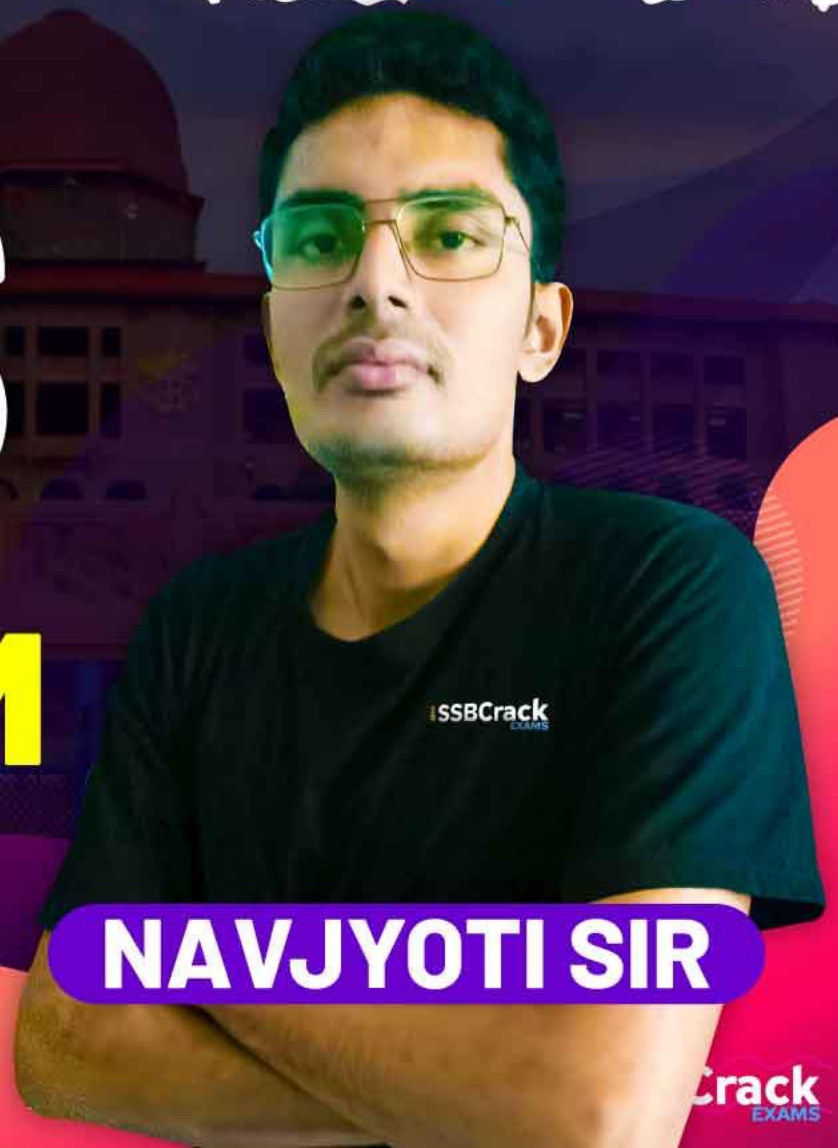
NDA 2 2024

LIVE

MATHS

BINOMIAL THEOREM

CLASS 2



NAVJYOTI SIR

Crack
EXAMS

11 June 2024 Live Classes Schedule

8:00AM	11 JUNE 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM

SSB INTERVIEW LIVE CLASSES

9:00AM	OVERVIEW OF SRT & SDT	ANURADHA MA'AM

AFCAT 2 2024 LIVE CLASSES

4:00PM	MATHS - TRIGONOMETRY - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM

NDA 2 2024 LIVE CLASSES

11:30AM	GK - BIOSPHERE RESERVES & NATIONAL PARKS	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 2	SHIVANGI MA'AM
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM
6:30PM	MATHS - BINOMIAL THEOREM - CLASS 2	NAVJYOTI SIR

CDS 2 2024 LIVE CLASSES

11:30AM	GK - BIOSPHERE RESERVES & NATIONAL PARKS	RUBY MA'AM
2:30PM	GS - CHEMISTRY - CLASS 2	SHIVANGI MA'AM
4:00PM	MATHS - TRIGONOMETRY - CLASS 1	NAVJYOTI SIR
5:30PM	ENGLISH - FILL IN THE BLANKS - CLASS 2	ANURADHA MA'AM

QUESTION

If $(1+ax)^n = 1 + 8x + 24x^2 + \ldots$, then the value of a and n, is

(a) 2, 4 (b) 2, 3 (c) 3, 6 (d) 1, 2

$(1+ax)^n = 1 + n(ax) + {}^nC_2 (ax)^2 + \ldots = 1 + 8x + 24x^2$

comparing coefficients

$na = 8$; ${}^nC_2 a^2 = 24$

$\frac{n(n-1)}{2} a^2 = 24$

$n(n-1)a^2 = 48$

$(n^2 - n)a^2 = 48$

$n^2a^2 - na^2 = 48$

$\frac{64}{a^2} a^2 - \frac{8}{a} \times a^2 = 48$

$64 - 8a = 48$

$8a = 16$

$a = 2$ | $n = 4$

QUESTION

If $(1+ax)^n = 1 + 8x + 24x^2 + \ldots$, then the value of a and n, is

(a) 2, 4 (b) 2, 3 (c) 3, 6 (d) 1, 2

ANSWER : (a)

QUESTION

The coefficient of x^{-7} in the expansion of $\left(ax - \frac{1}{bx^2}\right)^{11}$ will be

(a) $\frac{462\,a^6}{b^6}$ (b) $\frac{462\,a^5}{b^6}$

(c) $\frac{462\,a^3}{b^7}$ (d) None of these

General term,

$$T_{r+1} = {}^{11}C_r (ax)^{11-r} \left(\frac{-1}{bx^2}\right)^r$$

$$= {}^{11}C_r\, a^{11-r} \left(\frac{-1}{b}\right)^r (x^{11-r})(x^{-2r})$$

$$= {}^{11}C_r\, a^{11-r} \left(\frac{-1}{b}\right)^r x^{11-r-2r}$$

coefficient

$$11 - r - 2r = -7$$

$$11 - 3r = -7$$

$$r = 6$$

coefficient of x^{-7}

$${}^{11}C_6\, a^{11-6} \left(\frac{-1}{b}\right)^6$$

$${}^{n}C_r = {}^{n}C_{n-r}$$

$${}^{11}C_5\, a^5 \times \frac{1}{b^6} = \frac{11 \times 10 \times 9 \times 8 \times 7}{5 \times 4 \times 3 \times 2}$$

$$= 11 \times 42 = 462$$

$$= 462\,\frac{a^5}{b^6}$$

QUESTION

The coefficient of x^{-7} in the expansion of $\left(ax - \frac{1}{bx^2}\right)^{11}$ will be

(a) $\frac{462\,a^6}{b^6}$

(b) $\frac{462\,a^5}{b^6}$

(c) $\frac{462\,a^3}{b^7}$

(d) None of these

ANSWER : (b)

SSBCrack EXAMS

QUESTION

The coefficient of the middle term in the expansion of $(2+3x)^4$ is

(a) 6 (b) 5! (c) 8! (d) 216

General term

$$T_{r+1} = {}^{n}C_{r}\, a^{n-r} b^{r}$$

$n = 4$,

Total no. of terms in expansion, $(N) = n+1$

middle term $\Rightarrow \left(\frac{N+1}{2}\right)^{th}$ term $= \left(\frac{5+1}{2}\right)^{th} = 5$ (odd)

$= 3^{rd}$ term

$$T_3 = {}^{4}C_{2}\,(2)^{4-2}(3x)^{2} = {}^{4}C_{2}\, 2^2 \times 3^2 x^2$$

$$= \frac{4 \times 3}{2} \times 36$$

$$= 6 \times 36 = 216$$

$(n+1)$

- odd $\rightarrow \left(\frac{(n+1)+1}{2}\right)^{th}$ term
- even $\rightarrow$ $\left(\frac{n+1}{2}\right)^{th}$ term, $\left(\frac{n+1}{2}+1\right)^{th}$ term

QUESTION

The coefficient of the middle term in the expansion of $(2 + 3x)^4$ is

(a) 6 (b) 5! (c) 8! (d) 216

ANSWER : (d)

QUESTION

If p and q be positive , then the coefficients of x^p and x^q in the expansion of $(1 + x)^{p+q}$ will be

(a) equal
(b) equal in magnitude but opposite in sign
(c) reciprocal to each other
(d) None of the above

$$(1+x)^{p+q} = {}^{p+q}C_0 (1)^{p+q} (x)^0 + {}^{p+q}C_1 (1)^{p+q-1} (x)^1 + {}^{p+q}C_2 (1)^{p+q-2} (x)^2 + \cdots$$

$$= 1 + (p+q)x + {}^{p+q}C_2 (x)^2 + \cdots$$

$$(1+x)^n = 1 + nx + {}^nC_2 x^2 + {}^nC_3 x^3 + \cdots$$

coefficient of $x^p = {}^{p+q}C_p$

" " $x^q = {}^{p+q}C_q$

${}^{p+q}C_p = {}^{p+q}C_q$

$\left({}^nC_r = {}^nC_{n-r}\right)$

coefficients are equal.

QUESTION

If p and q be positive , then the coefficients of x^p and x^q in the expansion of $(1 + x)^{p+q}$ will be

(a) equal
(b) equal in magnitude but opposite in sign
(c) reciprocal to each other
(d) None of the above

ANSWER : (a)

QUESTION

The term independent of x in the expansion of $\left(\sqrt{\frac{x}{3}}+\frac{3}{2x^2}\right)^{10}$ will be

(a) 3/2 (b) 5/4

(c) 5/2 (d) None of these

independent term = coefficient of x^0

$$T_{r+1} = {}^{10}C_r \left(\left(\frac{x}{3}\right)^{\frac{1}{2}}\right)^{10-r}\left(\frac{3}{2x^2}\right)^r$$

$$= {}^{10}C_r \frac{1}{3^{\frac{10-r}{2}}} \times \left(\frac{3^r}{2^r}\right)\left(x^{\frac{10-r}{2}}\right)\left(x^{-2r}\right)$$

power of $x = \frac{10-r}{2} - 2r$

$$\frac{10-r}{2} - 2r = 0$$

$$10 - 5r = 0 \Rightarrow r = 2$$

independent term

$${}^{10}C_2 \frac{1}{3^4} \times \frac{3^2}{2^2}$$

$${}^{10}C_2 \times \frac{1}{36} = \frac{10 \times 9}{2} \times \frac{1}{36_4} = \frac{5}{4}$$

QUESTION

The term independent of x in the expansion of $\left(\sqrt{\frac{x}{3}}+\frac{3}{2x^2}\right)^{10}$ will be

(a) 3/2
(b) 5/4
(c) 5/2
(d) None of these

ANSWER : (b)

QUESTION

What is the coefficient of x^4 in the expansion of $\left(\frac{1-x}{1+x}\right)^2$?

(NDA 2010 II)

(a) -16 (b) 16
(c) 8 (d) -8

$(1-x)^2(1+x)^{-2}$

$(1-2x+x^2)(1-2x+3x^2-4x^3+5x^4-\ldots)$

$(1\times5)+(-2)(-4)+(1)(3)$

$=5+8+3=16$

$(1+x)^{-2}$

$=\ {}^{-2}C_0(1)^{-2}x^0+{}^{-2}C_1(1)^{-3}x^1+{}^{-2}C_2(1)^{-4}x^2+\ldots$

$=1+(-2)x+{}^{-2}C_2x^2+{}^{-2}C_3x^3+\ldots$

$=1-2x+\frac{(-2)(-2-1)}{2}x^2+\frac{(-2)(-2-1)(-2-2)}{3\times2}x^3+\ldots$

$=1-2x+3x^2-4x^3+5x^4-\ldots$

(no last term when n is (-ve))

QUESTION

What is the coefficient of x^4 in the expansion of $\left(\frac{1-x}{1+x}\right)^2$?

(NDA 2010 II)

(a) -16
(b) 16
(c) 8
(d) -8

ANSWER : (b)

QUESTION

For all $n \in N$, $2^{4n} - 15n - 1$ is divisible by)

(NDA 2011 I)

(a) 125
(b) 225
(c) 450
(d) None of these

$(2^4)^n - 15n - 1 = 16^n - 15n - 1$

$16^n = (1+15)^n$

$= 1 + 15n + {}^{15}C_2 (15)^2 + {}^{15}C_3 (15)^3 + {}^{15}C_4 (15)^4 + \cdots$

$16^n - 15n - 1 = 15^2 \left({}^{15}C_2 + {}^{15}C_3 (15) + {}^{15}C_4 (15)^2 + \cdots \right)$

$= 225k$

225 is a factor, or $16^n - 15n - 1$ is divisible by 225.

QUESTION

For all $n \in N$, $2^{4n} - 15n - 1$ is divisible by)

(NDA 2011 I)

(a) 125
(b) 225
(c) 450
(d) None of these

ANSWER : (b)

QUESTION

What is the number of terms in the expansion of $(a+b+c)^n$, $n \in N$?

(NDA 2010 II)

(a) $n+1$ (b) $n+2$

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

$$(a+(b+c))^n = \frac{a^n}{1} + \frac{n a^{n-1}(b+c)}{2} + \frac{{}^nC_2\, a^{n-2}(b+c)^2}{3} + \frac{{}^nC_3\, a^{n-3}(b+c)^3}{4} + \cdots + {}^nC_{n-1}\, a^1 (b+c)^{n-1} + {}^nC_n (b+c)^n$$

$$1+2+3+\cdots+n+n+1$$

$$\frac{n(n+1)}{2} + n+1 = \frac{n^2+n+2n+2}{2} = \frac{n^2+3n+2}{2} = \frac{(n+1)(n+2)}{2}$$

QUESTION

What is the number of terms in the expansion of $(a+b+c)^n$, $n \in N$?

(NDA 2010 II)

(a) $n+1$

(b) $n+2$

(c) $n(n+1)$

(d) $\frac{(n+1)(n+2)}{2}$

ANSWER : (d)

QUESTION

If the coefficients of 5th , 6th and 7th terms in the expansion of $(1+x)^n$ be in AP, then the value of n is

(a) 7 only
(b) 14 only
(c) 7 or 14
(d) None of these

$T_5 = {}^nC_4 (x)^4$

$=$

$T_6 \longrightarrow {}^nC_5$

$T_7 \longrightarrow {}^nC_6$

${}^nC_4$, ${}^nC_5$ & ${}^nC_6$ are in AP,

$$2\,{}^nC_5 = {}^nC_4 + {}^nC_6$$

$$\frac{2 \times n!}{(n-5)!\,5!} = \frac{n!}{(n-4)!\,4!} + \frac{n!}{(n-6)!\,6!}$$

$$\frac{2}{(n-5)(n-6)!} \times \frac{1}{5 \times 4!} = \frac{1}{(n-4)(n-5)(n-6)!} \times \frac{1}{4!} + \frac{1}{(n-6)!\,6 \times 5 \times 4!}$$

$$\frac{2}{5(n-5)} = \frac{1}{(n-4)(n-5)} + \frac{1}{30}$$

$$\frac{2}{5(n-5)} = \frac{1}{(n-4)(n-5)} + \frac{1}{30}$$

$n = 7$ ✓

$LHS = \frac{1}{5}$; $RHS = \frac{1}{5}$

$n = 14$

$$LHS = \frac{2}{5 \times 9} = \frac{2}{45}$$

$$RHS = \frac{1}{10 \times 9} + \frac{1}{30} = \frac{1+3}{90} = \frac{4}{90} = \frac{2}{45}$$

QUESTION

If the coefficients of 5th , 6th and 7th terms in the expansion of $(1 + x)^n$ be in AP, then the value of n is

(a)7 only
(b) 14 only
(c) 7 or 14
(d) None of these

ANSWER : (c)

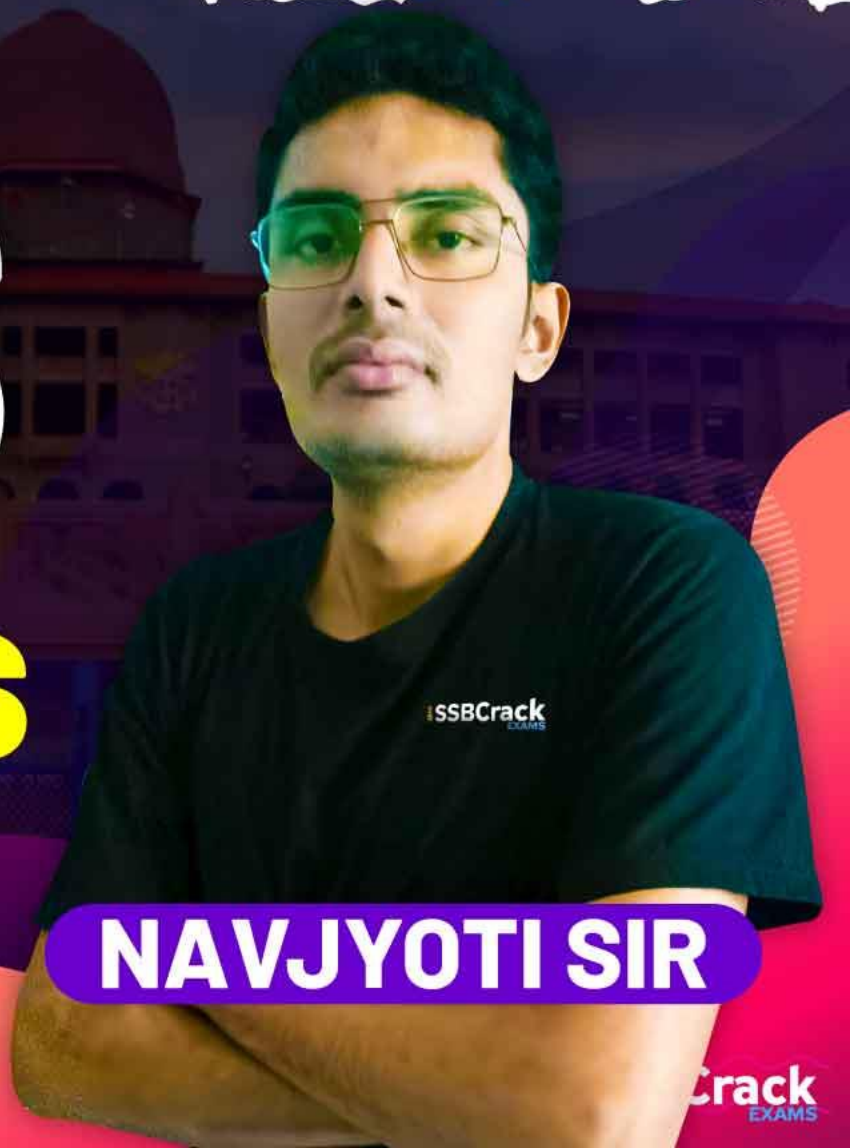
NDA 2 2024

LIVE

MATHS

SEQUENCE & SERIES

CLASS 1



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