

PERIODIC ASSESSMENT TEST (PAT)

STUDENT SUPPORT BOOKLET (SSB)

Answer Key (AK) | Standard Hints (SH) | Text Solutions (TS) | Weightage Sheet (WS)

CLASS	XI	COURSE NAME	VIKAAS	COURSE CODE	JA
PHASE CODE(S)	02JA	TOTAL PAGES	1	BATCH CODE(S)	02JA

Target Examination & Year:

JEE (MAIN + ADVANCED) 2025

TEST PATTERN	TEST TYPE	TEST CODE & SEQUENCE
JEE (MAIN)	PART TEST (PT)	MPT 03



DATE & DAY:

04th February 2024 | Saturday



Duration & Time:

3 Hrs | 11:30 AM to 02:30 PM

Contents:

▶ Weightage Sheet (WS)	☒
▶ Answer Key (AK)	☒
▶ Standard Hints (SH)	☐
▶ Text Solutions (TS)	☒
▶ Resonance Student's Critical Analysis of Learning for Excellence (ResoSCALE)	☐
▶ Student Self Assessment Sheet (SAS)	☐
▶ Video Solutions (VS)	☐

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ANSWER KEY (AK)

PAPER											
PART-A: PHYSICS	Q.No.	1	2	3	4	5	6	7	8	9	10
	Ans.	2	4	2	2	4	2	2	2	4	1
	Q.No.	11	12	13	14	15	16	17	18	19	20
	Ans.	1	2	4	2	4	1	3	2	1	3
	Q.No.	21	22	23	24	25	26	27	28	29	30
	Ans.	0003	0008	0004	0010	0035	0048	0019	0010	0020	0003
PART-B: CHEMISTRY	Q.No.	31	32	33	34	35	36	37	38	39	40
	Ans.	3	1	4	3	4	2	3	4	1	3
	Q.No.	41	42	43	44	45	46	47	48	49	50
	Ans.	3	3	1	3	3	2	1	2	3	4
	Q.No.	51	52	53	54	55	56	57	58	59	60
	Ans.	0006	0003	0006	0003	0010	0005	0006	0004	0007	0013
PART-C: MATHS	Q.No.	61	62	63	64	65	66	67	68	69	70
	Ans.	4	4	2	3	1	4	3	2	1	4
	Q.No.	71	72	73	74	75	76	77	78	79	80
	Ans.	2	2	3	4	1	2	2	2	3	3
	Q.No.	81	82	83	84	85	86	87	88	89	90
	Ans.	0000	0015	0005	0615	0021	0004	0084	0004	0008	0006

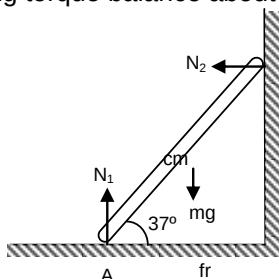
STUDENT'S SPACE

TEXT SOLUTIONS (TS)

PAPER

PART-A: PHYSICS

1. $N_1 = mg$ (1)
 $N_2 = fr$ (2)
 Applying torque balance about the point A :



$$(mg) \ell/2 \sin 53^\circ = (N_2) (\ell) \sin (37^\circ)$$

get $N_2 = fr = 200 \text{ N}$

2. From energy conservation

$$U \downarrow = KE \uparrow \Rightarrow mg \left(\frac{\ell}{2} \right) = \frac{1}{2} \left(\frac{m\ell^2}{3} \right) \omega^2$$

$$\omega = \sqrt{\frac{3g}{\ell}}$$

$$R = mg + m\omega^2 r_{cm} = mg + m \left(\frac{3g}{\ell} \right) \left(\frac{\ell}{2} \right)$$

$$R = \frac{5mg}{2}$$

3. $mv \hat{i} + mv \hat{j} + 2m \vec{v}_3 = 0$

$$\vec{v}_3 = -\frac{(v\hat{i} + v\hat{j})}{2} = \frac{v}{2} - (\hat{i} + \hat{j}) = -\frac{v}{\sqrt{2}}$$

$$k_f = \frac{1}{2} mv^2 + \frac{1}{2} mv^2 + \frac{1}{2} 2m \frac{v^2}{2}$$

$$k_f = \frac{3mv^2}{2}$$

4. Moment of inertia of a cylinder about an axis passing through centre and normal to circular face $= \frac{MR^2}{2}$

Moment of inertia of a cylinder about an axis passing through centre and normal to

$$\text{its length} = M \left[\frac{L^2}{12} + \frac{R^2}{4} \right]$$

$$\text{But } \frac{MR^2}{2} = M \left[\frac{L^2}{12} + \frac{R^2}{4} \right]$$

$$\text{or } \frac{R^2}{2} = \frac{L^2}{12} + \frac{R^2}{4} \text{ or } \frac{R^2}{4} = \frac{L^2}{12}$$

$$\therefore L = \sqrt{3} R$$

$$5. \Delta K = \frac{1}{2} \frac{I_1 I_2}{I_b I_t} (\omega_1 - \omega_2)^2$$

$$\Delta K = \frac{1}{2} \frac{I_t I_b}{I_b + I_t} \omega_i^2$$

$$6. m_A u_A + m_B \cdot 0 = (m_A + m_B) v$$

$$\Rightarrow m_A u_A = (m_A + m_B) v$$

$$\frac{1}{2} m_A u_A^2 = \frac{1}{2} (m_A + m_B) v^2$$

$$m_A u_A^2 = (m_A + m_B) v^2$$

$$\frac{m_A}{m_A + m_B} = \frac{v^2}{u_A^2}$$

$$\frac{m_A}{m_A + m_B} = \frac{m_A^2}{(m_A + m_B)^2}$$

$$\Rightarrow (m_A + m_B)^2 = m_A(m_A + m_B)$$

$$\Rightarrow m_A^2 + m_B^2 + 2m_A m_B = m_A^2 + m_A m_B$$

$$\Rightarrow m_B(m_B - m_A) = m_A m_B$$

$$\Rightarrow m_B = 3m_A$$

$$\Rightarrow \frac{m_A}{m_B} = \frac{1}{3}$$

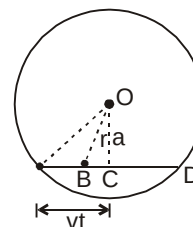
7. Since, there is no external torque, angular momentum will remain conserved. The moment of inertia will first decrease till the tortoise moves from A to C and then increase as it moves from C and D. Therefore ω will initially increase and then decrease.

Let R be the radius of platform m the mass of disc and M is the mass of platform.

Moment of inertia when the tortoise is at A

$$I_1 = mR^2 + \frac{MR^2}{2}$$

and moment of inertia when the tortoise is at B



$$I_2 = mr^2 + \frac{MR^2}{2}$$

here

$$r^2 = a^2 + [\sqrt{R^2 - a^2} - vt]^2$$

From conservation of angular momentum

$$\omega_0 I_1 = \omega(t) I_2$$

substituting the values we can see that variation of $\omega(t)$ is nonlinear.

$$8. \quad a = \frac{g \sin \theta}{1 + \frac{k^2}{R^2}} = \frac{g \times \frac{3}{5}}{1 + \frac{2}{3}} = \frac{9g}{25}$$

$$9. \quad mv_1 + mv_2 + mv_3 = 0$$

$$\vec{v}_1 + \vec{v}_2 + \vec{v}_3 = 0$$

$$0 + v \vec{GB} + \vec{v}_3 = 0$$

$$\vec{v}_3 = -v \vec{GB}$$

$$= v \vec{GB}$$

$$10. \quad U = 2x^2 + 3y^3 + z^2$$

$$F = -\frac{du}{dr}$$

$$\vec{F} = -(4x\hat{i} + 9y^2\hat{j} + 2\hat{k})$$

$$\vec{F} = -(4\hat{i} + 36\hat{j} + 2\hat{k}) \text{ N}$$

$$11. \quad v = \frac{ds}{dt} = 6t + 6$$

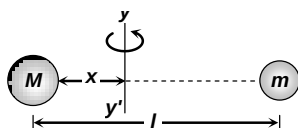
$$a_t = \frac{dv}{dt} = 6$$

$$a_c = \frac{v^2}{r} = \frac{12^2}{12} = 12$$

$$\Rightarrow a = \sqrt{a_c^2 + a_t^2} = 6\sqrt{5} \text{ m/s}^2$$

12. If the both mass are revolving about the axis yy' and tension in both the threads are equal then

यदि दोनों द्रव्यमान yy' अक्ष के परितः चक्कर लगा रहे हैं तथा दोनों धागों में तनाव समान है, तो,



$$M\omega^2 x = m\omega^2 (l-x)$$

$$\Rightarrow Mx = m(l-x) \Rightarrow x = \frac{ml}{M+m}$$

$$13. \quad \sqrt{2(u^2 - gL)}$$

$$14. \quad mv = 4mv_1 + m\frac{v}{2}$$

$$\Rightarrow m\frac{v}{2} = 4mv_1$$

$$v_1 = \frac{v}{8}$$

$$\Rightarrow \frac{1}{2}mv_1^2 = mgh$$

$$\frac{1}{2} \times \frac{v^2}{64} = gh$$

$$\Rightarrow h = \frac{v^2}{128g}$$

$$15. \quad m_2 \quad m_1$$

$$\textcircled{B} \rightarrow v \quad \textcircled{A}$$

$$u = 0$$

conservation of linear momentum along x direction

x दिशा के अनुदिश संवेग संरक्षण नियम से

$$m_2 v = m_1 v_x$$

$$\frac{m_2 v}{m_1} = v_x$$

along y direction

y दिशा के अनुदिश

$$m_2 \times \frac{v}{2} = m_1 v_y$$

$$\tan \theta = \frac{1}{2}$$

16. Both Assertion and Reason are true and Reason is the correct explanation of Assertion.

कथन व कारण दोनों सत्य है तथा कारण कथन का सही स्पष्टीकरण है।

17. If force on a particle is zero, then momentum of the particle is constant.

$$\text{If torque } \vec{\tau} = \vec{r} \times \vec{F} = 0 = \frac{d\vec{J}}{dt}$$

Then angular momentum $\vec{J}$ is constant

For couple forces on finite sized object, net external force is zero, but torque is non zero.

यदि एक कण पर बल शून्य है, तो कण का संवेग नियत होगा।

$$\text{यदि आघूर्ण } \vec{\tau} = \vec{r} \times \vec{F} = 0 = \frac{d\vec{J}}{dt}$$

तो कोणीय संवेग $\vec{J}$ नियत है।

परिमित आकार की वस्तुओं पर बल युग्मों के लिए कुल बाह्य बल शून्य है लेकिन आघूर्ण अशून्य है।

18. If the surface is smooth, there will be no energy loss. So we can apply the energy conservation

$$K_i + U_i = K_f + U_f$$

$$\frac{1}{2}mv^2 + 0 = 0 + \frac{1}{2}kx^2$$

$$\frac{1}{2}(50)(2)^2 + 0 = 0 + \frac{1}{2}(100)x^2 \Rightarrow x = \sqrt{2}m$$

19. If the surface is rough we will apply modified work energy theorem.

$$W_{us} + W_{nc} = \Delta KE + \Delta U$$

$$0 + -(\mu_k mg)x = \left(\frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 \right) + \left(\frac{1}{2}kx^2 - 0 \right)$$

$$-(0.1)(50)(10)x = \left(0 - \frac{1}{2}(50)(2)^2 \right) + \frac{1}{2}(100)x^2$$

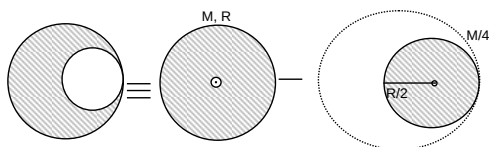
$$x^2 + x - 2 = 0$$

$$\Rightarrow x^2 + 2x - x - 2 = 0$$

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

$$\Rightarrow x = 1m$$

20.



$$I_1 = \frac{MR^2}{2}$$

$$I_2 = \frac{\left(\frac{M}{4}\right)\left(\frac{R}{2}\right)^2}{2} + \left(\frac{M}{4}\right)\left(\frac{R}{2}\right)^2 = \frac{3MR^2}{32}$$

$$I_{net} = I_1 - I_2 = \frac{MR^2}{2} - \frac{3MR^2}{32} = \frac{13MR^2}{32}$$

so answer is 3.

21.
$$a = \frac{g \sin \theta}{1 + \frac{I_{cm}}{mR^2}} = \frac{10 \times \frac{1}{2}}{1 + \frac{1}{2}} = \frac{10}{3}$$

time taken to return back

$$T = \frac{2u}{g_{eff}} = \frac{2 \times 5}{10/3} = 3 \text{ sec.}$$

22. 0008

23. 0004

24. From momentum conservation in perpendicular direction of initial motion.

$$mv_1 \sin \theta_1 = 10mv_2 \sin \theta_2 \quad \dots\dots(1)$$

$$\text{Given that } \left(\frac{1}{2}mu^2 \right) \frac{1}{2} = \frac{1}{2}mv_1^2 \quad \dots\dots(2)$$

From equation (1) & (2)

$$\sin \theta_1 = \sqrt{10} \sin \theta_2$$

$$n = 10$$

25. Speed of the cylinder at the lowest point

$$v = \sqrt{\frac{2gh}{1 + \frac{I_{cm}}{mR^2}}} = \sqrt{\frac{2gR}{1 + \frac{1}{2}}} = \sqrt{\frac{4}{3}gR}$$

$$N = mg + \frac{mV_{cm}^2}{R} = mg + \frac{m}{R} \left(\frac{4}{3}gR \right)$$

$$N = \frac{7}{3}mg$$

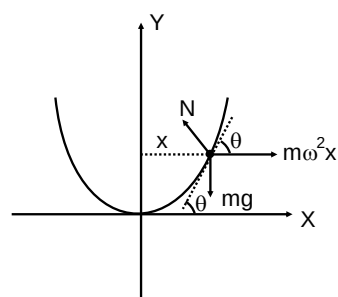
26.
$$I_{cm} = \left(\frac{m_1 m_2}{m_1 + m_2} \right) d^2 = \frac{(12m)(16m)}{12m + 16m} d^2$$

$$I_{cm} = \frac{48}{7}md^2$$

27.
$$\vec{r} = \vec{OP} = (3-5)\hat{i} + (6-3)\hat{j} = -2\hat{i} + 3\hat{j}$$

$$\vec{\tau} = \vec{r} \times \vec{F} = (2\hat{i} + 3\hat{j}) \times (3\hat{i} + 5\hat{j}) = -19\hat{k}$$

28.



$$(1) m\omega^2 x \cos \theta = mg \sin \theta$$

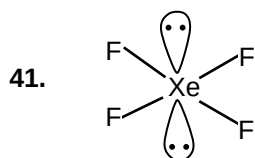
$$\Rightarrow \tan \theta = \frac{\omega^2 x}{g}; \tan \theta = \frac{dy}{dx} = 10x$$

$$(2) N = m\omega^2 x \sin \theta + mg \cos \theta$$

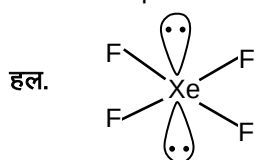
$$\Rightarrow \boxed{\omega = 10 \text{ rad/sec}}$$

29. $x + 5x = 24R$
 so $x = 4R$, $5x = 20R$
30. Solve in the reference frame fixed to the wall.
 Before collision, velocity of ball = $3v$ towards it.
 $\therefore$ After elastic collision of ball = $3v$ away from it (here we have used the result that a light mass is reversed by a heavy body at rest).
 Time of flight = $\sqrt{\frac{2h}{g}}$
 $\therefore$ Distance between wall and ball
 $= 3v \cdot \sqrt{\frac{2h}{g}}$
 यहाँ हम दीवार के निर्देश तंत्र के सापेक्ष इसे हल करेंगे।
 टक्कर के पहले, बॉल का वेग, = $3v$ पास आने वाला
 $\therefore$ प्रत्यास्थ टक्कर के बाद, बॉल का वेग = $3v$ दूर जाने वाला (स्थिर भारी वस्तु से टकराने के बाद बॉल का वेग पलट जाता है।)
 जमीन पर गिरने में लगा समय = $\sqrt{\frac{2h}{g}}$
 $\therefore$ गिरते वक्त दीवार और बॉल के बीच दूरी
 $= 3v \cdot \sqrt{\frac{2h}{g}}$

PART-B: CHEMISTRY



$\Rightarrow$ 4 bond pair + 2 lone pair.
 $\Rightarrow$ Steric Number = 6
 $= sp^3d^2$.



$\Rightarrow$ 4 बंध युग्म + 2 एकाकी युग्म.

$\Rightarrow$ त्रिविम संख्या = 6

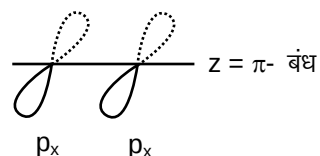
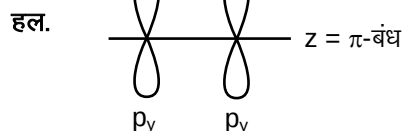
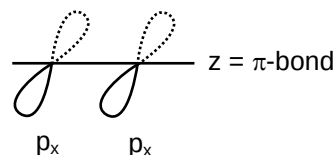
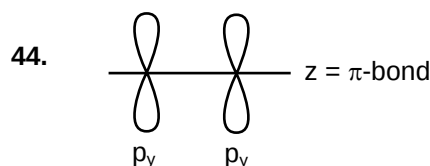
$= sp^3d^2$.

42. Due to inert pair effect.

अक्रिय युग्म प्रभाव के कारण।

43. XeO_4 will have normal bond angle of sp^3 hybridization and SF_4 has no π -bond.

हल. XeO_4 sp^3 संकरण का सामान्य बंध कोण रखेगा तथा SF_4 π -बंध नहीं रखता है।



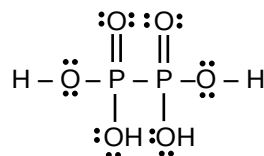
45. (3) SO_3 does not follow octet rule.

(3) SO_3 अष्टक नियम का पालन नहीं करता है।

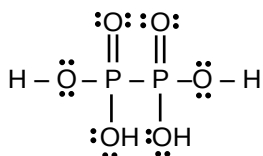
46. sp^3d hybridisation in XeF_2 does not involve $d_{x^2-y^2}$ orbital.

हल. XeF_2 में sp^3d संकरण में $d_{x^2-y^2}$ कक्षक सम्मिलित नहीं है।

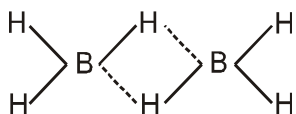
47. $H_4P_2O_6$ = Hypophosphoric acid



हल. $H_4P_2O_6$ = हाइपोफॉस्फोरिक अम्ल

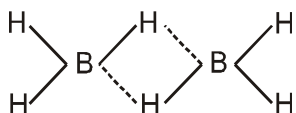


48. $(\text{BH}_3)_2$ or (B_2H_6)



It contains two 3 centre-2 electron bonds.

हल. $(\text{BH}_3)_2$ या (B_2H_6)



इसमें दो 3 केन्द्र-2 इलेक्ट्रॉन बंध होते हैं।

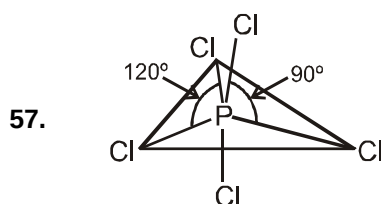
49. In PH_3 , bond angle is 93° , because of drago rule.

ड्रेगो नियम के कारण PH_3 में बंध कोण 93° है।

50. π -character in Si-N bond is due to $3d\pi \leftarrow 2p\pi$ back bonding.

हल. Si-N बन्ध में π -लक्षण, $3d\pi \leftarrow 2p\pi$ पश्च बन्धन के कारण होता है।

56. Mn_2O_7 , SO_2 , NO_2 , CrO_3 , SiO_2 = acidic
 Mn_2O_7 , SO_2 , NO_2 , CrO_3 , SiO_2 = अम्लीय



Number of 90° bond angle in PCl_5 are 6
 PCl_5 में 90° के कितने बंध कोण 6 हैं।

58. % of s character in $sp^3 = 25\%$
 sp^3 में % s लक्षण = 25%

59. (i) Planar molecules :

XeF_2 , ClF_3 , H_2O , $[\text{XeF}_5]^-$, I_3^- , BCl_3 , XeF_4 .

(ii) SF_4 - See - Saw shape

PCl_5 - Trigonal bipyramidal

SF_6 - Square bipyramidal

IF_7 - Pentagonal bipyramidal

हल. (i) समतलीय अणु :

XeF_2 , ClF_3 , H_2O , $[\text{XeF}_5]^-$, I_3^- , BCl_3 , XeF_4 .

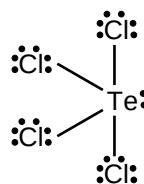
(ii) SF_4 - सी-साँ आकृति

PCl_5 - त्रिकोणीय द्विपिरामिडिय

SF_6 - वर्गाकार द्विपिरामिडिय

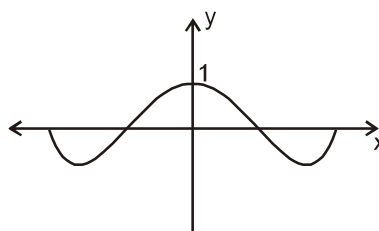
IF_7 - पंचकोणीय द्विपिरामिडिय

60.

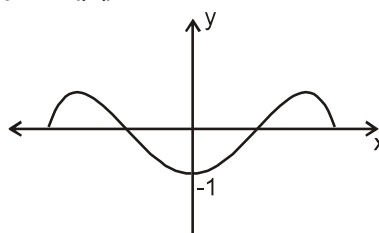


PART-C: MATHEMATICS

61. $y = f(|x|)$



$y = -f(|x|)$



$$62. \frac{\sum x_i}{16} = 16 \Rightarrow \sum x_i = 256$$

Excluding 16 sum of 15 observation = 240

Adding 3 more observations

Sum = 252 and number of observation = 18

$$\text{So mean} = \frac{252}{18} = 14$$

$$\text{हल. } \frac{\sum x_i}{16} = 16 \Rightarrow \sum x_i = 256$$

16 वे छोड़कर 15 प्रेक्षणों का योगफल = 240

3 और अधिक प्रेक्षण को जोड़ने पर

योग = 252 तथा प्रेक्षण की संख्या = 18

$$\text{इसलिए माध्य} = \frac{252}{18} = 14$$

63.

$$\left(\frac{2}{x} + x^{\log_8 x}\right)^6$$

$$T_4 = {}^6C_3 \cdot \left(\frac{2}{x}\right)^3 \cdot (x^{\log_8 x})^3 = 20 \times 8^7$$

$$\Rightarrow \frac{2}{x} \cdot x^{\log_8 x} = 2^7 \Rightarrow \frac{x^{\log_8 x}}{x} = 2^6 = 8^2$$

Taking logarithms on both sides to the base 8, we get

दोनों पक्षों का आधार 8, के साथ लघुगणक लेने पर

$$(\log_8 x)^2 = 2 + (\log_8 x)$$

$$\Rightarrow \log_8 x = 2 \text{ or } -1 \Rightarrow x = 8^2 \text{ or } \frac{1}{8}$$

64.

$$|a| + |b| > |a - b| \Rightarrow ab > 0$$

$$\Rightarrow (x^2 - 2x)(x - 4) > 0$$

$$\Rightarrow x(x - 2)(x - 4) > 0$$

$$\Rightarrow x \in (0, 2) \cup (4, \infty)$$

65.

$$\text{Coefficient of } x^2 \text{ in } (1 + ax + bx^2)(1 - 3x)^{15}$$

$$= {}^{15}C_2(-3)^2 + a \cdot {}^{15}C_1(-3) + b \cdot {}^{15}C_0 = 0$$

$$\frac{15 \cdot 14}{2} \cdot 9 - 3 \cdot a \cdot 15 + b = 0$$

$$15 \times 63 - 45a + b = 0 \dots\dots(1)$$

$$\text{Coefficient of } x^3 \text{ in } (1 + ax + bx^2)(1 - 3x)^{15}$$

$$= {}^{15}C_3(-3)^3 + a \cdot {}^{15}C_2(-3)^2 + b \cdot {}^{15}C_1(-3) = 0$$

$$\frac{15 \cdot 14 \cdot 13}{3 \times 2} \cdot 3^2 - a \cdot 3 \cdot \frac{15 \cdot 14}{2} + 15 \cdot b = 0$$

$$7 \cdot 13 \cdot 3 - 21a + b = 0 \dots\dots(2)$$

by using (1) - (2)

$$672 - 24a = 0 \Rightarrow a = 28$$

$$\text{Hence } b = 315$$

66.

$$n = 88$$

$$\text{Median} = \frac{44^{\text{th}} \text{ value} + 45^{\text{th}} \text{ value}}{2} = \frac{56 + 57}{2}$$

$$= 56.5$$

$$\text{माधिका} = \frac{44^{\text{वाँ मान}} + 45^{\text{वाँ मान}}}{2} = \frac{56 + 57}{2} =$$

$$56.5$$

M.D.(median) = माधिका के सापेक्ष माध्य विचलन

$$= \frac{\sum_{i=1}^{88} |x_i - 56.5|}{88} = \frac{43.5 + 42.5 + \dots + 0.5 + 0.5 + \dots + 43.5}{88}$$

$$= \frac{1 + 3 + 5 + \dots + 85 + 87}{88} = 22$$

67.

$$|x - 3| - a = \pm 5 \Rightarrow |x - 3| = a + 5, a - 5$$

$$a + 5 < 0 \text{ and और } a - 5 < 0$$

$$\Rightarrow a < -5 \text{ and और } a < 5$$

$$\Rightarrow a \in (-\infty, -5)$$

68.

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

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

coefficient of x is -15 x का गुणांक -15 है

$$\Rightarrow {}^{10}C_3 \cdot \left(\frac{-1}{a}\right)^3 = -15$$

69.

Given दिया गया $\sigma = 9$

Let a student obtains x marks out of 75.

Then his marks out of 100 are $\frac{4x}{3}$. Each

observation is multiply by $\frac{4}{3}$.

माना एक विद्यार्थी 75 में से x अंक प्राप्त करता है

तो उसके अंक 100 में से $\frac{4x}{3}$ होंगे। प्रत्येक प्रेक्षण

को $\frac{4}{3}$ से गुणा करने पर

$$\therefore \text{New SD नया मानक विचलन, } \sigma = \frac{4}{3} \times 9$$

$$= 12$$

$$\therefore \sigma^2 = 144.$$

70.

$$\sqrt{2-x} > x + 18 \dots\dots (i)$$

$$2 - x \geq 0 \Rightarrow x \leq 2 \dots\dots (ii)$$

$$\text{Case स्थिति I } x + 18 \leq 0 \Rightarrow x \leq -18 \dots\dots (iii)$$

equation (i) always holds

समीकरण (i) होगी यदि

$$\therefore x \in (-\infty, -18]$$

Case स्थिति II $x + 18 \geq 0$

$$\Rightarrow x \geq -18 \dots\dots (iv)$$

$$2 - x > x^2 + 36x + 324$$

$$x^2 + 37x + 322 < 0$$

$$(x + 14)(x + 23) < 0$$

$x \in (-23, -14)$ (ii)
 from equation (ii), (iv) & (v), we get
 (ii), (iv) और (v), समीकरण से
 solution of equation (i) $x \in (-\infty, -14)$
 समीकरण (i) का हल $x \in (-\infty, -14)$

71. $(1 + x^2)^{40} \left(x + \frac{1}{x}\right)^{-10} = (1 + x^2)^{40} \frac{(1 + x^2)^{-10}}{x^{-10}}$
 $= x^{10} (1 + x^2)^{30}$
 $\therefore$ Coefficient of $x^{20} =$ Coefficient of
 x^{10} in $(1 + x^2)^{30} = {}^{30}C_5 = {}^{30}C_{25}$

हल. $(1 + x^2)^{40} \left(x + \frac{1}{x}\right)^{-10} = (1 + x^2)^{40} \frac{(1 + x^2)^{-10}}{x^{-10}}$
 $= x^{10} (1 + x^2)^{30}$
 $\therefore$ x^{20} का गुणांक $= (1 + x^2)^{30}$ में x^{10} का
 गुणांक $= {}^{30}C_5 = {}^{30}C_{25}$

72. From the formula of mean we have
 माध्य के सूत्र से

$$14.7 = \frac{114 + a + b}{10} \Rightarrow a + b = 33$$

from the formula of variance we have
 प्रसरण के सूत्रानुसार

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$10.01 = \frac{69.12 + (a - 14.7)^2 + (b - 14.7)^2}{10}$$

put $a = 33 - b$ रखने पर

$$100.1 = 2b^2 - 66b + 620.1$$

$$\Rightarrow b^2 - 33b + 260 = 0$$

$$\Rightarrow b = 13 \text{ or } 20$$

So इसलिए $a = 20$ or या 13

$2a + b$ is either 46 or या 53

$2a + b$ का मान या तो 46 या 53 होगा।

73. $(x - 3)^2 (x - 1)(x - 2) \leq 0$

$$x \in [1, 2] \cup \{3\}$$

74. $\therefore {}^nC_r + {}^nC_{r-1} = {}^{n+1}C_r$

$$\therefore \left(\frac{51}{3}\right) + \left(\frac{50}{3}\right) + \left(\frac{49}{3}\right) + \left(\frac{48}{3}\right) + \left\{\left(\frac{47}{3}\right) + \left(\frac{47}{4}\right)\right\}$$

$$= \left(\frac{51}{3}\right) + \left(\frac{50}{3}\right) + \left(\frac{49}{3}\right) + \left(\frac{48}{3}\right) + \left(\frac{48}{4}\right)$$

$$= \left(\frac{51}{3}\right) + \left(\frac{50}{3}\right) + \left(\frac{49}{3}\right) + \left(\frac{49}{4}\right) = \left(\frac{51}{3}\right) + \left(\frac{50}{3}\right) + \left(\frac{50}{4}\right)$$

$$= \left(\frac{51}{3}\right) + \left(\frac{51}{4}\right) = \left(\frac{52}{4}\right).$$

75. $|4 - |x - 2|| = 3$
 $\Rightarrow |x - 2| = 7$ or या 1
 $\Rightarrow x = 9, -5, 3, 1$
 $P = 8, Q = -135$
 $\therefore |P| + |Q| = 143$

76. $T_{r+1} = {}^{642}C_r 5^{\frac{642-r}{2}} \cdot 7^{\frac{r}{6}}$
 $r = 0, 6, 12, \dots, 642 \Rightarrow$ total 108 terms.
 $\Rightarrow$ कुल 108 पद

77. $\sum_{i=1}^{10} (x_i - 50)^2 = 250$

$$\sigma = \sqrt{\frac{\sum_{i=1}^{10} (x_i - 50)^2}{10}} = 5 \text{ coeff. of variation}$$

$$\text{चरिता गुणांक} = \frac{\sigma}{\bar{x}} \times 100 = 10\%$$

78. Obviously (स्पष्ट है।) by graphical transformation. ग्राफीय रूपान्तरण से

79. $(1 + x)(1 - x)^{-1}$
 $= (1 + x)(1 + x + x^2 + \dots \infty)$
 coeff. of $x^{10} = 1 + 1 = 2$.
 x^{10} का गुणांक $= 1 + 1 = 2$.

80. Here the class 30-40 has maximum frequency. so this is the modal class
 $\ell = 30, f_0 = 45, f_1 = 30, f_2 = 35, h = 10$
 $\therefore \text{Mode} = \ell +$

$$\frac{f_0 - f_1}{2f_0 - f_1 - f_2} \times h = 30 + \frac{45 - 30}{2 \times 45 - 30 - 35} \times 10 = 36$$

81. $N = 7^{100} - 3^{100}$
 $= (10 - 3)^{100} - 3^{100} = ({}^{100}C_0 \cdot 10^{100} - \dots - {}^{100}C_{99} \cdot 10 \cdot 3^{99}) + 3^{100} - 3^{100}$
 $= (1000)N + 3^{100} - 3^{100}$
 $= (1000)N$
 last 3 digits (अंतिम 3 अंक) = 000

82. $a_1, a_2, \dots, a_5, a_6, a_7, \dots, a_{10}$

$$\frac{\sum_{i=1}^{10} a_i}{10} = 12.5, \quad \frac{\sum_{i=1}^6 a_i}{6} = 15, \quad \frac{\sum_{i=6}^{10} a_i}{5} = 10$$

$$a_6 + 12.5 \times 10 = 90 + 50$$

$$a_6 = 15$$

83. $\sqrt{\log_2 \left(\frac{x-4}{1-x^2} \right)} > 1$ i.e. अर्थात् $\log_2 \left(\frac{x-4}{1-x^2} \right) > 1$

i.e. अर्थात् $\frac{x-4}{1-x^2} > 2$

$$\frac{x-4}{1-x^2} - 2 > 0 \quad \text{i.e. अर्थात्} \quad \frac{(x+2)(2x-3)}{(x-1)(x+1)} < 0$$

$$\therefore x \in (-2, -1) \cup (1, 3/2)$$

$$\therefore a = 1, b = 3/2$$

$$\therefore 2(a+b) = 5$$

84. General term महत्तम पद $\frac{10!}{\alpha! \beta! \gamma!} x^{\beta+2\gamma}$

for coefficient of x^4 का गुणांक $\Rightarrow \beta + 2\gamma = 4$

$$\gamma = 0, \beta = 4, \alpha = 6 \Rightarrow \frac{10!}{6!4!0!} = 210$$

$$\gamma = 1, \beta = 2, \alpha = 7 \Rightarrow \frac{10!}{7!2!1!} = 360$$

$$\gamma = 2, \beta = 0, \alpha = 8 \Rightarrow \frac{10!}{8!0!2!} = 45$$

$$\text{Total कुल} = 615$$

85. $\sum_{i=1}^7 i = S_1 \quad \sum_{i=1}^7 i^2 = P_1$
 $X_{in} = \frac{S_1 + 4}{8} \Rightarrow 11 \times 8 = S_1 + 4 \Rightarrow S_1 = 84$

$$X_{cor} = \frac{S_1 + 20}{8} = \frac{84 + 20}{8} = 13$$

$$\sigma_{in}^2 = \frac{P_1 + 4^2}{8} - (X_{in})^2$$

$$21 = \frac{P_1 + 16}{8} - (11)^2$$

$$\sigma_{cor}^2 = \frac{P_1 + 400}{8} - (13)^2$$

$$\sigma_{cor}^2 - 21 = \frac{400 - 16}{8} - 13^2 + 11^2$$

$$\sigma_{cor}^2 = 21$$

86. Minimum value occur in $x \in [2, 3]$

न्यूनतम मान $x \in [2, 3]$ में होगा

$$\Rightarrow (x-1) + (x-2) - (x-3) - (x-4) = 4$$

87. Coefficient of x^{18} in $(1+x)(1-x)^{10}$
 $(1+x+x^2)^9$

$$= \text{Coefficient of } x^{18} \text{ in } (1-x^2) \{(1-x)$$

$$(1+x+x^2)\}^9$$

$$= \text{Coefficient of } x^{18} \text{ in } (1-x^2)(1-x^3)^9$$

$$= {}^9C_6 - 0 = 84$$

88. Variance of 10, 20, 100 is A then
 variance of $2 \times 10 + 2, 2 \times 20 + 2, 2 \times 30 + 2, \dots, 2 \times 100 + 2$ is $4A = B$

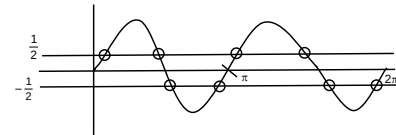
10, 20, 100 का प्रसरण A तो $2 \times 10 + 2, 2 \times 20 + 2, 2 \times 30 + 2, \dots, 2 \times 100 + 2$ का प्रसरण $4A$ होगा

$$B = 4A \text{ So इसलिए, } \frac{B}{A} = 4$$

89. $\log_{1/2} |\sin x| = 2 - \log_{1/2} |\cos x|$
 $\log_{1/2} |\sin x \cos x| = 2$

$$|\sin x \cos x| = \frac{1}{4}$$

$$\sin 2x = \pm \frac{1}{2}$$



Number of solution हलों की संख्या = 8.

90.

x_i (observation)	0	2	2^2	2^n
f_i (frequency)	nC_0	nC_1	nC_2	nC_n

$$\bar{x} = \frac{\sum f_i x_i}{\sum f_i}$$

$$\frac{0 \times {}^nC_0 + 2 \times {}^nC_1 + 2^2 \times {}^nC_2 + \dots + 2^n \times {}^nC_n}{{}^nC_0 + {}^nC_1 + {}^nC_2 + \dots + {}^nC_n} = \frac{3^n - 1}{2^n} = \frac{728}{2^n}$$

$$\Rightarrow 3^n = 3^6$$

$$\Rightarrow n = 6$$

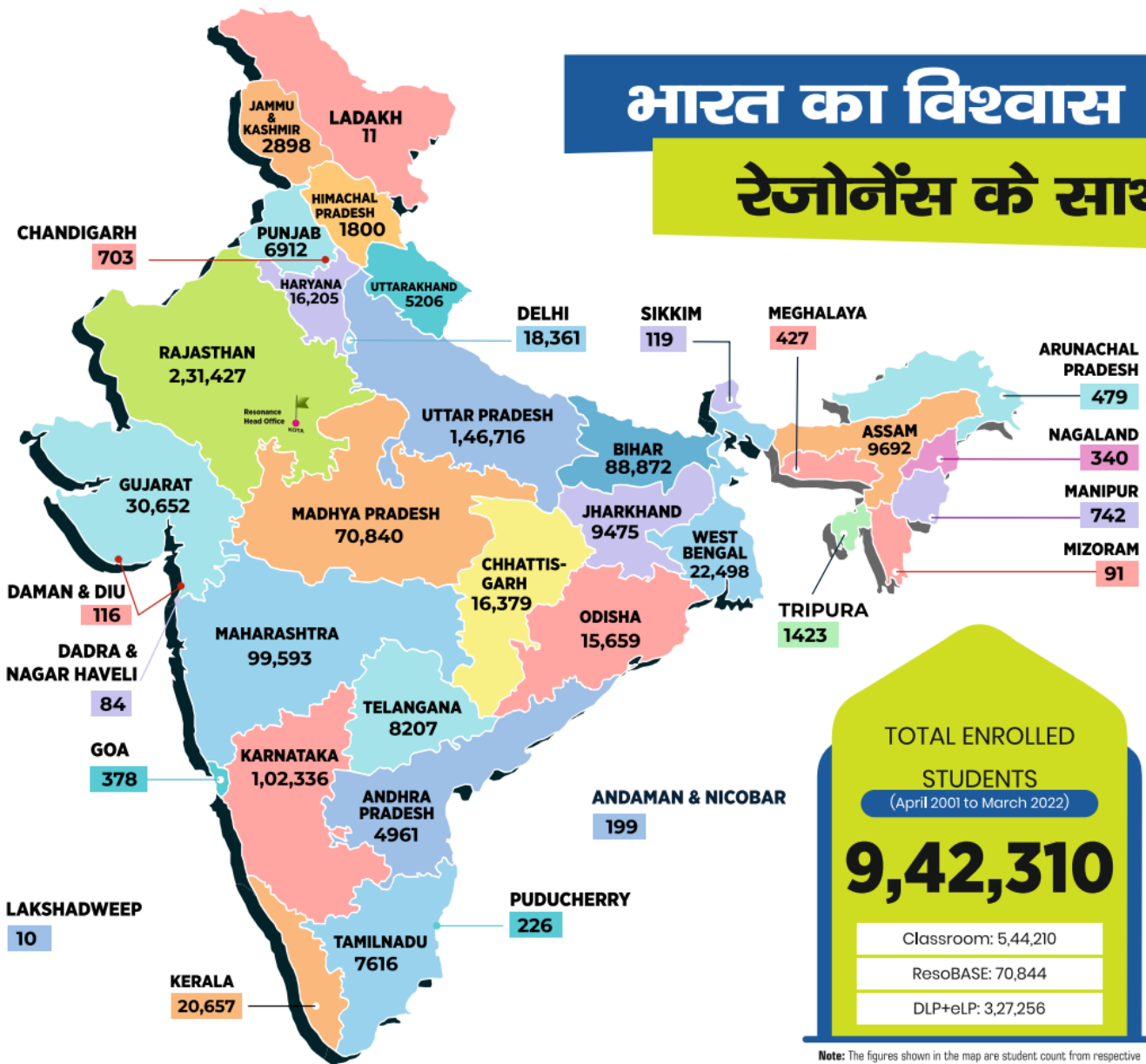
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