NDA 2 2024

LIVE

MATHS
REVISION

CLASS 2

NAVJYOTI SIR

SSBCrack EXAMS

06 August 2024 Live Classes Schedule

8:00AM	06 AUGUST 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	06 AUGUST 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

SSB INTERVIEW LIVE CLASSES

9:00AM	INTRODUCTION OF PPDT & PRACTICE	ANURADHA MA'AM

AFCAT 2 2024 LIVE CLASSES

1:00PM	MAHA MARATHON SESSION - PART 2	

NDA 2 2024 LIVE CLASSES

11:00AM	GK - HISTORY REVISION - CLASS 2	RUBY MA'AM
12:00PM	PHYSICS REVISION - CLASS 2	NAVJYOTI SIR
1:00PM	MATHS REVISION - CLASS 2	NAVJYOTI SIR
2:00PM	BIOLOGY REVISION - CLASS 2	SHIVANGI MA'AM

CDS 2 2024 LIVE CLASSES

11:00AM	GK - HISTORY REVISION - CLASS 2	RUBY MA'AM
12:00PM	PHYSICS REVISION - CLASS 2	NAVJYOTI SIR
2:00PM	BIOLOGY REVISION - CLASS 2	SHIVANGI MA'AM
3:00PM	MATHS REVISION - CLASS 2	NAVJYOTI SIR

REVISION TOPICS :

- **Sets, Relations and Functions**
- **Complex Numbers**

SSBCrack EXAMS

Q) If $f(x) + 2f\left(\frac{1}{x}\right) = 3x$, $x \neq 0$ and

$S = \{x \in R : f(x) = f(-x)\}$; then S:

(a) contains exactly two elements.

(b) contains more than two elements.

(c) is an empty set.

(d) contains exactly one element.

$f(x) + 2f\left(\frac{1}{x}\right) = 3x$ —— (1)

$f\left(\frac{1}{x}\right) + 2f\left(\frac{1}{\frac{1}{x}}\right) = 3\left(\frac{1}{x}\right)$

$f\left(\frac{1}{x}\right) + 2f(x) = \frac{3}{x}$ —— (2)

Add (1) & (2),

$3f(x) + 3f\left(\frac{1}{x}\right) = 3x + 3\left(\frac{1}{x}\right)$

$f(x) + f\left(\frac{1}{x}\right) = x + \frac{1}{x}$ —— (3)

(2) − (1),

$f(x) - f\left(\frac{1}{x}\right) = \frac{3}{x} - 3x$ —— (4)

(3) + (4),

$2f(x) = -2x + \frac{4}{x}$

NDA 2 2024 - REVISION - MATHS – CLASS 2

$$2f(x) = -2x + \frac{4}{x}$$

$$f(x) = -x + \frac{2}{x} = \frac{2}{x} - x$$

$$S = \{ f(x) = f(-x) \}$$

$$f(x) = \frac{2}{x} - x$$

$$f(-x) = -\frac{2}{x} + x$$

$$\frac{2}{x} - x = -\frac{2}{x} + x$$

$$\frac{4}{x} = 2x$$

$$\frac{2}{x} = x \Rightarrow x^2 = 2$$

$$x = +\sqrt{2}, -\sqrt{2}$$

$$S = \{ \sqrt{2}, -\sqrt{2} \}$$

Q) If $f(x) + 2f\left(\frac{1}{x}\right) = 3x, x \neq 0$ and

$S = \{x \in R : f(x) = f(-x)\}$; then S:

(a) contains exactly two elements.

(b) contains more than two elements.

(c) is an empty set.

(d) contains exactly one element.

Ans: (a)

SSBCrack EXAMS

Q) Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is

(a) reflexive and transitive only

(b) reflexive only

(c) an equivalence relation

(d) reflexive and symmetric only

✓ Reflexive : (3,3), (6,6), (9,9), (12,12)

✗ Symmetric : $(6,12) \in R$ but $(12,6) \notin R$

✓ Transitive :

Q) Let $R = \{(3, 3), (6, 6), (9, 9), (12, 12), (6, 12), (3, 9), (3, 12), (3, 6)\}$ be a relation on the set $A = \{3, 6, 9, 12\}$. The relation is

(a) reflexive and transitive only

(b) reflexive only

(c) an equivalence relation

(d) reflexive and symmetric only

Ans: (a)

SSBCrack EXAMS

Q) If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals.

(a) X (b) Y

(c) ϕ ✓ (d) None of these.

$X \cap (X \cup Y)^c$ — De-Morgan's law

$(A \cup B)^c = A^c \cap B^c$

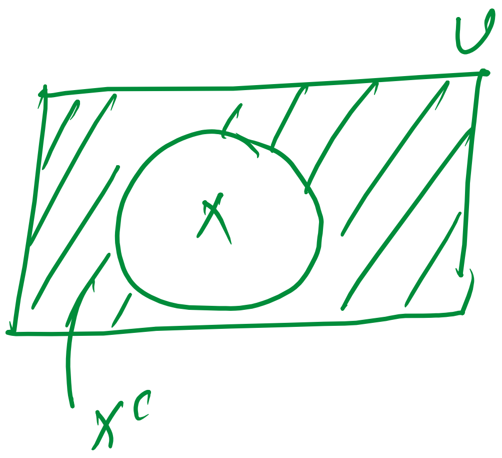
$(A \cap B)^c = A^c \cup B^c$

$= X \cap (X^c \cap Y^c)$

$= (X \cap X^c) \cap Y^c$

$= \phi \cap Y^c$

$= \phi$



Q) If X and Y are two sets, then $X \cap (X \cup Y)^c$ equals.

(a) X

(b) Y

(c) ϕ

(d) None of these.

Ans: (c)

Q) Let $f(x) = x^2 + 2x - 5$

and $g(x) = 5x + 30$

What are the roots of the equation $g[(f(x)] = 0$?

(a) 1, –1
(b) –1, –1 ✓
(c) 1, 1
(d) 0, 1

$g(x) = 5x + 30$

$g(f(x)) = g(x^2 + 2x - 5) = 5(x^2 + 2x - 5) + 30$

$= 5x^2 + 10x + 5$

$= 5(x+1)^2$

$g(f(x)) = 0$

$5(x+1)^2 = 0$

$(x+1)^2 = 0$

$x = -1, -1$

SSBCrack EXAMS

Q) Let $f(x) = x^2 + 2x - 5$

and $g(x) = 5x + 30$

What are the roots of the equation $g[(f(x)] = 0$?

(a) 1, –1
(b) –1, – 1
(c) 1, 1
(d) 0, 1

Ans: (b)

SSBCrack EXAMS

Q) If a set X contains n (n > 5) elements, then what is the number of subsets of X containing less than 5 elements ?

(a) C (n, 4) $= {}^nC_4$

(b) C (n, 5)

(c) $\sum_{r=0}^{5} C(n,r)$

(d) $\sum_{r=0}^{4} C(n,r)$ ✓

(no. of elements of set X)

subsets with zero elements $= {}^nC_0$

" " 1 " $= {}^nC_1$

" " two " $= {}^nC_2$

$${}^nC_0 + {}^nC_1 + {}^nC_2 + {}^nC_3 + {}^nC_4 = \left(\sum_{r=0}^{4} {}^nC_r\right)$$

Q) If a set X contains n (n > 5) elements, then what is the number of subsets of X containing less than 5 elements ?

(a) C (n, 4)

(b) C (n, 5)

(c) $\sum_{r=0}^{5} C(n, r)$

(d) $\sum_{r=0}^{4} C(n, r)$

Ans: (d)

SSBCrack EXAMS

Q) If $f(x) = \dfrac{\sqrt{x-1}}{x-4}$, defines a function on $\boldsymbol{R}$, then what is its domain ?

(a) $(-\infty, 4) \cup (4, \infty)$ (b) $[4, \infty)$

(c) $(1, 4) \cup (4, \infty)$ (d) $[1, 4) \cup (4, \infty)$

$x - 4 \neq 0$

$x \neq 4$

$x - 1 \geq 0$

$x \geq 1$

$[1, 4) \cup (4, \infty)$

Q) If $f(x) = \dfrac{\sqrt{x-1}}{x-4}$, defines a function on $\boldsymbol{R}$, then what is its domain ?

(a) $(-\infty, 4) \cup (4, \infty)$

(b) $[4, \infty)$

(c) $(1, 4) \cup (4, \infty)$

(d) $[1, 4) \cup (4, \infty)$

Ans: (d)

Q) For f to be a function, what is the domain of f, if

$$f(x)=\frac{1}{\sqrt{|x|-x}}\ ?$$

(a) $(-\infty, 0)$ (b) $(0, \infty)$ (c) $(-\infty, \infty)$ (d) $(-\infty, 0]$

$x \geq 0$

$f(x) = \frac{1}{\sqrt{0}}$ = (not defined)

$(x < 0)$

$f(x) = \frac{1}{\sqrt{(+x)-(-x)}} = \frac{1}{\sqrt{2x}}$ (defined)

→ using -ve value

positive

eg $x = -2$

$\frac{1}{\sqrt{|-2|-(-2)}} = \frac{1}{\sqrt{4}}$ (positive value inside square root)

Q) For f to be a function, what is the domain of f, if $f(x)=\dfrac{1}{\sqrt{|x|-x}}$?

(a) $(-\infty, 0)$ (b) $(0, \infty)$ (c) $(-\infty, \infty)$ (d) $(-\infty, 0)$

Ans: (a)

Q) In an examination out of 100 students, 75 passed in English 60 passed in Mathematics and 45 passed in both English and Mathematics. What is the number of students passed in exactly one of the two subjects?

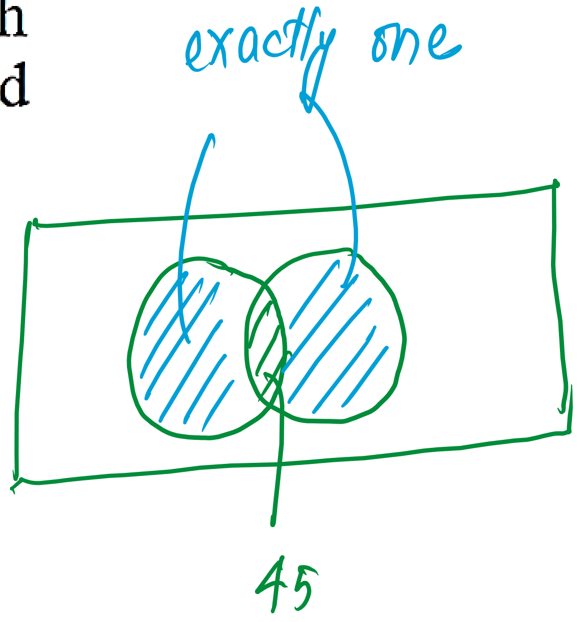
(a) 45 (b) 60

(c) 75 (d) 90

only Eng + only maths,

$(75 - 45) + (60 - 45)$

$= 30 + 15 = 45$



SSBCrack EXAMS

Q) In an examination out of 100 students, 75 passed in English 60 passed in Mathematics and 45 passed in both English and Mathematics. What is the number of students passed in exactly one of the two subjects?

(a) 45 (b) 60

(c) 75 (d) 90

Ans: (a)

Q) Let $R = \{x \mid x \in N, x \text{ is a multiple of } 3 \text{ and } x \leq 100\}$

$S = \{x \mid x \in N, x \text{ is a multiple of } 5 \text{ and } x \leq 100\}$

What is the number of elements in $(R \times S) \cap (S \times R)$?

(a) 36 (b) 33

(c) 20 (d) 6

$R = \{3, 6, 9 \ldots\ldots 99\}$

$S = \{5, 10, 15 \ldots 100\}$

common elements → 15, 30, 45, 60, 75, 90

(6)

R×S = {(first element from R, second element from S)

S×R = {(" " S, " " R)

Q) Let $R = \{x \mid x \in N, x \text{ is a multiple of } 3 \text{ and } x \leq 100\}$

$S = \{x \mid x \in N, x \text{ is a multiple of } 5 \text{ and } x \leq 100\}$

What is the number of elements in $(R \times S) \cap (S \times R)$?

(a) 36

(b) 33

(c) 20

(d) 6

Ans: (a)

Q) Let z_1 and z_2 be two non-zero complex numbers such that

$$|z_1| = |z_2| = \left|\frac{1}{z_1} + \frac{1}{z_2}\right| = 2$$

What is the value of $|z_1 + z_2|$?

(a) 8 (b) 4

(c) 2 (d) 1

$$\left|\frac{z_1}{z_2}\right| = \frac{|z_1|}{|z_2|}$$

$$|z_1 \cdot z_2| = |z_1||z_2|$$

$$\left|\frac{z_2 + z_1}{z_1 z_2}\right| = 2$$

$$|z_1 + z_2| = 2|z_1||z_2|$$

$$= 2 \times 2 \times 2 = 8$$

Q) Let z_1 and z_2 be two non-zero complex numbers such that

$$|z_1| = |z_2| = \left|\frac{1}{z_1} + \frac{1}{z_2}\right| = 2$$

What is the value of $|z_1 + z_2|$?

(a) 8 (b) 4

(c) 2 (d) 1

Ans: (a)

SSBCrack EXAMS

Q) What is one of the values of $\sqrt{i}+\sqrt{-i}$?

(a) ✓ $\sqrt{2}$ (b) 0

(c) $\pm\frac{1+i}{\sqrt{2}}$ (d) $\pm\frac{1-i}{\sqrt{2}}$

$$\sqrt{i}+\sqrt{-i}$$

$$\frac{1+i+1-i}{\sqrt{2}} = \frac{2}{\sqrt{2}} = \sqrt{2}$$

$$i = \frac{(1+i)^2}{2} \qquad -i = \frac{(1-i)^2}{2}$$

$$\sqrt{i} = \frac{1+i}{\sqrt{2}} \qquad \sqrt{-i} = \frac{1-i}{\sqrt{2}}$$

Q) What is one of the values of $\sqrt{i} + \sqrt{-i}$?

(a) $\sqrt{2}$

(b) 0

(c) $\pm\frac{1+i}{\sqrt{2}}$

(d) $\pm\frac{1-i}{\sqrt{2}}$

Ans: (a)

SSBCrack EXAMS

Q) If $1, \omega, \omega^2$ are the three cube roots of unity, then what is $\frac{(a\omega^6 + b\omega^4 + c\omega^2)}{(b + c\omega^{10} + a\omega^8)}$ equal to?

(a) $\frac{a}{b}$

(b) b

(c) ω

(d) ω^2

$\omega^{3n} = 1$

$\omega^{3n+1} = \omega$

$\omega^{3n+2} = \omega^2$

(*)

Multiplying and dividing by ω,

$$\frac{a \cdot 1 + b\omega + c\omega^2}{b + c\omega^1 + a\omega^2} = \frac{a + b\omega + c\omega^2}{a\omega^2 + b + c\omega} = \frac{\omega(a + b\omega + c\omega^2)}{(a + b\omega + c\omega^2)} = \omega$$

Q) If $1, \omega, \omega^2$ are the three cube roots of unity, then what is $\frac{(a\omega^6 + b\omega^4 + c\omega^2)}{(b + c\omega^{10} + a\omega^8)}$ equal to?

(a) $\frac{a}{b}$ (b) b

(c) ω (d) ω^2

Ans: (c)

Q) If $\alpha = \frac{1+i\sqrt{3}}{2}$, then what is the value of $1 + \alpha^8 + \alpha^{16} + \alpha^{24} + \alpha^{32}$?

(a) 0 (b) 1

(c) $-\omega$ (d) $-\omega^2$

$\omega = \frac{-1+\sqrt{3}i}{2}$

$1 + \omega^8 + \omega^{16} + \omega^{24} + \omega^{32}$

$1 + \omega^8 + (\omega^8)^2 + (\omega^8)^3 + (\omega^8)^4$

$= 1 + \omega^2 + \omega^4 + \omega^6 + \omega^8$

$= 1 + \omega^2 + \omega + 1 + \omega^2$

$\omega^8 = \omega^{6 \cdot 2} = \omega^2$

$2 + \omega + \omega^2 + \omega^2$

$= 2 + (-1) + \omega^2$

$= 1 + \omega^2$

$= -\omega$

$1 + \omega + \omega^2 = 0$

$\omega + \omega^2 = -1$

$1 + \omega^2 = -\omega$

Q) If $\alpha = \frac{1+i\sqrt{3}}{2}$, then what is the value of $1 + \alpha^8 + \alpha^{16} + \alpha^{24} + \alpha^{32}$?

(a) 0

(b) 1

(c) $-\omega$

(d) $-\omega^2$

Ans: (c)

Q) What is $i^{1000} + i^{1001} + i^{1002} + i^{1003}$ equal to (where $i = \sqrt{-1}$)?

(a) 0 ✓ (b) i

(c) $-i$ (d) 1

$i^{1000}(1 + i + i^2 + i^3)$

$1(1 + i - 1 + (-i))$

$= 1(0) = 0$

$i = \sqrt{-1}$

$i^{4n} = 1$

$i^{4n+1} = i^1$

$i^{4n+2} = i^2 = -1$

$i^{4n+3} = i^3 = i^2 \cdot i^1$

$= (-1) \cdot i$

$= -i$

Q) What is $i^{1000} + i^{1001} + i^{1002} + i^{1003}$ equal to (where $i = \sqrt{-1}$)?

(a) 0 (b) i

(c) $-i$ (d) 1

Ans: (a)

Q) What is the square root of the complex number $-5+12i$?

(a) $2-3i$ (b) $2+3i$

(c) $-2+3i$ (d) $\sqrt{-5}+\sqrt{12i}$

$\sqrt{-5+12i} = a+bi$

$-5+12i = (a^2-b^2) + 2abi$

comparing real & imaginary parts,

$a^2-b^2 = -5$ — (1)

$2ab = 12$ — (2)

$(a^2+b^2)^2 = (a^2-b^2)^2 + 4a^2b^2$

$(a^2+b^2)^2 = (-5)^2 + (12)^2$

$a^2+b^2 = 13$ (As $a^2+b^2 > 0$ (sum of squares)) — (3)

$a^2-b^2 = -5$ — (1)

(3) + (1) $2a^2 = 8 \Rightarrow a = \pm 2$

(3) − (1) $= 2b^2 = 18 \Rightarrow b = \pm 3$

From eqn (2),

$2ab = 12$

$ab > 0$

Q) What is the square root of the complex number $-5 + 12i$?

(a) $2 - 3i$

(b) $2 + 3i$

(c) $-2 + 3i$

(d) $\sqrt{-5} + \sqrt{12i}$

Ans: (b)

Q) If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$, then what is α^{31} equal to?

(a) α (b) α^2

(c) 0 (d) 1

Q) If α is a complex number such that $\alpha^2 + \alpha + 1 = 0$, then what is α^{31} equal to?

(a) α (b) α^2

(c) 0 (d) 1

Ans: (a)

Q) The modulus and principal argument of the complex number $\dfrac{1+2i}{1-(1-i)^2}$ are respectively

(a) 1, 0 (b) 1, 1 (c) 2, 0 (d) 2, 1

Q) The modulus and principal argument of the complex number $\dfrac{1+2i}{1-(1-i)^2}$ are respectively

(a) 1, 0 (b) 1, 1 (c) 2, 0 (d) 2, 1

Ans: (a)

Q) If z is a complex number such that $z + z^{-1} = 1$, then what is the value of $z^{99} + z^{-99}$?

(a) 1

(b) –1

(c) 2

(d) –2

Q) If z is a complex number such that $z + z^{-1} = 1$, then what is the value of $z^{99} + z^{-99}$?

(a) 1 (b) –1

(c) 2 (d) –2

Ans: (d)

Q) If $y = \cos\theta + i\sin\theta$, then the value of $y + \frac{1}{y}$ is

a) $2\cos\theta$

b) $2\sin\theta$

c) $2\text{cosec}\,\theta$

d) $2\tan\theta$

Q) If $y = \cos\theta + i\sin\theta$, then the value of $y + \frac{1}{y}$ is

a) $2\cos\theta$

b) $2\sin\theta$

c) $2\operatorname{cosec}\theta$

d) $2\tan\theta$

Ans: (a)

Q) If $A = \{x \in Z : x^3 - 1 = 0\}$ and $B = \{x \in Z : x^2 + x + 1 = 0\}$, where Z is set of complex numbers, then what is $A \cap B$ equal to ?

(a) Null set

(b) $\left\{\frac{-1+\sqrt{3}\,i}{2}, \frac{-1-\sqrt{3}\,i}{2}\right\}$

(c) $\left\{\frac{-1+\sqrt{3}\,i}{4}, \frac{-1-\sqrt{3}\,i}{4}\right\}$

(d) $\left\{\frac{1+\sqrt{3}i}{2}, \frac{1-\sqrt{3}\,i}{2}\right\}$

Q) If $A = \{x \in Z : x^3 - 1 = 0\}$ and $B = \{x \in Z : x^2 + x + 1 = 0\}$, where Z is set of complex numbers, then what is $A \cap B$ equal to ?

(a) Null set

(b) $\left\{\frac{-1+\sqrt{3}\,i}{2}, \frac{-1-\sqrt{3}\,i}{2}\right\}$

(c) $\left\{\frac{-1+\sqrt{3}\,i}{4}, \frac{-1-\sqrt{3}\,i}{4}\right\}$

(d) $\left\{\frac{1+\sqrt{3}i}{2}, \frac{1-\sqrt{3}\,i}{2}\right\}$

Ans: (b)

Q)Which one of the following is correct in respect of the cube roots of unity?

(a) They are collinear

(b) They lie on a circle of radius $\sqrt{3}$

(c) They form an equilateral triangle

(d) None of the above

Q) Which one of the following is correct in respect of the cube roots of unity?

(a) They are collinear

(b) They lie on a circle of radius $\sqrt{3}$

(c) They form an equilateral triangle

(d) None of the above

Ans: (c)

Q) If $z = \left(\frac{\sqrt{3}}{2}+\frac{i}{2}\right)^{107} + \left(\frac{\sqrt{3}}{2}-\frac{i}{2}\right)^{107}$, then what is the imaginary part of z equal to?

(a) 0

(b) $\frac{1}{2}$

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

(d) 1

Q) If $z = \left(\frac{\sqrt{3}}{2}+\frac{i}{2}\right)^{107} + \left(\frac{\sqrt{3}}{2}-\frac{i}{2}\right)^{107}$, then what is the imaginary part of z equal to?

(a) 0

(b) $\frac{1}{2}$

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

(d) 1

Ans: (a)

Q) Let $z = i^3(1 + i)$ be a complex number. What is its argument?

(a) π

(b) $\frac{\pi}{4}$

(c) $-\frac{\pi}{4}$

(d) $\frac{5\pi}{4}$

Q) Let $z = i^3(1 + i)$ be a complex number. What is its argument?

(a) π

(b) $\frac{\pi}{4}$

(c) $-\frac{\pi}{4}$

(d) $\frac{5\pi}{4}$

Ans: (c)

Q) If 1, ω, ω^2 are the cube roots of unity, then the value of $(1+\omega)(1+\omega^2)(1+\omega^4)(1+\omega^8)$ is

(a) -1 (b) 0

(c) 1 (d) 2

SSBCrack EXAMS

Q) If 1, ω, ω^2 are the cube roots of unity, then the value of $(1+\omega)(1+\omega^2)(1+\omega^4)(1+\omega^8)$ is

(a) -1 (b) 0

(c) 1 (d) 2

Ans: (c)

Q) If $z^2 + z + 1 = 0$, where z is complex number, then the value of

$$\left(z+\frac{1}{z}\right)^2+\left(z^2+\frac{1}{z^2}\right)^2+\left(z^3+\frac{1}{z^3}\right)^2+\ldots\ldots\ldots+\left(z^6+\frac{1}{z^6}\right)^2 \text{ is}$$

(a) 18 (b) 54

(c) 6 (d) 12

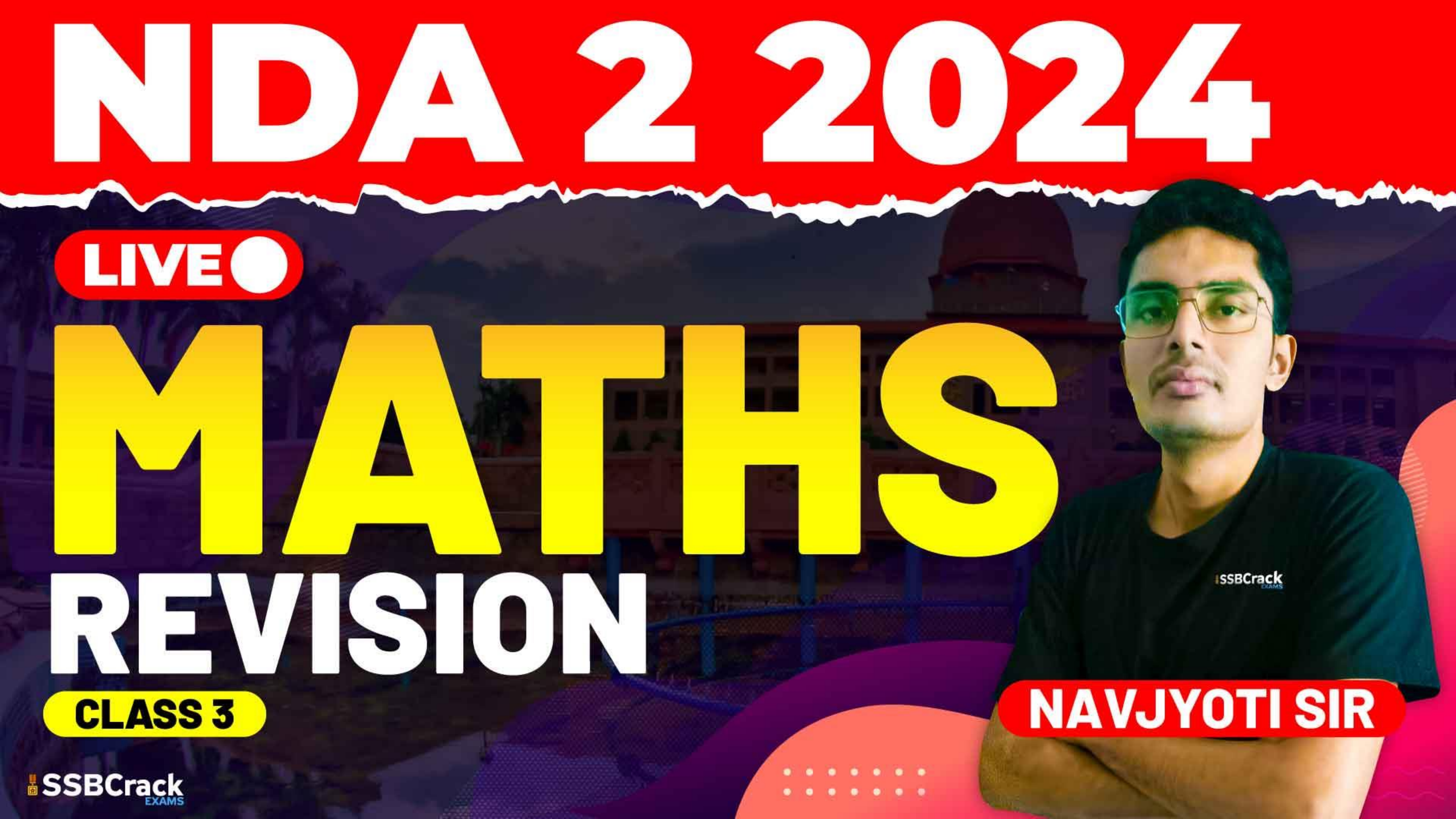
Q) If $z^2 + z + 1 = 0$, where z is complex number, then the value of

$$\left(z+\frac{1}{z}\right)^2+\left(z^2+\frac{1}{z^2}\right)^2+\left(z^3+\frac{1}{z^3}\right)^2+\ldots\ldots\ldots+\left(z^6+\frac{1}{z^6}\right)^2 \text{ is}$$

(a) 18 (b) 54

(c) 6 (d) 12

Ans: (d)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REVISION TOPICS :

(07/08/24)

- Quadratic Equations and Inequalities
- Trignometric Functions