# NDA 1 2025

LIVE

# MATHS

## BINOMIAL THEOREM

CLASS 2


NAVJYOTI SIR

# 12 Nov 2024 Live Classes Schedule

| | | |
|---|---|---|
| 8:00AM | 12 NOVEMBER 2024 DAILY CURRENT AFFAIRS | RUBY MA'AM |
| 9:00AM | 12 NOVEMBER 2024 DAILY DEFENCE UPDATES | DIVYANSHU SIR |

## SSB INTERVIEW LIVE CLASSES

| | | |
|---|---|---|
| 9:30AM | OVERVIEW OF PIQ FORM & PERSONAL INTERVIE | ANURADHA MA'AM |

## NDA 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 11:30AM | GK - MODERN HISTORY - CLASS 3 | RUBY MA'AM |
| 1:00PM | CHEMISTRY MCQ - CLASS 5 | SHIVANGI MA'AM |
| 4:00PM | MATHS - BINOMIAL THEOREM - CLASS 2 | NAVJYOTI SIR |
| 5:30PM | ENGLISH - ONE WORD SUBSTITUTION - CLASS 1 | ANURADHA MA'AM |

## CDS 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 11:30AM | GK - MODERN HISTORY - CLASS 3 | RUBY MA'AM |
| 1:00PM | CHEMISTRY MCQ - CLASS 5 | SHIVANGI MA'AM |
| 5:30PM | ENGLISH - ONE WORD SUBSTITUTION - CLASS 1 | ANURADHA MA'AM |
| 7:00PM | MATHS - GEOMETRY - CLASS 6 | NAVJYOTI SIR |

## AFCAT 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 5:30PM | ENGLISH - ONE WORD SUBSTITUTION - CLASS 1 | ANURADHA MA'AM |



# QUESTION

Evaluate: $\left(x^2 - \sqrt{1-x^2}\right)^4 + \left(x^2 + \sqrt{1-x^2}\right)^4$

$\sqrt{1-x^2} = y \longrightarrow y^2 = 1 - x^2$

$(x^2 - y)^4 + (x^2 + y)^4$

$= 2\left( (x^2)^4 + {}^4C_2 (x^2)^2 (y)^2 + {}^4C_4 (x^2)^0 (y)^4 \right)$

$= 2\left( x^8 + 6x^4y^2 + y^4 \right)$

$= 2\left(x^8 + 6x^4(1-x^2) + (1-x^2)^2\right) \Rightarrow 2\left[x^8 + 6x^4 - 6x^6 + 1 + x^4 - 2x^2\right]$

of the form,

$(a+b)^n + (a-b)^n$

$= 2\left({}^nC_{\underline{0}} a^n b^0 + {}^nC_{\underline{2}} a^{n-2} b^2 + {}^nC_4 a^{n-4} b^4 + \ldots\right)$

$$2\left(x^8 + \underbrace{6x^4 - 6x^6 + 1 + x^4}_{} - 2x^2\right)$$

$$2\left(x^8 + 7x^4 - 6x^6 - 2x^2 + 1\right)$$

$$\underline{2x^8 + 14x^4 - 12x^6 - 4x^2 + 2}$$

terms at odd places,

$$(a+b)^n + (a-b)^n = 2\left(\text{terms with } r = 0, 2, 4, 6, 8 \ldots\right)$$

$$= 2\left({}^nC_0 \quad {}^nC_2 \quad {}^nC_4 \quad {}^nC_6 \ldots\right)$$

terms at even places,

$$(a+b)^n - (a-b)^n = 2\left(\text{terms with } r = 1, 3, 5, 7 \ldots\right) = 2\left({}^nC_1 \quad {}^nC_3 \quad {}^nC_5 \ldots\right)$$

# QUESTION

What is the remainder when $7^n - 6n$ is divided by 36 for $n = 100$?

PYQ – 2024 - II

(a) 0

(b) 1 ✓

(c) 2

(d) 6

$$7^n = (1+6)^n$$

$$= 1 + {}^nC_1 6^1 + {}^nC_2 6^2 + {}^nC_3 6^3 + \dots {}^nC_n 6^n$$

$$= 1 + 6n + 36\,{}^nC_2 + 36({}^nC_3 \cdot 6) + \dots$$

$$7^n - 6n = 1 + 36({}^nC_2 + 6\,{}^nC_3 + 36\,{}^nC_4 + \dots)$$

$$\boxed{a^n - b}$$

$$(1 + (a-1))^n = \underline{\qquad}$$

(expand like $(1+x)^n$ ___

divided by 36

remainder = 1

SSBCrack EXAMS

# QUESTION

What is the coefficient of $x^{10}$ in the expansion of $(1-x^2)^{20}\left(2-x^2-\frac{1}{x^2}\right)^{-5}$ ?

(a) $-1$

(b) $1$

(c) $10$

(d) Coefficient of $x^{10}$ does not exist

**PYQ – 2024 -I**

$$(1-x^2)^{20}\left\{(-1)\left(x^2+\frac{1}{x^2}-2\right)\right\}^{-5}$$

$$2-x^2-\frac{1}{x^2}$$

$$-\left(-2+x^2+\frac{1}{x^2}\right)$$

$$(1-x^2)^{20}\,\underline{(-1)}^{-5}\left\{\left(x-\frac{1}{x}\right)^2\right\}^{-5}$$

$$\left(x-\frac{1}{x}\right)^2=x^2+\frac{1}{x^2}-2$$

$$-(1-x^2)^{20}\left[\left\{\frac{x^2-1}{x}\right\}^2\right]^{-5}$$

$$-(1-x^2)^{20}\left[\left\{\frac{x^2-1}{x}\right\}^2\right]^{-5}$$

$$-\underline{(1-x^2)^{20}}\left\{\frac{(1-x^2)^2}{x^2}\right\}^{-5} = -\frac{(1-x^2)^{20}(1-x^2)^{-10}}{x^{-10}}$$

$$= -x^{10}(1-x^2)^{20-10} = -x^{10}(1-x^2)^{10}$$

$$= -\underline{x^{10}}\left(1+{}^{10}C_1(-x^2)^1+{}^{10}C_2(-x^2)^2+\dots\right]$$

$$=$$

Coefficient of $x^{10} = -1$

SSBCrack EXAMS

# QUESTION

PYQ – 2024 - I

. If the 4th term in the expansion of $\left(mx+\frac{1}{x}\right)^n$ is $\frac{5}{2}$, then what is the value of $mn$?

(a) –3

(b) 3 ✓

(c) 6

(d) 12

$\left(mx+\frac{1}{x}\right)^n$

General term, $T_4 = {}^nC_3\,(mx)^{n-3}\left(\frac{1}{x}\right)^3$

$\frac{5}{2}(x^0) = {}^nC_3\, m^{n-3}\, x^{n-3} \cdot x^{-3}$

equating power of x, $\longrightarrow 0 = n-3-3 \Rightarrow n = 6$

coefficient $\longrightarrow \frac{5}{2}$

$${}^{n}C_{3} \; m^{n-3} = \frac{5}{2}$$

$${}^{6}C_{3} \; m^{6-3} = \frac{5}{2}$$

$$\frac{\cancel{6} \times \cancel{5} \times 4}{\cancel{3 \times 2}} m^{3} = \frac{\cancel{5}}{2}$$

$$m^{3} = \frac{1}{8} \Rightarrow \underbrace{m = \frac{1}{2}}$$

$$mn = \frac{1}{2} \times 6 = 3$$

# What is the coefficient of $x^3y^4$ in $(2x + 3y^2)^5$ ?

A. 240

B. 360

C. 720

D. 1080

General term, ${}^5C_r \, (2x)^{5-r} (3y^2)^r$

$\left({}^5C_r \, 2^{5-r} \, 3^r\right) x^{5-r} \, y^{2r} \longleftrightarrow x^3 y^4$

coefficient

$5 - r = 3 \quad | \quad 2r = 4$

$r = 2$

${}^5C_2 \, 2^{5-2} \, 3^2$

$\frac{5 \times 4}{2} \times 2^3 \times 3^2 = 10 \times 8 \times 9 = 720$

# What is the coefficient of $x^3y^4$ in $(2x + 3y^2)^5$ ?

A. 240

B. 360

C. 720

D. 1080

***What is the middle term in the expansion of*** $\left(\frac{x\sqrt{y}}{3} - \frac{3}{y\sqrt{x}}\right)^{12}$ ?

A. $C(12,7)\ x^3y^{-3}$

B. $C(12,6)\ x^{-3}y^{-3}$

C. $C(12,7)\ x^{-3}y^{-3}$

D. $C(12,6)\ x^3y^{-3}$ ✓

$^nC_r = C(n, r)$ ; $^nP_r = P(n, r)$

Number of terms $= 12+1 = 13$ —— (odd)

middle term $\longrightarrow \left(\frac{13+1}{2}\right)^{th}$ term $=$ 7th

$$T_7 = {}^{12}C_6 \left(\frac{x\sqrt{y}}{3}\right)^{12-6} \left(-\frac{3}{y\sqrt{x}}\right)^6 = {}^{12}C_6\ \frac{x^6 y^3}{3^6} \times \frac{(-3)^6}{y^6 x^3}$$

$$= {}^{12}C_6\ x^3 y^{-3}$$

*What is the middle term in the expansion of* $\left(\frac{x\sqrt{y}}{3} - \frac{3}{y\sqrt{x}}\right)^{12}$ ?

A. C(12,7) $x^3y^{-3}$

B. C(12,6) $x^{-3}y^{-3}$

C. C(12,7) $x^{-3}y^{-3}$

**D. C(12,6) $x^3y^{-3}$**

**The coefficients of $x^m$ and $x^n$ , where m and n are positive integers, in the expansion of $(1 + x)^{m+n}$ are**

A. equal ✓

B. equal in magnitude but opposite in sign

C. reciprocal to each other

D. in the ratio m : n

$$(1+x)^{m+n} = 1 + {}^{m+n}C_1 x^1 + {}^{m+n}C_2 x^2 + \dots$$

$$x^m \longrightarrow {}^{m+n}C_m \qquad x^n \longrightarrow {}^{m+n}C_n$$

$${}^nC_r = {}^nC_{n-r}$$

coefficients are equal.

**The coefficients of $x^m$ and $x^n$ , where m and n are positive integers, in the expansion of $(1 + x)^{m + n}$ are**

A. equal

B. equal in magnitude but opposite in sign

C. reciprocal to each other

D. in the ratio m : n

SSBCrack EXAMS

# The natural number $6^{10} - 51$ is

A. a prime number

B. an even number

C. divisible by 5

D. a power of 3

$$(1+5)^{10} = 1 + {}^{10}C_1 5^1 + {}^{10}C_2 5^2 + {}^{10}C_3 5^3 + \ldots$$

$$6^{10} = \underline{1 + 10(5)} +$$

$$6^{10} - 51 = {}^{10}C_2 5^2 + {}^{10}C_3 5^3 + \ldots$$

$$= 5\left({}^{10}C_2 5 + {}^{10}C_3 5^2 + \ldots\right) = \underline{5m}$$

divisible by 5,

**The natural number $6^{10} - 51$ is**

A. a prime number

B. an even number

**C. divisible by 5**

D. a power of 3

SSBCrack EXAMS

# What is the coefficient of $x^3$ in $(3 - 2x) / (1 + 3x)^3$ ?

A. −272

B. − 540

C. − 870

D. − 918

$$(3-2x)(1+3x)^{-3}$$

$$\underline{(3-2x)}\left({}^{-3}C_0 (1)^{-3}(3x)^0 + {}^{-3}C_1 (1)^{-3-1}(3x)^1 + {}^{-3}C_2 (1)^{-3-2}(3x)^2 + {}^{-3}C_3 (1)^{-6}(3x)^3 + \dots\right)$$

$$(3-2x)\left(1\cdot 1\cdot 1 + (-3)(1)(3x) + \left(\frac{(-3)(-3-1)}{2!}\right)(1)^{-5}(9x^2) + \frac{(-3)(-3-1)(-3-2)}{3!}\,27x^3 + \dots\right)$$

$$= (-30)(27) + (-2)(9)(6) = -810$$

# What is the coefficient of $x^3$ in $(3 - 2x) / (1 + 3x)^3$ ?

A. $-272$

B. $-540$

C. $-870$

**D. $-918$**

**If n is even, then the middle term in the expansion of $\left(x^2 + \frac{1}{x}\right)^n$ is $924x^6$, then n is equal to**

$n+1 \longrightarrow$ odd

A. 10

B. 12

C. 14

D. None of these

middle term $= \frac{n+1+1}{2} = \left(\frac{n}{2}+1\right)^{th}$ term

$T_{\frac{n}{2}+1} = {}^nC_{\frac{n}{2}} \underbrace{(x^2)^{n-\frac{n}{2}}\left(\frac{1}{x}\right)^{n/2}} = \underline{924}\,\underline{x^6}$

power of $x$,

$x^n \cdot \frac{1}{x^{n/2}} = x^6 \Rightarrow \frac{n}{2} = 6 \Rightarrow n = 12$

**If n is even, then the middle term in the expansion of $\left(x^2 + \frac{1}{x}\right)^n$ is $924x^6$, then n is equal to**

A. 10

**B. 12**

C. 14

D. None of these

**If the 4th term in expansion of $\left(\frac{2}{3}x - \frac{3}{2x}\right)^n$ is independent of x, then n is equal to**

A. 5

B. 6 ✓

C. 9

D. None of these

$$T_4 = {}^nC_3 \left(\frac{2}{3}x\right)^{n-3} \left(-\frac{3}{2x}\right)^3$$

power of x = 0

$$n - 6 = 0$$

$$n = 6$$

**If the 4th term in expansion of $\left(\frac{2}{3}x - \frac{3}{2x}\right)^n$ is independent of x, then n is equal to**

A. 5

**B. 6**

C. 9

D. None of these

# If in the expansion of $(1 + x)^n$, the coefficient of $r^{th}$ and $(r + 2)^{th}$ term be equal, then r is equal to

A. $2n$

B. $(2n + 1) / 2$

C. $n / 2$

D. $2n - 1 / 2$

$$T_r = {}^nC_{r-1} \, x^{r-1} \qquad T_{r+2} = {}^nC_{r+1} \, x^{r+1}$$

coefficients

$${}^nC_{r-1} = {}^nC_{r+1}$$

$$\frac{1}{(n-r+1)!\,(r-1)!} = \frac{1}{(n-r-1)!\,(r+1)!}$$

$$\frac{1}{(n-r+1)(n-r)} = \frac{1}{(r+1)r}$$

$$\frac{1}{(n-r+1)(n-r)} = \frac{1}{(r+1)r}$$

$$\cancel{r^2} + r = n^2 - nr - rn + \cancel{r^2} + n - r$$

$$2r = n^2 - 2nr + n$$

$$n^2 + n(1-2r) - 2r = 0$$

$$n^2 + n - 2rn - 2r = 0$$

(a) $r = 2n$

$\frac{2n+1}{2}$

$\checkmark\ n/2$ — put options and check

$\frac{2n-1}{2}$

**If in the expansion of $(1 + x)^n$, the coefficient of $r^{th}$ and $(r + 2)^{th}$ term be equal, then r is equal to**

A. 2n

B. (2n + 1) / 2

C. **n / 2**

D. 2n – 1 / 2

**In the expansion of $\left(x^3 + \frac{1}{x^2}\right)^8$ then the term containing $x^4$ is**

A. $70x^4$

B. $60x^4$

C. $56x^4$

D. None of these

HW

**In the expansion of $\left(x^3 + \frac{1}{x^2}\right)^8$ then the term containing $x^4$ is**

A. $70x^4$

B. $60x^4$

C. $56x^4$

D. None of these

**The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification will be**

A. 202

B. 51

C. 50

D. None of these

$$\underbrace{{}^{100}C_0} \quad \underbrace{{}^{100}C_2 \quad {}^{100}C_4 \quad \dots \quad {}^{100}C_{100}}$$

$$1 \quad + \quad 50 \quad = \quad 51$$

**The total number of terms in the expansion of $(x + a)^{100} + (x - a)^{100}$ after simplification will be**

A. 202

**B. 51**

C. 50

D. None of these

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

A. $-16$

B. $16$

C. $8$

D. $-8$

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

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

A. −16

**B. 16**

C. 8

D. −8

**What is the term independent of x in the expansion of $(1+x+2x^3)\left(\frac{3x^{-2}}{2}-\frac{1}{3x}\right)^9$ ?**

A. 1 / 3

B. 19 / 54

C. 1 / 4

D. No such term exists in the expansion

check for r if whole,

**What is the term independent of x in the expansion of $(1+x+2x^3)\left(\frac{3x^{-2}}{2}-\frac{1}{3x}\right)^9$?**

A. 1 / 3

B. 19 / 54

C. 1 / 4

**D. No such term exists in the expansion**

# For all n ∈ N , $2^{4n} - 15n - 1$ is divisible by

$16^n - 15n - 1$

A. 125

B. 225

C. 450

D. None of these

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

A. 125

**B. 225**

C. 450

D. None of these

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

A. $n + 1$

B. $n + 2$

C. $n(n + 1)$

D. $(n + 1)(n + 2)/2$ ✓

$$(a + (b+c))^n$$

$$= \underbrace{a^n}_{1} + {}^nC_1 \underbrace{a^{n-1}(b+c)^1}_{2} + {}^nC_2 \underbrace{a^{n-2}(b+c)^2}_{3} + \underbrace{{}^nC_3\, a^{n-3}(b+c)^3}_{4} + \dots \underbrace{{}^nC_n (b+c)^n}_{n+1}$$

$$1 + 2 + 3 + 4 + \dots (n+1) = \frac{(n+1)(n+2)}{2}$$ ✓

$$1 + 2 + 3 + 4 + \dots n = \frac{n(n+1)}{2}$$

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

A. $n + 1$

B. $n + 2$

C. $n(n + 1)$

**D. $(n + 1)(n + 2)/2$**

**If $(1 - x + x^2)^n = a_0 + a_1x + a_2x^2 + \dots + a_{2n}x^{2n}$, then $a_0 + a_2 + a_4 + \dots + a_{2n}$ is equal to**

A. $(3^n + 1) / 2$

B. $(3^n - 1) / 2$

C. $(1 - 3^n) / 2$

D. $3^n + 1/2$

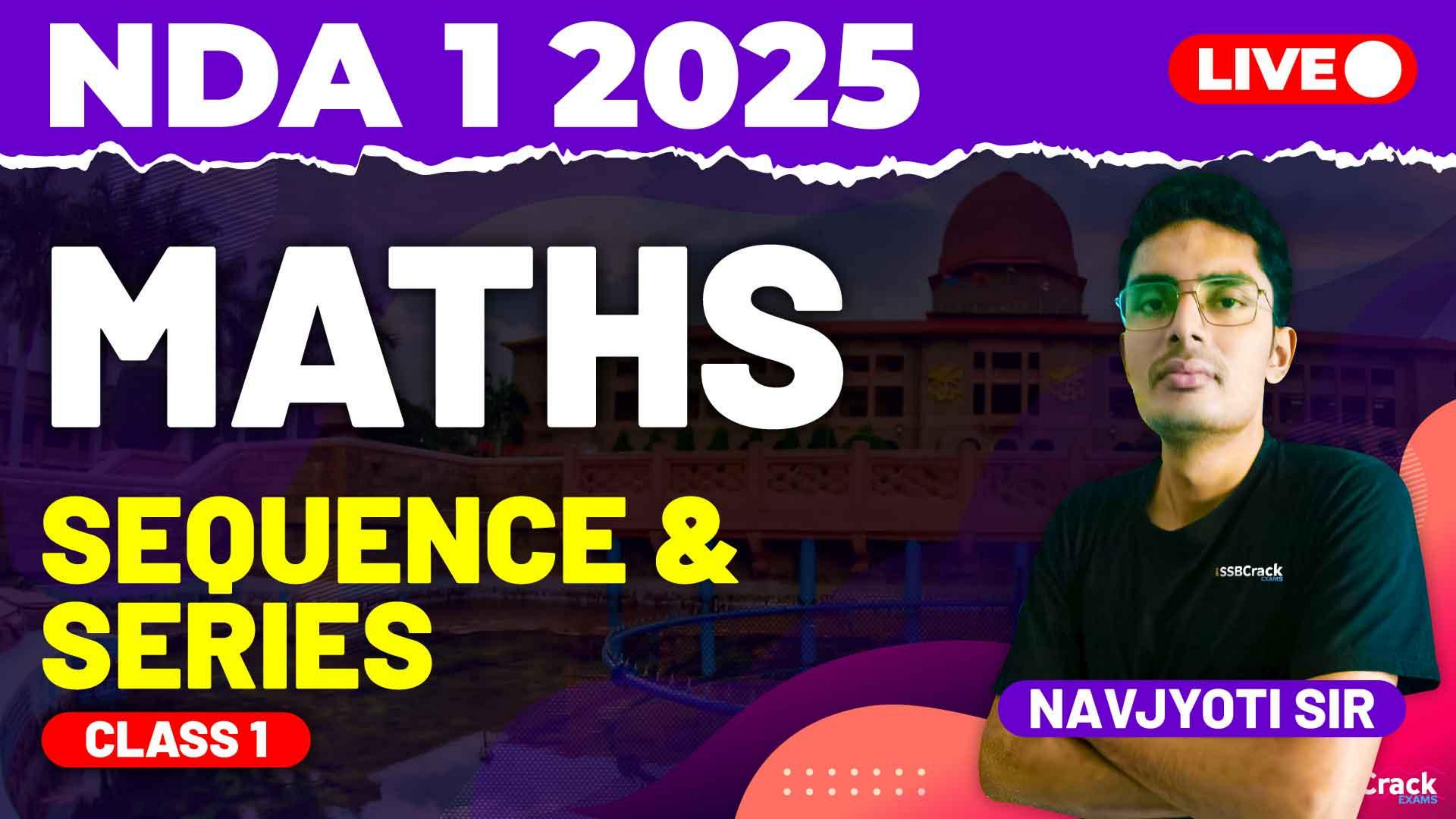
**If $(1 - x + x^2)^n = a_0 + a_1x + a_2x^2 + \ldots + a_{2n}x^{2n}$, then $a_0 + a_2 + a_4 + \ldots + a_{2n}$ is equal to**

A. $(3^n + 1) / 2$

B. $(3^n - 1) / 2$

C. $(1 - 3^n) / 2$

D. $3^n + 1/2$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