term in the expansion of $\left(1 - \frac{1}{x}\right)^n (1 - x)^n$, is
(a) ${}^{2n}C_n$ (b) ${}^{-2n}C_n$ (c) ${}^{-2n}C_{n-1}$ (d) None of these

Q.29 In the expansion of $\left(x^3 - \frac{1}{x^2}\right)^{15}$, the constant term, is
(a) ${}^{15}C_6$ (b) 0 (c) $-{}^{15}C_6$ (d) 1

Q30 If the expansion in power of x of the function $\frac{1}{(1-ax)(1-bx)}$ is
$a_0 + a_1 x + a_2 x^2 + a_3 x^3 + \cdots$, Then a_n is
(a) $\frac{a^n - b^n}{b-a}$ (b) $\frac{a^{n+1} - b^{n+1}}{b-a}$ (c) $\frac{b^{n+1} - a^{n+1}}{b-a}$ (d) $\frac{b^n - a^n}{b-a}$

Q.31 The number of terms in $(1 + x)^{101}(1 + x^2 - x)^{100}$ is
(a) 101 (b) 202 (c) 301 (d) 302

Q.32 For what value of r the coefficient of $(r-1)^{th}$ and $(2r+3)^{rd}$ terms is the expansion of $(1 + x)^{15}$ are equal.
(a) $r = 3$ (b) $r = 4$ (c) $r = 5$ (d) $r = 6$

Q.33 If the middle term in the expansion of $(x^2 + \frac{1}{x})^n$ is $924x^6$ then $n =$
(a) 10 (b) 12 (c) 14 (d) None of these

Q.34 The greatest coefficient in the expansion of $(1+x)^{2n+1}$ is

(a) $\frac{(2n+1)!}{n!(n+1)!}$ (b) $\frac{(2n+2)!}{n!(n+1)!}$ (c) $\frac{(2n+1)!}{[(n+1)!]^2}$ (d) $\frac{(2n)!}{(n!)^2}$

Q.35 In the expansion of $(1+3x+2x^2)^6$ the coefficient of x^{11} is

(a) 144 (b) 288 (c) 216 (d) 576

Q.36 If the coefficients of x^2 and x^3 in the expansion of $(3+ax)^9$ are the same, then the value of a is

(a) $-\frac{7}{9}$ (b) $-\frac{9}{7}$ (c) $\frac{7}{9}$ (d) $\frac{9}{7}$

Q.37 The greatest integer less than or equal to $(\sqrt{2}+1)^6$ is

(a) 196 (b) 197 (c) 198 (d) 199

Q.38 The sum ${}^{10}C_1 + {}^{10}C_3 + {}^{10}C_5 + {}^{10}C_7 + {}^{10}C_9$ equals

(a) 2^9 (b) 2^{10} (c) $2^{10}-1$ (d) 2^9-1

Q.39 The sum $\frac{C_1}{C_0}+\frac{2C_2}{C_1}+\frac{3C_3}{C_2}+\cdots.+\frac{nC_n}{C_{n-1}}$ equals

(a) $\frac{n(n-1)}{2}$ (b) $\frac{n(n+2)}{2}$ (c) $\frac{n(n+1)}{2}$ (d) $\frac{(n-1)(n-2)}{2}$

Q.40 The sum $\frac{C_0}{1}+\frac{C_2}{3}+\frac{C_4}{5}+\frac{C_6}{7}\ldots\ldots..$ equals

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

Q.41 The sum $1^2C_1 - 2^2C_2 + 3^2C_3 - \cdots.+(-1)^{n-1}n^2C_n$ equals

(a) $\frac{n^2\cdot 2^{n+1}}{n+1}$ (b) 0 (c) $\frac{2^{n+1}}{n-1}$ (d) $\frac{n^2(n+1)}{2}$

Q.42 The sum of $C_0-\frac{C_1}{2}+\frac{C_2}{3}-\frac{C_3}{4}+\cdots\ldots\ldots..(n+1)$ terms equals

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

Q.43 The sum $\frac{C_0}{2}-\frac{C_1}{3}+\frac{C_2}{4}-\frac{C_3}{5}+\cdots\ldots\ldots..$ equals

(a) $\frac{1}{(n-1)(n+1)}$ (b) $\frac{1}{(n+1)(n+2)}$ (c) $\frac{1}{2(n-1)(n+1)}$ (d) 0

Q.44 $3C_0+3^2\frac{C_1}{2}+3^3\frac{C_2}{3}+\cdots\ldots 3^{n+1}\cdot\frac{C_n}{n+1}$ equals to

(a) $\frac{3^{n+1}-1}{n+1}$ (b) $\frac{3^{n+1}+1}{n+1}$ (c) $\frac{4^{n+1}-1}{n+1}$ (d) $\frac{4^{n-1}-1}{n+1}$

Q.45 $C_0-3C_1+5C_2+\cdots\ldots+(-1)^n[2n+1]C_n$ equals to

(a) $(n-1)2^n$ (b) 0 (c) $n(n+1)2^n$ (d) $(n-1)2^{n-1}$

Q.46 If $S_n = C_0C_1 + C_1C_2 + \cdots\ldots + C_{n-1}C_n$ and $\frac{S_{n+1}}{S_n}=\frac{15}{4}$, then value of n is equal to

(a) 3,7 (b) 2,4 (c) 1,3 (d) 1,2

Q.47 If number of terms in the expansion of $(x-2y+3z)^n$ are 45 then n is equal to

(a) 7 (b) 8 (c) 9 (d) 10

Q.48 Coefficient of x^{11} in the expansion of $(2x^2+x-3)^6$ is

(a) 384 (b) 192 (c) 572 (d) 64

Q.49 The coefficient of two consecutive terms in the expansion of $(1+x)^n$ will be equal if

(a) n is any integer (b) n is an odd integer

(c) n is an even integer (d) Nothing can be said in general

Q.50 If a_r is the coefficient of x^r in the expansion $(1+x+x^2)^n$, then $a_1-2a_2+3a_3-\cdots..2na_{2n}=$

(a) 0 (b) n (c) –n (d) 2n

Q.51 The coefficient of x^{50} in $(1+x)^{41}(1-x+x^2)^{40}$ is

(a) ${}^{41}C_3$ (b) 19800 (c) ${}^{40}C_2\times{}^{21}C_1$ (d) 0

Q.52 The coefficient of x^r in the expansion of $(1-2x)^{-1/2}$ is

(a) $\frac{(2r)!}{(r!)^2}$ (b) $\frac{(2r)!}{2^r(r!)^2}$ (c) $\frac{(2r)!}{(r!)^2 2^{2r}}$ (d) $\frac{(2r)!}{2^r(r+1)!(r-1)!}$

Q.53 $1+\frac{1}{3}x+\frac{1.4}{3.6}x^2+\frac{1.4.7}{3.6.9}x^3+\cdots\ldots$ is equal to

(a) x (b) $(1+x)^{1/3}$ (c) $(1-x)^{1/3}$ (d) $(1-x)^{-1/3}$

Q.54 The first four term is the expansion of $(1-x)^{3/2}$ will be when $|x|<1$

(a) $1-\frac{3}{2}x+\frac{3}{8}x^2-\frac{1}{16}x^3$ (b) $1-\frac{3}{2}x-\frac{3}{8}x^2-\frac{x^3}{16}$

(c) $1-\frac{3}{2}x+\frac{3}{8}x^2+\frac{1}{16}x^3$ (d) $1+\frac{3}{2}x+\frac{3}{8}x^2+\frac{x^3}{16}$

Q.55 If $(a+bx)^{-2}=\frac{1}{4}-3x+\cdots\ldots$, then $(a,b)=$

(a) (2,12) (b) (−2,12) (c) (2, −12) (d) (−2, −12)

Q.56 If the third term in the binomial expansion of $(1+x)^m$ is $\frac{-1}{8}x^2$ then rational value of m, is.

(a) 2 (b) $\frac{1}{2}$ (c) 3 (d) 4

Q.57 If the coefficient of r th term and $(r+1)^{th}$ term in the expansion of $(1+x)^{20}$ are in the ration 1:2 then r is equal to.

(a) 6 (b) 7 (c) 8 (d) 9

Q.58 The exponent of x occurring in the 7^{th} term of the expansion of $(\frac{ax}{2}-\frac{8}{bx})^9$ is

(a) 3 (b) –3 (c) 5 (d) –5

Q.59 The term containing a^3b^4 in the expansion of $(a-2b)^7$ is

(a) 3^{rd} (b) 4^{th} (c) 5^{th} (d) 6^{th}

Q.60 In the expansion of $(\frac{x^3}{2}-\frac{2}{x^2})^{12}$, 5^{th} term from the end is

(a) $-7920x^{-4}$ (b) $7920x^4$ (c) $7920x^{-4}$ (d) $-7920x^4$

Q.61 The coefficient of a^m and a^n(m, n are positive integer) in the expansion of $(1+a)^{m+n}$ are

(a) Unequal (b) Equal

(c) Reciprocal of each other (d) Additive inverse of each other

Q.62 In the expansion of $(2+\frac{1}{3x})^n$, the coefficient of x^{-7} and x^{-8} are equal then n is equal to

(a) **51** (b) 52 (c) 55 (d) 56

Q.63 If in the expansion of $(1+kx)^4$ the coefficient of x^3 is 32 , then the value of k is equal to

(a) **2** (b) 4 (c) 8 (d) 1

Q.64 In the expansion of $(x+a)^5$, $T_2 : T_3 = 1:3$, then x: a is equal to

(a) 1: 2 (b) 2: 1 (c) 2: 3 (d) 3: 2

Q.65 $(1.003)^4$ is nearly equal to

(a) 1.012 (b) 1.0012 (c) 0.988 (d) 1.003

Q.66 The two consecutive term in the expansion of $(3+2x)^{74}$ which have equal coefficients, are

(a) 7^{th} and 8^{th} (b) 11^{th} and 12^{th} (c) 30^{th} and 31^{st} (d) 31^{st} and 32^{nd}

Q.67 If in the expansion of $(1+x)^n$ fifth term is 4 time the fourth term and fourth term is 6 times the third term. Then the value of n and x is.

(a) 11,2 (b) 2,11 (c) 3,12 (d) 12,3

Q.68 n the binomial expansion of $(a-b)^n$, $n \geq 5$ the sum of the 5^{th} and 6^{th} term is zero then $\frac{a}{b}$ equal.

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

Q.69 If the coefficients of 2nd, 3rd and 4 th terms in the expansion of $(1+x)^{2n}$ are in A.P., then

(a) $2n^2-9n+7=0$ (b) $2n^2+5n+7=0$

(c) $n^2-9n+7=0$ (d) $n^2+9n-7=0$

Q.70 In the expansion of $(y^{1/5}+x^{1/10})^{55}$, the number of terms free of radical sign are

(a) 5 (b) 6 (c) 50 (d) 56

Q.1 Prove that the coefficient of middle term in the expansion of $(1+x)^{2n}$ is equal to the sum of the coefficient of two middle terms in $(1+x)^{2n-1}$.

Q.2 The 3^{rd}, 4^{th} and 5^{th} terms in the expansion of $(x+a)^n$ are respectively 84, 280 and 560. Find the value of x, a, and n.

Q.3 Find the interval of x, for which the expansion of $(8-3x)^{3/2}$ in term of power of x, is valid.

Q4 Find the coefficient of x, in the expansion of $[\sqrt{1+x^2}-x]^{-1}$ in ascending power of x, when $|x|<1$.

Q.5 Find sum of series$1+\frac{1}{4}+\frac{1.3}{4.8}+\frac{1.3.5}{4.8.12}+\cdots..$

Q.6 If $\alpha=\frac{5}{2!3}+\frac{5.7}{3!3^2}+\frac{5.7.9}{4!3^3}+\cdots\ldots$ then find the value of $\alpha^2+4\alpha$.

Q.7 Expand $(x^2+2a)^5$ by using binomial theorem.

Q.8 Expand $(x+y)^7$ by using the binomial theorem.

Q.9 Expand $(1+2x+x^2)^3$ by using the binomial theorem.

Q.10 Let P(n) be the statement : " $n(n+1)(n+2)$ is a multiple of 12 ". Show that P(3) and P(4) are true but P(5) is not true

Q.11 If 15^{th} term and 16^{th} term in the expansion of $(1+x)^{30}$ are equal, then find the value of x.

Q.12 By using PMI, prove that for all $n\in\mathbb{N}, \frac{1}{1\cdot4}+\frac{1}{4\cdot7}+\frac{1}{7\cdot10}+\cdots\ldots\ldots+\frac{1}{(3n-2)(3n+1)}=\frac{n}{3n+1}$.

Q.13 Find the term involving a^2b^5 in the expansion of $(a-2b)^4(a+b)^3$

Q.14 Write the fifth term in the expansion of $(2x^2-\frac{1}{3x^3})^{10}, x\neq0$.

Q.15 Find the middle terms in the expansion of $(4x-\frac{x^3}{8})^7$

Q16 If the ration of the fifth term from the beginning to the fifth term from the end in the expansion of $(2^{\frac{1}{4}}+\frac{1}{3^{\frac{1}{4}}})^n$ is $\sqrt{6}$: 1then value of n is equal to.

Q.17 The value of the coefficient of x^4 in the expansion of $(2-x+3x^2)^6$ is

Q.18 The greatest value of n for which 9^7-7^9 is divisible by 2^n is equal to

Q.19 By using the principal of mathematics induction, prove that for all $n\in\mathbb{N}, 12^n+2\cdot5^{n-1}$ is divisible by 7

Q.20 In the expansion of $(1-x)^{2n-1}$ a_r is denoted as the coefficient of x^r, then prove that $a_{r-1}+a_{2n-r}=0$

ANSWER KEY – LEVEL – I

Q.	1	2	3	4	5	6	7	8	9	10
Ans.	b	c	c	c	d	c	a	c	c	a
Q.	11	12	13	14	15	16	17	18	19	20
Ans.	d	b	a	c	b	a	d	b	b	c
Q.	21	22	23	24	25	26	27	28	29	30
Ans.	d	b	a	c	b	a	d	b	b	c
Q.	31	32	33	34	35	36	37	38	39	40
Ans.	b	c	b	a	d	d	b	a	c	a
Q.	41	42	43	44	45	46	47	48	49	50
Ans.	b	c	b	c	b	b	b	b	b	c
Q.	51	52	53	54	55	56	57	58	59	60
Ans.	d	b	d	c	d	b	b	b	c	c
Q.	61	62	63	64	65	66	67	68	69	70
Ans.	b	c	a	c	a	c	a	b	a	b

ANSWER KEY – LEVEL – II

2. $(x = 1, a = 2, n = 7)$

3. $x < \frac{8}{3}$

4. 1

5. $\sqrt{2}$

6. 23

16. 10

17. 3660

18 6