

# NARAYANA'S SENSATIONAL SUCCESS ACROSS INDIA

**7** Students Secured **100 Percentile**  
in All India JEE Main-2020

BELOW 10  
**21**  
RANKS  
All Cat

BELOW 100  
**113**  
RANKS  
All Cat



**ADMISSIONS OPEN (2020-21)**

## OUR REGULAR CLASSROOM PROGRAMME

**One Year Classroom Program**  
**JEE/NEET-2021**  
(for students moving from XI to XII)

**Two Year Classroom Program**  
**JEE/NEET-2022**  
(for students moving from X to XI)

**Three Year Integrated Classroom Program**  
**JEE/NEET-2023**  
(for students moving from IX to X)

**Four Year Integrated Classroom Program**  
**JEE/NEET-2024**  
(for students moving from VIII to IX)

**FOUNDATION PROGRAMMES**  
**For NTSE, NSEJS, JSTSE,**  
**Olympiads & School/Board Exams**  
(for students moving to  
Class VI, VII, VIII, IX & X)

**APEX BATCH**  
**Two years school Integrated**  
**Classroom Program - 2022**  
For JEE Main & Advance / NEET (for XI Studying Students)  
**Course Feature** - Complete Coverage of CBSE - Regular Classes - Weekly Test & Regular Analysis - Lab Facility  
- Motivation & Counseling - Competitive Exam Prep - Ample time for self study

**Online Classes for IIT/NEET/Foundation/Olympiads**

- Access Recording of Past Classes on n-Learn App
- Online Parent Teacher Meeting
- Personalized Extra Classes & Live Doubt Solving
- Hybrid/Customized Classroom model
- Video Solution of Weekly/Fortnightly Test
- Printed Study Material will be sent by us
- n-Learn App
- Counselling Motivational sessions
- Affordable Fee
- Doubt Classes / Practice Classes
- Provision to Convert from online to regular classroom programme
- Once Classes resume by just paying nominal fee

**Online Test**

- Micro & Macro Analysis
- Relative performance (All India Ranking)
- Question wise Analysis
- Unlimited Practice Test
- Grand Test

**NARAYANA**

**Digital**  
**Classes**  
STUDY ONLINE FROM HOME

**For Class**  
**7<sup>th</sup> to 12<sup>th</sup> +**





**JEE-MAIN-2021**

**MARCH ATTEMPT**

**17.03.21\_SHIFT - I**

**MATHEMATICS**

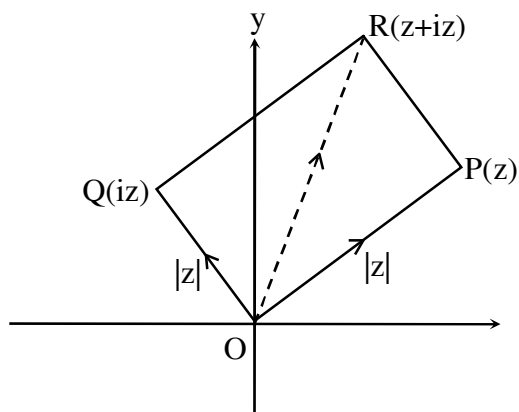
## MATHEMATICS

1. Let  $z, iz, z + iz$ , are vertices of the triangle then area of this triangle is

- (1)  $\frac{1}{2}|z|^2$                       (2)  $\frac{1}{2}|z + iz|^2$                       (3) 0                      (4) 1

Ans. (1)

Sol.



Area of  $\Delta = \frac{1}{2}$  (area of square)

$$= \frac{1}{2}|z|^2$$

2. Let  $4x + 3y \leq 75$ ,  $3x + 4y \leq 100$ ,  $x \geq 0$ ,  $y \geq 0$  and  $z = 6xy + y^2$ . Find maximum value  $z$  is

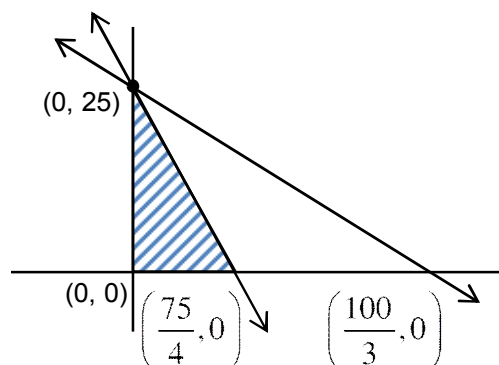
- (1) 575                      (2) 600                      (3) 625                      (4) 675

Ans. (3)

Sol.  $x \geq 0, y \geq 0$

$$4x + 3y \leq 75$$

$$3x + 4y \leq 100$$



$(x, y)$	$z = 6xy + y^2$
$(0, 25)$	$z = 0 + 625$
$(\frac{75}{4}, 0)$	$z = 0 + 0$
$(0, 0)$	$z = 0 + 0$

$z_{\max} = 625$  at  $x = 0, y = 25$

3. There are two dice each numbers as 1, 2, 3, 5, 7, 11. Find the probability that the sum of the no's on them is less than or equal to 8.

- (1)  $\frac{1}{2}$                       (2)  $\frac{17}{36}$                       (3)  $\frac{19}{36}$                       (4) none of these

**Ans.** (2)

**Sol.**  $n(S) = 36$

possible ordered pair ; (1, 1), (1, 2), (1, 3), (1, 5), (1, 7), (2, 1), (2, 2), (2, 3), (2, 5), (3, 1), (3, 2), (3, 3), (3, 5), (5, 1), (5, 2), (5, 3), (7, 1)

Number of ordered pair = 17

$$\text{Probability} = \frac{17}{36}$$

4. Let  $(p \rightarrow q) \leftrightarrow (\sim q * p)$  is a tautology, then  $p * \sim q$  is equivalent to -

- (1)  $p \rightarrow q$                       (2)  $p \vee q$                       (3)  $p \leftrightarrow q$                       (4)  $p \wedge q$

**Ans.** (1)

**Sol.**

p	q	$\sim q$	$p \rightarrow q$	$\sim q * p$	$\sim q \wedge p$	$\sim(\sim q \wedge p)$
T	T	F	T	T	F	T
F	T	F	T	T	F	T
T	F	T	F	F	T	F
F	F	T	T	T	F	T

for  $(p \rightarrow q) \leftrightarrow (\sim q * p)$  to be tautology, truth values of  $\sim q * p$  will be as shown in table so.

$$(\sim q * p) \equiv \sim(\sim q \wedge p) \equiv q \vee \sim p \equiv \sim p \vee q \equiv p \rightarrow q$$

$$\text{Hence } p * \sim q \equiv \sim(p \wedge \sim q) \equiv \sim p \vee q \equiv p \rightarrow q$$

5. The value of  $\lim_{x \rightarrow 0^+} \frac{\cos^{-1}(x - [x]^2) \sin^{-1}(x - [x]^2)}{x - x^3}$

- (1)  $\frac{\pi}{2}$                       (2)  $\frac{\pi}{4}$                       (3)  $-\frac{\pi}{2}$                       (4)  $-\frac{\pi}{4}$

**Ans.** (1)

**Sol.**  $\lim_{x \rightarrow 0^+} \frac{\cos^{-1}(x - [x]^2) \sin^{-1}(x - [x]^2)}{x(1 - x^2)}$

$$\Rightarrow \lim_{x \rightarrow 0^+} \frac{\cos^{-1} x \sin^{-1} x}{x} = \frac{\pi}{2}$$

6. If  $\frac{dy}{dx} = (x - 1)y + x - 1$ ,  $y(0) = 0$ , find  $y(1) =$

- (1)  $e^{\frac{1}{2}} - 1$                       (2)  $e^{\frac{1}{2}} - 1$                       (3)  $1 - e^{\frac{1}{2}}$                       (4)  $1 + e^{\frac{1}{2}}$

**Ans.** (2)



**Sol.**  $\frac{dy}{dx} = (x-1)y + (x-1)$

$$\frac{dy}{dx} = (x-1)(y+1)$$

$$\frac{dy}{y+1} = (x-1) dx$$

$$\ln(y+1) = \frac{x^2}{2} - x + c$$

$$x=0, y=0$$

$$\Rightarrow c=0$$

$$\therefore \ln(y+1) = \frac{x^2}{2} - x$$

$$\text{putting } x=1, \ln(y+1) = \frac{1}{2} - 1 = -\frac{1}{2}$$

$$y+1 = e^{-\frac{1}{2}}$$

$$y = e^{-\frac{1}{2}} - 1$$

$$\therefore y(1) = e^{-\frac{1}{2}} - 1$$

7. The value of  $\int_0^{\sqrt{\pi/2}} [\{x^2\} + \cos x] dx$ ; (where  $[\cdot]$  denotes greatest integer function)

(1)  $1 - \sqrt{\frac{\pi}{2}}$

(2)  $\sqrt{\frac{\pi}{2}}$

(3)  $\sqrt{\frac{\pi}{2}} + 1$

(4)  $\sqrt{\frac{\pi}{2}} - 1$

**Ans.** (4)

**Sol.**  $I = \int_0^1 [\cos x] dx + \int_1^{\sqrt{\pi/2}} [1 + \cos x] dx$

$$= \int_0^1 0 + \int_1^{\sqrt{\pi/2}} 1 dx + \int_1^{\sqrt{\pi/2}} [\cos x] dx$$

$$= 0 + \sqrt{\frac{\pi}{2}} - 1 + \int 0 dx$$

$$= \sqrt{\frac{\pi}{2}} - 1$$

8. If 4<sup>th</sup> term in the expansion of  $(x + x^{\log_2 x})^7$  is 4480 then x is equal to

- (1) 2                                      (2) 3                                      (3) 4                                      (4) 5

**Ans.** (1)

**Sol.**  ${}^7C_3 x^4 (x^{\log_2 x})^3 = 4480$

$$35 x^4 (x^{\log_2 x})^3 = 4480$$

$$x^4 (x^{\log_2 x})^3 = 128$$

take log w.r.t base 2 we get  $4 \log_2 x + 3 \log_2 (x^{\log_2 x}) = \log_2 128$

Let  $\log_2 x = y$

$$4y + 3y^2 = 7$$

$$\Rightarrow y = 1, \frac{-7}{3}$$

$$\Rightarrow \log_2 x = 1, \frac{-7}{3}$$

$$x = 2, x = 2^{-7/3}$$

9. Let  $g(\alpha) = \int_{\pi/6}^{\pi/3} \frac{\sin^\alpha x}{\sin^\alpha x + \cos^\alpha x} dx$  than which of the following option is **INCORRECT** ?

- (1)  $g(\alpha)$  is increasing function                                      (2)  $g(\alpha)$  is strictly decreasing function  
(3)  $g(\alpha)$  is even function                                      (4)  $g(\alpha)$  has point of inflection at  $\alpha = -\frac{1}{2}$

**Ans.** (2)

**Sol.**  $g(\alpha) = \int_{\pi/6}^{\pi/3} \frac{\sin^\alpha x}{\sin^\alpha x + \cos^\alpha x} dx$  ..... (i)

$$g(\alpha) = \int_{\pi/6}^{\pi/3} \frac{\cos^\alpha x}{\sin^\alpha x + \cos^\alpha x} dx$$
 ..... (ii)

adding equation (i) and (ii)

$$2g(\alpha) = \int_{\pi/6}^{\pi/3} 1 dx = \frac{\pi}{6}$$

$$\Rightarrow g(\alpha) = \frac{\pi}{12}$$



10. If  $y = 4 + \frac{1}{5 + \frac{1}{4 + \frac{1}{5 + \frac{1}{4 + \frac{1}{5 + \dots}}}}}$  then find the value of 'y'

- (1)  $\frac{10+2\sqrt{30}}{5}$  (2)  $\frac{10-2\sqrt{30}}{5}$  (3)  $\frac{5+\sqrt{30}}{10}$  (4)  $\frac{6-\sqrt{30}}{5}$

Ans. (1)

Sol.  $y = 4 + \frac{1}{5 + \frac{1}{y}}$

$$y = 4 + \frac{y}{5y+1}$$

$$5y^2 - 20y - 4 = 0$$

$$y = \frac{20 \pm \sqrt{400 + 80}}{10}$$

$$y = \frac{20 \pm 4\sqrt{30}}{10}, y > 0$$

$$y = \frac{10 + 2\sqrt{30}}{5}$$

11. If  $\lim_{x \rightarrow 0} \frac{\cos(\sin x) - \cos x}{x^4} = \frac{1}{k}$  then find the value of k.

- (1) 4 (2) 6 (3) 2 (4) 3

Ans. (2)

Sol.  $\frac{1}{k} = \lim_{x \rightarrow 0} \frac{2 \sin\left(\frac{\sin x + x}{2}\right) \sin\left(\frac{x - \sin x}{2}\right)}{x^4}$

$$= \lim_{x \rightarrow 0} \frac{(\sin x + x)(x - \sin x)}{2x^4} = \left( \lim_{x \rightarrow 0} \frac{\sin x + x}{2x} \right) \left( \lim_{x \rightarrow 0} \frac{x - \sin x}{x^3} \right)$$

$$= 1 \times \lim_{x \rightarrow 0} \frac{1 - \cos x}{3x^2} = \frac{1}{6}$$

$$k = 6$$

12. y-axis lies on a plane having point (1, 2, 3), then equation of plane is

- (1)  $x + 3z = 10$  (2)  $x + 3z = 0$  (3)  $3x - z = 0$  (4)  $3x + y = 6$

Ans. (3)

**Sol.** Let the equation of the plane is  $a(x - 1) + b(y - 2) + c(z - 3) = 0$

y-axis lies on it D.R.'s of y-axis are 0, 1, 0

$$\therefore 0.a + 1.b + 0.c = 0 \Rightarrow b = 0$$

$$\therefore \text{Equation of plane is } a(x - 1) + c(z - 3) = 0$$

$$x = 0, z = 0 \text{ also satisfy it } -a - 3c = 0 \Rightarrow a = -3c$$

$$-3c(x - 1) + c(z - 3) = 0$$

$$-3x + 3 + z - 3 = 0$$

$$3x - z = 0$$

**13.** If  $A = \begin{bmatrix} 0 & \sin \alpha \\ \sin \alpha & 0 \end{bmatrix}$  where  $\alpha \in \left(0, \frac{\pi}{2}\right)$  and  $\left|A^2 - \frac{1}{2}I\right| = 0$ , then the value of  $\alpha$  is

- (1)  $\frac{\pi}{6}$                       (2)  $\frac{\pi}{2}$                       (3)  $\frac{\pi}{3}$                       (4)  $\frac{\pi}{4}$

**Ans.** (4)

**Sol.**  $A^2 = \begin{bmatrix} 0 & \sin \alpha \\ \sin \alpha & 0 \end{bmatrix} \begin{bmatrix} 0 & \sin \alpha \\ \sin \alpha & 0 \end{bmatrix} = \begin{bmatrix} \sin^2 \alpha & 0 \\ 0 & \sin^2 \alpha \end{bmatrix}$

$$A^2 - \frac{1}{2}I = \begin{bmatrix} \sin^2 \alpha & 0 \\ 0 & \sin^2 \alpha \end{bmatrix} - \begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{bmatrix} = \begin{bmatrix} \sin^2 \alpha - \frac{1}{2} & 0 \\ 0 & \sin^2 \alpha - \frac{1}{2} \end{bmatrix}$$

$$\Rightarrow \left|A^2 - \frac{1}{2}I\right| = 0$$

$$\begin{vmatrix} \sin^2 \alpha - \frac{1}{2} & 0 \\ 0 & \sin^2 \alpha - \frac{1}{2} \end{vmatrix} = 0$$

$$\Rightarrow \left(\sin^2 \alpha - \frac{1}{2}\right)^2 = 0 \Rightarrow \sin^2 \alpha = \frac{1}{2} \Rightarrow \sin \alpha = \frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}$$

$$\alpha = \frac{\pi}{4}$$

**14.** If  $\tan^{-1}(1+x) + \cot^{-1}\left(\frac{1}{x-1}\right) = \tan^{-1}\frac{8}{31}$ , then sum of possible value of 'x' is equal to

- (1)  $\frac{-31}{4}$                       (2)  $\frac{-33}{4}$                       (3)  $\frac{-32}{4}$                       (4)  $\frac{-30}{4}$

**Ans.** (3)



**Sol.** Taking tan both sides

$$\frac{(1+x)+(x-1)}{1-(1+x)(x-1)} = \frac{8}{31}$$

$$\Rightarrow \frac{2x}{2-x^2} = \frac{8}{31}$$

$$\Rightarrow 4x^2 + 31x - 8 = 0$$

$$\Rightarrow x = -8, \frac{1}{4}$$

but at  $x = \frac{1}{4}$

$$\text{LHS} > \frac{\pi}{2} \text{ and RHS} < \frac{\pi}{2}$$

So, only solution is  $x = -8$

**15.** If the equation

$$kx + y + z = 1$$

$$x + ky + z = 1$$

$$x + y + kz = 1$$

have no solution, then

(1)  $k = 1$

(2)  $k = -2$

(3)  $k = -1$

(4)  $k = 2$

**Ans.** (2)

**Sol.**  $D = \begin{vmatrix} k & 1 & 1 \\ 1 & k & 1 \\ 1 & 1 & k \end{vmatrix} = 0$

$$k(k^2 - 1) - (k - 1) + (1 - k) = 0$$

$$(k - 1)(k^2 + k - 1 - 1) = 0$$

$$(k - 1)(k^2 + 1 - 2) = 0$$

$$(k - 1)(k - 1)(k + 2) = 0$$

$$k = 1, k = 2$$

for  $k = 1$  equation identical so  $k = -2$  for no solution.

**16.** If PQR is triangle and perpendicular bisector of PR is  $2x - y + 2 = 0$  then circumcenter of  $\Delta PQR$  is

(1) (1,4)

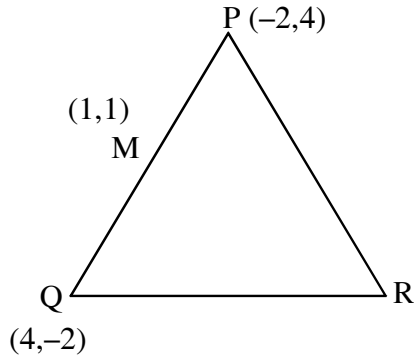
(2) (-2,-2)

(3) (2,6)

(4) (0,2)

**Ans.** (2)

**Sol.**



Perpendicular bisector of PR :  $2x - y + 2 = 0$  .....(1)

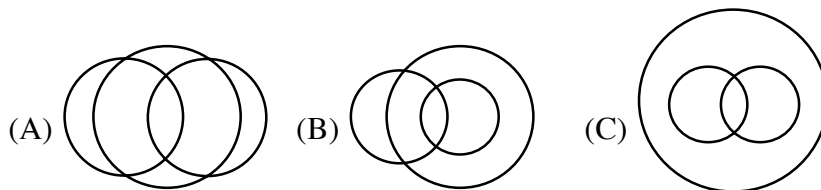
Mid point of PQ  $\rightarrow M(1, 1)$

equation of perpendicular bisector of PQ :  $x - y = 0$  .....(2)

$\therefore$  POI of equation (1) & (2) is circumcentre

So, circumcentre  $(-2, -2)$

- 17.** 3 games are played in a school. If some students played exactly 2 games, and no student play all the 3 games, then which venn diagram can represents the above situation



- (1) Only A is correct  
(2) A & B are correct  
(3) Only C is correct  
(4) None of these

**Ans.** (4)

**Sol.** In are the (A), (B), (C) there are some students which play all the three games hence no venn diagram is correct

- 18.** Let there are two teams, one team has 7 boys and 6 girls & other team has 4 boys n girls. Let total match between two teams of same genders one 52 (each match is happened between two players) then n is equal to

- (1) 8 (2) 6 (3) 5 (4) 4

**Ans.** (4)

**Sol.**  $7 \times 4 + 6 \times n = 52$

$$6n = 24$$

$$\Rightarrow n = 4$$



19. Let  $S_1 \equiv x^2 + y^2 - 10x - 10y + 41 = 0$  and  $S_2 \equiv x^2 + y^2 - 16x - 10y + 80 = 0$  are two circles, then which of the following is INCORRECT ?

- (1) Both circles intersect each other at two distinct points
- (2) Centres of both circles lie inside the region of each other
- (3) Distance between centres is average of radii of circles
- (4) Both circles pass through centers of each other

Ans. (2)

Sol.  $C_1(5, 5)$ ,  $C_2(8, 5)$   
position of  $C_1(5, 5)$  in  $S_2 = 0$   
 $= 25 + 25 - 80 - 50 + 80$   
 $= 0$

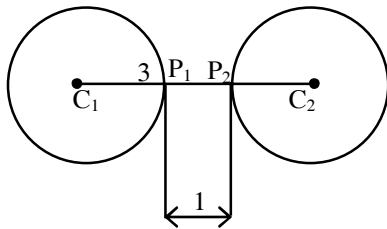
position of  $C_2(8, 5)$  in  $S_1 = 0$   
 $= 64 + 25 - 80 - 50 + 41$   
 $= 0$

$\Rightarrow S_1$  and  $S_2$  intersect each other and pass through center of each other

20. Let  $S_1$  &  $S_2$  be two circles  $x^2 + y^2 - 10x - 10y + 41 = 0$  and  $x^2 + y^2 - 24x - 10y + 160 = 0$  respectively  $P_1$  is a point on  $S_1$  and  $P_2$  is a point of  $S_2$ . Minimum value of distance  $P_1P_2$  is \_\_\_\_\_

Ans. 1

Sol.  $S_1 : (x - 5)^2 + (y - 5)^2 = 9$  centre  $(5, 5)$ ,  $r_1 = 3$   
 $S_2 : (x - 12)^2 + (y - 5)^2 = 9$  centre  $(12, 5)$ ,  $r_2 = 3$



So  $(P_1P_2)_{\min} = 1$

21. If  $\cot^{-1}\alpha = \cot^{-1}2 + \cot^{-1}8 + \cot^{-1}18 + \cot^{-1}32 + \dots$  up to 100 terms then ' $\alpha$ ' is equal to

Ans. 1.01

Sol. 
$$\begin{aligned} \text{RHS} &= \sum_{n=1}^{100} \cot^{-1} 2n^2 = \sum_{n=1}^{100} \tan^{-1} \left( \frac{2}{4n^2} \right) \\ &= \sum_{n=1}^{100} \tan^{-1} \left( \frac{(2n+1) - (2n-1)}{1 + (2n+1)(2n-1)} \right) \\ &= \sum_{n=1}^{100} \tan^{-1}(2n+1) - \tan^{-1}(2n-1) \\ &= \tan^{-1}201 - \tan^{-1}1 \\ &= \tan^{-1} \left( \frac{200}{202} \right) \\ &\Rightarrow \cot^{-1} \alpha = \cot^{-1} \left( \frac{101}{100} \right) \\ &\Rightarrow \alpha = 1.01 \end{aligned}$$

- 22.** Let  $B_i$  ( $i = 1, 2, 3$ ) be three independent events in a sample space. The probability that only  $B_1$  occur is  $\alpha$ , only  $B_2$  occurs is  $\beta$  and only  $B_3$  occurs is  $\gamma$ . Let  $p$  be the probability that none of the events  $B_i$  occurs and these 4 probabilities satisfy the equations  $(\alpha - 2\beta)p = \alpha\beta$  and  $(\beta - 3\gamma)p = 2\beta\gamma$  (All the probabilities are assumed to lie in the interval  $(0,1)$ ). Then  $\frac{P(B_1)}{P(B_3)}$  is equal to\_\_\_\_\_.

**Ans.** 6

**Sol.** Let  $x, y, z$  be probability of  $B_1, B_2, B_3$  respectively

$$\Rightarrow x(1-y)(1-z) = \alpha \Rightarrow y(1-x)(1-z) = \beta \Rightarrow z(1-x)(1-y) = \gamma \Rightarrow (1-x)(1-y)(1-z) = P$$

Putting in the given relation we get  $x = 2y$  and  $y = 3z \Rightarrow x = 6z \Rightarrow \frac{x}{z} = 6$

- 23.** Let  $A = \begin{bmatrix} 2 & 3 \\ 0 & -1 \end{bmatrix}$ , the value of  $\det(A^4) - \det(A^{10} - (\text{adj}(2A))^{10})$

**Ans.** 16

**Sol.**  $|A| = -2 \Rightarrow |A|^4 = 16$

$$A^{10} = \begin{bmatrix} 2^{10} & 2^{10}-1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1024 & 1023 \\ 0 & 1 \end{bmatrix}$$

$$2A = \begin{bmatrix} 4 & 6 \\ 0 & -2 \end{bmatrix}$$

$$\text{adj}(2A) = \begin{bmatrix} -2 & -6 \\ 0 & 4 \end{bmatrix}$$

$$\text{adj}(2A) = -2 \begin{bmatrix} 1 & 3 \\ 0 & -2 \end{bmatrix}$$

$$(\text{adj}(2A))^{10} = 2^{10} \begin{bmatrix} 1 & 3 \\ 0 & -2 \end{bmatrix}^{10}$$

$$= 2^{10} \begin{bmatrix} 1 & -(2^{10}-1) \\ 0 & 2^{10} \end{bmatrix}$$

$$= 2^{10} \begin{bmatrix} 1 & -1023 \\ 0 & 1024 \end{bmatrix}$$

$$A^{10} - (\text{adj}(2A))^{10} = \begin{bmatrix} 0 & 2^{11} \times 1023 \\ 0 & 1 - (1024)^2 \end{bmatrix}$$

$$|A^{10} - \text{adj}(2A)^{10}| = 0$$



**24.** Find the remainder when  $(2021)^{3762}$  is divided by 17.

**Ans.** 4

**Sol.**  $(2021)^{3762} = (2023 - 2)^{3762} = \text{multiple of } 17 + 2^{3762}$   
 $= 17\lambda + 2^2 (2^4)^{940}$   
 $= 17\lambda + 4 (17 - 1)^{940}$   
 $= 17\lambda + 4 (17\mu + 1)$   
 $17k + 4; (k \in \mathbb{I})$   
 Remainder = 4

**25.** If  $\vec{r} \times \vec{a} = \vec{r} \times \vec{b}$ ,  $\vec{a} = 2\hat{i} - 3\hat{j} + 4\hat{k}$ ,  $\vec{b} = 7\hat{i} + \hat{j} - 6\hat{k}$ ,  $\vec{c} = \hat{i} + 2\hat{j} + \hat{k}$ , and  $\vec{r} \cdot \vec{c} = -3$   
 find  $\vec{r} \cdot \vec{a}$

**Ans.** 42

**Sol.**  $\vec{r} \times \vec{a} - \vec{r} \times \vec{b} = \vec{0}$   
 $\vec{r} \times (\vec{a} - \vec{b}) = \vec{0}$   
 $\Rightarrow \vec{r} = \lambda (\vec{a} - \vec{b})$   
 $\Rightarrow \vec{r} = \lambda (-5\hat{i} - 4\hat{j} + 10\hat{k})$   
 $\vec{r} \cdot \vec{c} = -3 \Rightarrow \lambda (-5 - 8 + 10) = -3$   
 $\Rightarrow \lambda = 1$   
 $\therefore \vec{r} = -5\hat{i} - 4\hat{j} + 10\hat{k}$   
 $\vec{r} \cdot \vec{a} = (-5\hat{i} - 4\hat{j} + 10\hat{k}) \cdot (2\hat{i} - 3\hat{j} + 4\hat{k})$   
 $= -10 + 12 + 40 = 42$

**26.** Let  $2x - 7y + 4z - 11 = 0$  and  $-3x - 5y + 4z - 3 = 0$  are two planes. If plane  $ax + by + cz - 7 = 0$  passes through the line of intersection of given planes and point  $(-2, 1, 3)$ , then find the value of  $2a + b + c + 7$ .

**Ans.** 4

**Sol.** Equation of plane is  $(2x - 7y + 4z - 11) + \lambda(-3x - 5y + 4z - 3) = 0$   
 it passes through the point  $(-2, 1, 3)$   
 $\therefore (-4 - 7 + 1) + \lambda(6 - 5 + 9) = 0 \quad \Rightarrow \lambda = 1$   
 $\therefore$  Equation of plane is  $-x - 12y + 8z - 14 = 0$   
 $\Rightarrow -\frac{1}{2}x - 6y + 4z - 7 = 0$   
 $\therefore a = -\frac{1}{2}, b = -6, c = 4$   
 $\therefore 2a + b + c + 7 = 4$