PATTERN OF MATHS CUET-2022

Chapters	No. of questions
Matrices	2
Permutation and Combination	4
Probability	4
Derivatives	1
Functions	1
Limits	1
Application of Derivatives	1
Definite Integral	1
Sets	7
Sequence and series	7
Trigonometry Ratio	2
2D (Straight lines)	3
Vectors	5
Complex Numbers	1
Statistics	2
Log	1
Surds	1
Statics	1

CUET-2022

1. **If $(25)^{7.5}\times(5)^{2.5} \div (125)^{1.5}=5^{X}$ then x=? CUET-2022**

(a) 13 (b) 8.5 (c) 16 (d) 17.5

1. **Ans. (a)** $(25)^{7.5} \times (5)^{2.5} \div (125)^{1.5} = 5^{x}$

$$\Rightarrow \frac{5^{(2\times7.5)}\times5^{2.5}}{5^{(3\times1.5)}}=5^{x} \Rightarrow \frac{5^{15}\times5^{2.5}}{5^{4.5}}=5^{x}$$

$\Rightarrow 5^{x} = 5^{(15+2.5-4.5)} = (5)^{13} \Rightarrow x = 13$

2. **If** $A=\begin{bmatrix}\cos B & -\sin B\\ \sin B & \cos B\end{bmatrix}$ **then A + A^{T} = I for B equals to __________. CUET-2022**

(a) $\frac{\pi}{3}$ **(b)** $\frac{\pi}{6}$ **(c)** π **(d)** $\frac{3\pi}{2}$

2. **Ans. (a)** **As A + A^{T} = I**

$$\Rightarrow \begin{bmatrix}\cos B & -\sin B\\ \sin B & \cos B\end{bmatrix}+\begin{bmatrix}\cos B & \sin B\\ -\sin B & \cos B\end{bmatrix}$$

$$=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix} \Rightarrow \begin{bmatrix}2\cos B & 0\\ 0 & 2\cos B\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$$

$\Rightarrow 2\cos B = 1 \Rightarrow B=\frac{\pi}{3}$

3. **The number of 7-digit numbers whose sum of the digits equals to 10 and which is formed by using the digit 1, 2 and 3 only is CUET-2022**

(a) 55 (b) 66 (c) 77 (d) 56

3. **Ans. (c)** **As sum of digits of 7 digit no. is 10**

$x_1 + x_2 + x_3 + x_4 + x_5 + x_6 + x_7 = 10$

where $x_1, x_2, x_3,\ldots\ldots\ldots\ldots, x_7$ are 1, 2, 3

$\Rightarrow$ **Five $\rightarrow$ 1's, one $\rightarrow$ 2's , one $\rightarrow$ 3's** $=\frac{\lfloor 7}{\lfloor 5}=42$ **ways**

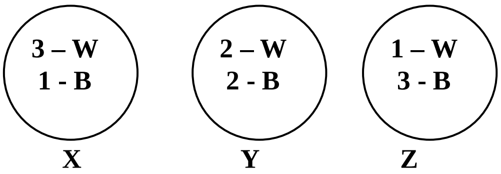
Four $\rightarrow$1's, three $\rightarrow$ 2's $=\frac{\lfloor 7}{\lfloor 4\lfloor 3}=\frac{7.6.5}{6}=35$

Total ways = 42 + 35 = 77

4. **If from each of the three boxes containing 3 white and 1 black, 2 white and 2 black, 1 white and 3 black balls, one ball is drawn at random, then the probability that 2 white and 1 black balls will be drawn is CUET-2022**

(a) $\frac{13}{32}$ **(b)** $\frac{1}{4}$ **(c)** $\frac{1}{32}$ **(d)** $\frac{3}{16}$

4. **Ans. (a)**



Let boxes be X, Y, Z

We have to choose 2W, 1 B balls by choosing one from each box

This can be done in

X(white) Y(white) Z(Black) + X(white) Y(Black) Z(white) + X(Black) Y (white) Z(white)

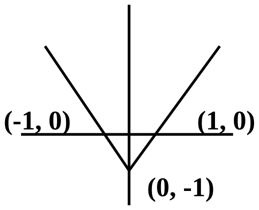
$$=\left(\frac{3}{4}.\frac{2}{4}.\frac{3}{4}\right)+\frac{3}{4}:\frac{2}{4}.\frac{1}{4}+\frac{1}{4}.\frac{2}{4}.\frac{1}{4}=\frac{26}{64}=\frac{13}{32}$$

5. **Let f (x) =||x| - 1 |, then point(s) where f(x) is not differentiable is (are):** **CUET-2022**

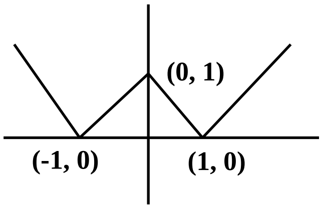
(a) 0, ±1 (b) ±1 (c) 0 (d) 1

5. **Ans. (a)** **A = ||x| - 1|**

At first we draw graph of y = |x |- 1



So graph of y = ||x| - 1|



As there are three corner points at x = 0, ± 1

⇒ Not differentiable at x = 0, ± 1.

6. **Let f : [2, ∞] → R be the function defined by f (x) = x^2 - 4x + 5 , then the range of f** **CUET-2022**

(a) R (b) [1, ∞) (c) [4, ∞) (d) (-∞,0]

6. **Ans. (b)** **f(x) = $x^2 - 4x + 5$**

= $x^2 - 4x + 4 + 1 = (x - 2)^2 + 1 \geq 1$

7. **The function** $f(x) = \frac{[\ln(1+ax) - \ln(1-bx)]}{x}$ **is not defined at x = 0. What value may be assigned to f at x = 0, so that it is continuous?** **CUET-2022**

(a) a + b (b) a – b (c) b – a (d) ln a + ln b

7. **Ans. (a)** **To make f(x) continuous at x = 0**

$$\Rightarrow \lim_{x\to 0} f(x) = f(0)$$

$$\Rightarrow f(0) = \lim_{x\to 0} \frac{\log(1+ax) - \log(1-bx)}{x} \to \frac{0}{0} \text{ form}$$

= By L'Hospital Rule.

$$= \lim_{x\to 0} \frac{\frac{a}{1+ax} + \frac{b}{1-bx}}{1} = a + b$$

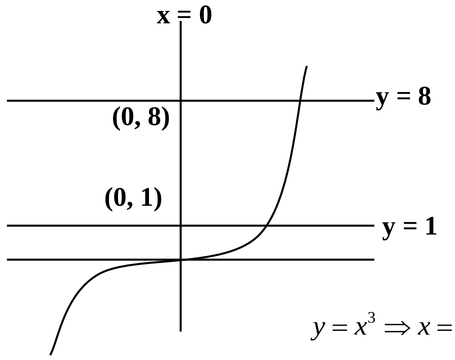
As f is cont. ⇒ f(0) = a + b

8. **The area enclosed between the graphs of y = x^3 and the lines x = 0, y = 1, y = 8 is** **CUET-2022**

(a) 7 (b) 12 (c) $\frac{45}{4}$ **(d)** $\frac{21}{8}$

8. **Ans. (c)**

Here curves are y = x^3, x = 0, y = 1, y = 8



$y = x^3 \Rightarrow x = y^{\frac{1}{3}}$

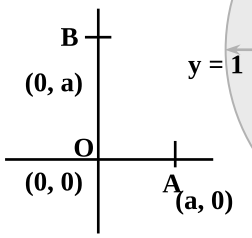
So required Area is $= \int_1^8 x\, dy \;= \int_1^8 y^{\frac{1}{3}} dy$

$$= \left| \frac{y^{\frac{4}{3}}}{\frac{4}{3}} \right|_1^8 = \frac{3}{4}\left(8^{\frac{4}{3}} - 1\right) = \frac{3}{4}(16-1) = \frac{45}{4}$$

9. **If the vertices of a triangles are O(0, 0), A (a, 0) and B(0, a). Then, the distance between its circumcenter and orthocenter is: CUET-2022**

(a) $\frac{a}{2}$ **(b)** $\frac{a}{\sqrt{2}}$ **(c)** $\sqrt{2a}$ **(d)** $\frac{a}{4}$

9. **Ans. (b)**



It's a right angled Δ
Here orthocenter is (0, 0)
Circumcentre is mid point of hypoteneous so circumcentre is $\left(\frac{a}{2}, \frac{a}{2}\right)$

$$\Rightarrow d = \sqrt{\left(\frac{a}{2} - 0\right)^2 + \left(\frac{a}{2} - 0\right)^2} = \sqrt{\frac{a^2}{4} + \frac{a^2}{4}} = \sqrt{\frac{a^2}{2}}$$

$$= \frac{a}{\sqrt{2}}$$

10. **The straight line x + y = 0, 3x + y – 4 = 0 and x + 3y – 4 = 0 from a triangle which is CUET-2022**
(a) Right angled
(b) Equilateral
(c) Isosceles
(d) Isosceles and right angled

10. **Ans. (c)**

As lines are x + y = 0, …(1)

3x + y – 4 = 0, …(2)

x + 3y – 4 = 0 …(3)

So points of intersection of (1), (2) are 2x = 4

$\Rightarrow$ x = 2, y = - 2 $\Rightarrow$ A(2, - 2)

Points of intersection (1), (3) $\Rightarrow$ 2y = 4 $\Rightarrow$ y = 2

$\Rightarrow$ x = - 2 $\Rightarrow$B(-2, 2)

Points of intersection (2), (3) $\Rightarrow$ y = 1 $\Rightarrow$x = 1

$\Rightarrow$ C(1, 1)

As A(2, - 2) B(-2, 2), C(1, 1)

$$d = AB = \sqrt{(2+2)^2 + (-2-2)^2} = \sqrt{32} = 4\sqrt{2}$$

$$AC = \sqrt{(2-1)^2 + (-2-1)^2} = \sqrt{10}$$

$$BC = \sqrt{(-2-1)^2 + (2-1)^2} = \sqrt{10}$$

$\Rightarrow$ AC = BC $\Rightarrow$ Isosceles Δ

11. If one of the lines of $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the axes in the first quadrant, then **CUET-2022**

(a) $h^2 - ab = 0$ (b) $h^2 + ab = 0$

(c) $(a + b)^2 = h^2$ (d) $(a + b)^2 = 4h^2$

11. **Ans. (d)** As bisector of axes are y = ± x

Also bisector lies in first quadrant $\Rightarrow$ y = x is a bisector.

Also for $ax^2 + 2hxy + by^2 = 0$ …(1)

$$m_1 + m_2 = -\frac{2h}{b} \text{ ....(2)}$$

$$m_1 m_2 = \frac{a}{b} \text{ ....(3)}$$

where m_1, m_2 are slopes of lines given by (1)

But if one of lines is y = x $\Rightarrow$ $m_1 = 1$

So put in (2)

$$\Rightarrow 1 + m_2 = -\frac{2h}{b}$$

Also from (3) $\Rightarrow 1.m_2 = \frac{a}{b} \Rightarrow m_2 = \frac{a}{b}$

$\Rightarrow 1 + \frac{a}{b} = -\frac{2h}{b}$ $\Rightarrow$ a + b = - 2h

$\Rightarrow$ $(a + b)^2 = 4h^2$

12. What is the value of : $[\tan^2 (90 - \theta) - \sin^2 (90 - \theta)]$ $\operatorname{cosec}^2 (90 - \theta)\cot^2 (90 - \theta)$ **CUET-2022**

(a) 0 (b) 1 (c) –1 (d) 2

12. **Ans. (b)**

$[\tan^2 (90 - \theta) - \sin^2 (90 - \theta)] \operatorname{cosec}^2 (90 - \theta)\cot^2 (90 - \theta)$

$= (\cot^2\theta - \cos^2\theta) (\sec^2\theta \tan^2\theta)$

$$= \cos^2\theta\left[\frac{1}{\sin^2\theta} - 1\right]\left(\sec^2\theta \tan^2\theta\right)$$

$$= \frac{\cos^2\theta}{\sin^2\theta}\left(1 - \sin^2\theta\right)\left(\frac{1}{\cos^2\theta} \cdot \frac{\sin^2\theta}{\cos^2\theta}\right)$$

$$= \frac{\cos^2\theta . \cos^2\theta}{\sin^2\theta} \cdot \frac{\sin^2\theta}{\cos^2\theta . \cos^2\theta} = 1$$

13. If A + B = 45°, then (1 + tan A) (1 + tan B) is equal to **CUET-2022**

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

13. **Ans. (b)** **If A + B = 45°**

⇒ tan (A + B) = tan 45° = 1

$$\frac{\tan A + \tan B}{1 - \tan A \tan B} = 1$$

⇒ tan A + tan B = 1 –tan A tan B

⇒ tan A + tan B + tan A tan B = 1 ...(1)

Now to find

(1 + tan A) (1 + tan B)

= 1 + tan A + tan B + tan A tan B

= 1 + 1 = 2

14. **If $\vec{a}$ and $\vec{b}$ and are two unit vectors such that $\vec{a}+2\vec{b}$ and $5\vec{a}-4\vec{b}$ are perpendicular to each other, then the angle between $\vec{a}$ and $\vec{b}$ is:**

CUET-2022

(a) 45° **(b) 60°**

(c) $\cos^{-1}\left(\frac{1}{3}\right)$ **(d)** $\cos^{-1}\left(\frac{2}{7}\right)$

14. **Ans. (b)** **Here** $|\vec{a}| = |\vec{b}| = 1$

$$\left(\vec{a}+2\vec{b}\right).\left(5\vec{a}-4\vec{b}\right)=0$$

$$\Rightarrow 5|\vec{a}|^2 - 8|\vec{b}|^2 + 6\vec{a}.\vec{b} = 0$$

$$\Rightarrow 5|\vec{a}|^2 - 8|\vec{b}|^2 + 6|\vec{a}||\vec{b}|\cos\theta = 0$$

$$\Rightarrow 5.1^2 - 8.1^2 + 6.1.1\cos\theta = 0$$

$$\Rightarrow \cos\theta = \frac{1}{2} \Rightarrow \theta = 60°$$

15. **Let** $\vec{a} = \hat{i} - j$ **and** $\vec{b} = \hat{i} + j + k$ **and** $\vec{c}$ **be a vector such** $\left(\vec{a}\times\vec{c}\right)+\vec{b}=0$ **and** $\vec{a}.\vec{c}=4$**, then** $|\vec{c}|^2$ **equal to:**

CUET-2022

(a) 8 **(b)** $\frac{19}{2}$ **(c) 9** **(d)** $\frac{17}{2}$

15. **Ans. (b)** **Here** $\vec{a}\times\vec{c}+\vec{b}=0$

$$\Rightarrow \vec{a}\times\vec{c} = -\vec{b} = -(i+j+k) \Rightarrow |\vec{a}\times\vec{c}| = \sqrt{3}$$

Also $a.c = 4$

$$|\vec{a}| = \sqrt{1^2+1^2} = \sqrt{2}$$

$$\left(\vec{a}.\vec{c}\right)^2 + \left(\vec{a}\times\vec{c}\right)^2 = |\vec{a}|^2|\vec{c}|^2$$

$$4^2 + \left(\sqrt{3}\right)^2 = \left(\sqrt{2}\right)^2|\vec{c}|^2 \Rightarrow 19 = 2c^2$$

$$\Rightarrow |\vec{c}|^2 = \frac{19}{2}$$

16. **If** $\vec{a},\vec{b},\vec{c}$ **and** $\vec{d}$ **are the unit vectors such that** $\left(\vec{a}\times\vec{b}\right).\left(\vec{c}\times\vec{d}\right)=1$ **and** $\left(\vec{a}.\vec{c}\right)=\frac{1}{2}$**, then CUET-2022**

(a) only $\vec{a},\vec{b},\vec{c}$ **are non-coplanar**

(b) only $\vec{a},\vec{b},\vec{d}$ **are non-coplanar**

(c) Both $\vec{a},\vec{b},\vec{c}$ **and** $\vec{a},\vec{b},\vec{d}$ **are non-coplanar**

(d) Both $\vec{a},\vec{b},\vec{c}$ **and** $\vec{a},\vec{b},\vec{d}$ **are coplanar**

16. **Ans. (d)** Let α be the angle between a and b, β be the angle between c and d, θ be the angle between a × b and c × d. Then (a× b) . (c × d) = 1 ⇒ sin α sin β cos θ = 1

$$\Rightarrow \alpha = \frac{\pi}{2}, \beta = \frac{\pi}{2}, \theta = 0$$

⇒ a ⊥ b, c ⊥ d and (a × b) || (c × d)
Now
(a × b) || (c × d) ⇒ a × b = λ (c × d) [λ is some real number]
⇒ (a × b).c = λ (c × d).c = 0
⇒ [a b c] = 0
Also [(a × b) . d] = λ (c × d) . d = 0
[a b d] = 0
∴ a, b, c and a, b, d are coplanar vectors.

17. Let A = {1, 2, 3} and consider the relation R = {(1, 1), (2, 2), (3, 3), (1, 2), (1, 3)} then R is CUET-2022
(a) Reflexive but not symmetric
(b) Reflexive but no transitive
(c) Symmetric and transitive
(d) Equivalence relation

17. **Ans. (a)** It's reflexive as (1, 1), (2, 2), (3, 3) ∈ R
As (1, 2) ∈ R but (2, 1) ∉ R ⇒ Not symmetric.
It's transitive as for every (a, b), (b, c) ∈ R
⇒ (a, c) ∈ R

18. A spring is being moved up and down. An object is attached to the end of the spring that undergoes a vertical displacement. The displacement is given by the equation y = 3.50 sin t + 1.20 sin 2t. Find the first two values of t(in seconds) for which y = 0. CUET-2022

(a) $t = 0, \frac{\pi}{4}$ (b) $t = 0, \frac{\pi}{2}$

(c) t = 0, π (d) $t = 0, \frac{\pi}{6}$

18. **Ans. (c)** As y = 0 ⇒ 0 = 3.5 sin t + 1.2 sin 2t = 0
⇒ 3.5 sin t + 2.4 sin t cos t = 0
⇒ sin t (3.5 + 2.4 cos t) = 0 ⇒ sin t = 0
or

$$\cos t = -\frac{3.5}{2.4} = -\frac{35}{24} < -1$$ not possible

⇒ sin t = 0 ⇒ t = 0, π

19. A ball is thrown off the edge of a building at an angle of 60° and with the initial velocity of 5 meters per second. The equation that represents the horizontal distance of the ball x is x = v_0 (cosθ)t, where v_0 is the initial velocity, θ is the angle at which it is thrown and t is the time in seconds. About how far will the ball travel in 10 seconds? CUET-2022

(a) $25\sqrt{3}m$ (b) $50\sqrt{2}m$ (c) 25 m (d) $\frac{25}{\sqrt{3}}m$

19. **Ans. (c)** θ = 60°, V_0 = 5 metres | second
t = 10 seconds

∴ x = 5 × cos60° × 10 $= 5 \times \frac{1}{2} \times 10$ = 25 m

20. Let b be a positive integer and R = {(a, b) $\in$ Z × Z | a - b = nm for some m $\neq$ 0 $\in$ Z} CUET-2022
(a) Reflexive on Z
(b) Symmetric
(c) Transitive
(d) Equivalence relation of Z

20. Ans. (d) A = {(a, b) $\in$ Z × Z| a – b = nm for m $\neq$ 0}
$\Rightarrow$ m | (a – b) as m divides a-b
Reflexive as m | (a – a) = 0
Symmetric as if m | (a – b) $\Rightarrow$ m | (b – a)
Transitive as if m | (a – b) , m | (b – c)
$\Rightarrow$ m |(a – b) + (b – c) $\Rightarrow$ m | (a – c)
$\Rightarrow$ Transitive

21. The a, b, c and d are in GP and are in ascending order such that a + d = 112 and b + c = 48. If the GP is continued with a as the first term, then the sum of the first six terms is CUET-2022
(a) 1156 (b) 1256 (c) 1356 (d) 1456

21. Ans. (d) As a, b, c, d, are in G.P.
Take a, b, c, d as
a, ar, ar^2, ar^3
Also a + d = 112 $\Rightarrow a + ar^3 = 112$
$\Rightarrow a(1 + r^3) = 112$ …(1)
b + c = 48 $\Rightarrow ar + ar^2 = 48$
$\Rightarrow$ ar (1 + r) = 48 …(2)
Divide (1) by (2)

$$\frac{1+r^3}{r(1+r)} = \frac{112}{48} = \frac{7}{3} \Rightarrow \frac{(1+r)(1-r+r^2)}{r(1+r)} = \frac{7}{3}$$

$$\Rightarrow \frac{1-r+r^2}{r} = \frac{7}{3} \Rightarrow 3 - 3r + 3r^2 = 7r$$

$\Rightarrow 3r^2 - 10r + 3 = 0 \Rightarrow 3r^2 - 9r - r + 3 = 0$
3r (r – 3) – 1(r – 3) = 0
(r – 3) (3r – 1) = 0 $\Rightarrow$ r $= 3, \frac{1}{3}$
Also ar (1 + r) = 48
a.3(1 + 3) = 48 $\Rightarrow$ a = 4
$\Rightarrow$ so sum of first six terms

$$S_6 = \frac{a(r^6-1)}{r-1} = \frac{4(3^6-1)}{3-1} = 2.(3^6-1)$$

= 2.(729 – 1) = 2.728 = 1456

22. Given below are two statements:
<u>Statement I:</u> If A $\subset$ B; then B can be expressed as $B = A \cup (\overline{A} \cap B)$ and P(A) > P(B).
<u>Statement II:</u> If A and B are independent events, than (A and $\overline{B}$), ($\overline{A}$ and B) and ($\overline{A}$ and $\overline{B}$) are also independent.
In the light of the above statements, choose the most appropriate answer from the options given below: CUET-2022
(a) Both Statement I and Statement II are true
(b) Both Statement I and Statement II are false
(c) Statement I is true but Statement II is false
(d) Statement I is false but Statement II are true

22. Ans. (d) Statement I:-
As A $\subset$ B . Then P(A) < P(B)
So P(A) > P(B) is not true
Statement II:- As A, B independent

$\Rightarrow (\overline{A}, B), (A, \overline{B}), (\overline{A}, \overline{B})$ **are independent**

So statement II is true.

23. If $\vec{a}.\vec{b}$ and $\vec{c}$ are unit vectors, then $\left|\vec{a}-\vec{b}\right|^2+\left|\vec{b}-\vec{c}\right|^2+\left|\vec{c}-\vec{a}\right|^2$ does not exceed:

CUET-2022

(a) 4 (b) 9 (c) 8 (d) 6

23. Ans. (b) **As** $\left|\vec{a}\right|=\left|\vec{b}\right|=\left|\vec{c}\right|=1$

$\left|\vec{a}-\vec{b}\right|^2+\left|\vec{b}-\vec{c}\right|^2+\left|\vec{c}-\vec{a}\right|^2$

$=2\left[\left|\vec{a}\right|^2+\left|\vec{b}\right|^2+\left|\vec{c}\right|^2\right]-2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right)$

$=2(1+1+1)-2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right)$

$=6-2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right)$

As $\left(\vec{a}+\vec{b}+\vec{c}\right)^2\geq 0$

$\Rightarrow\left|\vec{a}\right|^2+\left|\vec{b}\right|^2+\left|\vec{c}\right|^2+2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right)\geq 0$

$\Rightarrow 1+1+1+2\left(\vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\right)\geq 0$

$\Rightarrow \vec{a}.\vec{b}+\vec{b}.\vec{c}+\vec{c}.\vec{a}\geq -\frac{3}{2}$

$\Rightarrow\left|\vec{a}-\vec{b}\right|^2+\left|\vec{b}-\vec{c}\right|^2+\left|\vec{c}-\vec{a}\right|^2\geq 6-2\left(-\frac{3}{2}\right)=9$

24. If $\vec{a}=\hat{i}+j+k$, $\vec{a}.\vec{b}=1$ and $\vec{a}\times\vec{b}=j-k$ then $\vec{b}$ is equal to: **CUET-2022**

(a) $\hat{i}-j+k$ **(b)** $2j-k$

(c) $\hat{i}$ **(d)** $2\hat{i}$

24. Ans. (c) **As** $\left(\vec{a}.\vec{b}\right)^2+\left(\vec{a}\times\vec{b}\right)^2=a^2b^2$

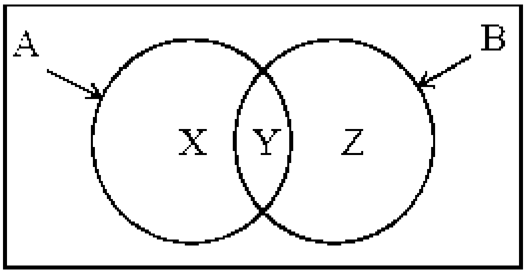
$\vec{a}.\vec{b}=1, \left|\vec{a}\times\vec{b}\right|=\sqrt{1+1}=\sqrt{2}$ **,** $\left|\vec{a}\right|=\sqrt{3}$

$\Rightarrow (1)^2+\left(\sqrt{2}\right)^2=\left(\sqrt{3}\right)^2 b^2$

$3=3\vec{b}^2\Rightarrow\vec{b}^2=1\Rightarrow\left|\vec{b}\right|=1$

Only (c) choice satisfies.

25. Consider the diagram given below and the following two statements:



<u>Statement I:</u> Events A and B can be expressed as:

$A=\left(A\cap\overline{B}\right)\cup Y$

$B=\left(A\cap B\right)\cup Z$

<u>Statement II:</u> Events A and B can be expressed as:

A = X – Y

B = Y + Z

In the light of the above statements, choose the most appropriate answer from the options given below: CUET-2022

(a) Both Statement I and Statement II are true

(b) Both Statement I and Statement II are false

(c) Statement I is true but Statement II is false

(d) Statement I is false Statement II are true

25. **Ans. (c)** Statement I is true as it's clear from venn-diagram.

But statement II : A = X – Y is not true.

Statement I is true but statement II is not true.

26. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

<u>Assertion A:</u> In a class of 40 students, 22 drink sprite, 10 drink Sprite but not Pepsi. Then the number of student who drink both Sprite and Pepsi is 15.

<u>Reason R:</u> For any two finite sets A and B, $n(A) = n(A-B) + n(A \cap B)$

In the light of the above statements, choose the most appropriate answer from the options given below: CUET-2022

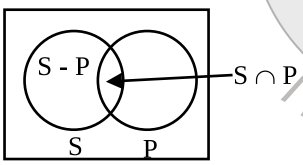
(a) Both A and R are true and R is the correct explanation of A

(b) Both A and R are true and R is not the correct explanation of A

(c) A is true but R is not false.

(d) A is false but R is true.

26. **Ans. (d)**



As $n(S) = n(S - P) + n(S \cap P)$

$\Rightarrow 22 = 10 + n(S \cap P) \Rightarrow n(S \cap P) = 12$

But we are given $n(S \cap P) = 15$

So assertion A is not true.

Reason R : $n(A) = n(A - B) + n(A \cap B)$ is definitely true.

27. Match List I with List II

<u>List I</u>

A. If 4th term of a G.P. is square of its second term, and its first term is 3, then common ratio is ________.

B. The first term of an AP is 5, the last term is 45 and the sum of the terms is 400. The number of term is _________

C. The sum of three numbers which are in AP is 27 and sum of their squares is 293. Then the common difference is __________.

D. The fourth and 54th terms of an AP are, respectively 64 and –61. The common difference is __________.

<u>List II</u>

I. 5

II. $-\frac{5}{2}$

III. 16

IV. 3

Choose the correct answer from the options given below: CUET-2022

(a) A – IV; B – III; C – I; D – II
(b) A – III; B – II; C – I; D – IV
(c) A – II; B – III; C – I; D – IV
(d) A – II; B – I; C – III; D – IV

27. **Ans. (a)** Statement A implies a = 3

$T_4 = (T_2)^2 \Rightarrow ar^3 = (ar)^2 \Rightarrow r^3 = r^2 a \Rightarrow r = a = 3$

$\Rightarrow$ A $\rightarrow$ IV from list I, II

Also B implies a = 5, l = 45, S_n = 400

$$S_n = \frac{n}{2}[a+l] = 400$$

n [5 + 45] = 800 $\Rightarrow$ n = 16

$\Rightarrow$ B – III

So we can conclude only (a) choice satisfies

Just for our satisfaction we can go further

C(implies)

$\Rightarrow (a - d) + (a) + (a + d) = 27$

$3a = 27 \Rightarrow a = 9$

$(a - d)^2 + a^2 + (a + d)^2 = 293$

$(9 - d)^2 + 9^2 + (9 + d)^2 = 293$

$(9 - d)^2 + (9 + d)^2 = 212$

$2[9^2 + d^2] = 212 \Rightarrow 9^2 + d^2 = 106$

$d^2 = 25 \Rightarrow d = 5 \quad \Rightarrow C \rightarrow I$

D implies $T_4 = a + 3d = 64$

$T_{54} = a + 53d = -61$

By subtracting $\Rightarrow 50d = -125 \Rightarrow d = -\frac{125}{50} = -\frac{5}{2}$

$\Rightarrow$ D – II. Only (a) choice true.

28. Given below are two statements: one is labelled as Assertion A and the other is labelled as Reason R.

<u>Assertion A:</u> The system of equations x + y + z = 4, 2x – y + 2z = 5, x – 2y – z = –3 has unique solution.

<u>Reason R:</u> If A is 3 × 3 matrix and B is a 3 × 1 non-zero column matrix, then the equation AX = B has unique solution if A is non-singular.

In the light of the above statements, choose the most appropriate answer from the options given below: CUET-2022

(a) Both A and R are correct and R is the correct explanation of A
(b) Both A and R are correct and R is not the correct explanation of A
(c) A is correct but R is not correct.
(d) A is correct but R is correct.

28. **Ans. (a)** x + y + z = 4

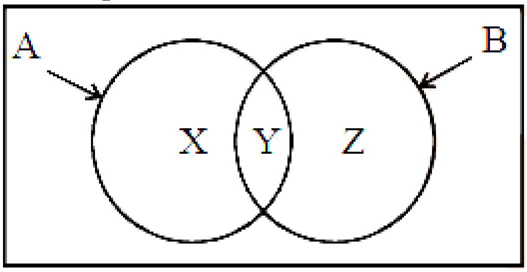
2x – y + 2z = 5 and x – 2y – z = - 3

$$\Rightarrow D = \begin{vmatrix} 1 & 1 & 1 \\ 2 & -1 & 2 \\ 1 & -2 & -1 \end{vmatrix} = 1(5) - 1(-4) + (-3)$$

$= 5 + 4 - 3 = 6 \neq 0 \Rightarrow$ Assertion A is true.

Now reason R is also correct and R is correct explanation of A.

29. **Consider the diagram given below and the following two statements:**



<u>Statement I:</u> Regions X, Y and Z can be expressed as $A \cap \overline{B}$, $A \cap B$ and $\overline{A} \cap B$ respectively.
<u>Statement II:</u> P(Y) = P(A) – P(X) = P(B) – P(Z).
In the light of the above statements, choose the most appropriate answer from the options given below: CUET-2022
(a) Both Statement I and Statement II are true
(b) Both Statement I and Statement II are false
(c) Statement I is true but Statement II is false
(d) Statement I is false Statement II are true

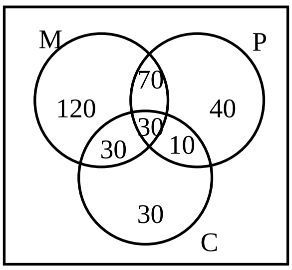
29. **Ans. (a) Very clear from given venn diagram**

30. **In a class there are 400 students, the following table shows the number of students studying one or more of the subjects:**

Subject	**Number of students**
Mathematics	**250**
Physics	**150**
Chemistry	**100**
Mathematics and Physics	**100**
Mathematics and Chemistry	**60**
Physics and Chemistry	**40**
Mathematics, Physics and Chemistry	**30**

A. The number of students who study only Mathematics is 100.
B. The number of students who study only Physics is 40.
C. The number of students who study only Chemistry is 40.
D. The number of students who do not study Mathematics, Physics and Chemistry is 70.
Choose the correct answer from the options given below. CUET-2022
(a) B and D only (b) A and B only
(c) A only (d) C only

30. **Ans. (a)**



So no. of students who study physics only = 40 is true
⇒ Statement B is true
Also $n(M \cup P \cup C) = 250 + 40 + 10 + 30 = 330$
⇒ No. of students who study neither of maths, Physics, chemistry is $n(M \cup P \cup C)^c = 400 - 330 = 70$
So D statement also true.

31. **The arithmetic means of two observations is 125 and their geometric means is 60. Find the harmonic mean of the two observations.** **CUET-2022**

(a) 4.17 **(b) 8.34** **(c) 28.8** **(d) 57.6**

31. **Ans. (c)** **As** $A = \frac{a+b}{2} = 125$

$G = \sqrt{ab} = 60$

$G^2 = AH \Rightarrow H = \frac{G^2}{A} = \frac{(60)^2}{125}$

$= \frac{3600}{125} = 28.8$

32. **The arithmetic mean and standard deviation of series of 20 items were calculated by a student as 20 cm and 5 cm respectively. But while calculating them an item 15 was misread as 30. Find the correct standard deviation.** **CUET-2022**

(a) 4.10 **(b) 4.40** **(c) 4.54** **(d) 4.66**

32. **Ans. (c)** **As incorrect** $\overline{x} = 20$ **cm**

Incorrect S.D = 5

N = 20 ⇒ $\sum x_i$ **= 20 × 20 = 400**

As 15 was misread as 30

⇒ Corrected mean $\overline{x} = \frac{400-15}{20} = \frac{385}{20}$

Incorrect SD $= \sqrt{\frac{\sum x_i^2}{n} - (\overline{x})^2}$

$5 = \sqrt{\frac{\sum x_i^2}{n} - (20)^2}$

$5^2 + (20)^2 = \frac{\sum x_i^2}{n} \Rightarrow incorrect \sum x_i^2 = 425 \times 20 = 8500$

Now correct $\sum x_i^2 = 8500 - (30)^2 + 15^2$

= 8500 – 900 + 225

= 7600 + 225 = 7825

Now correct S.D. $S = \sqrt{\frac{\sum x_i^2}{n} - (\overline{x})^2}$

$= \sqrt{\frac{7825}{20} - \left(\frac{385}{20}\right)^2}$

$= \sqrt{\frac{7825 \times 20 - (385)^2}{(20)^2}} = \frac{5}{20}\sqrt{313 \times 20 - (77)^2}$

$= \frac{1}{4}\sqrt{6260 - 5929} = \frac{1}{4}\sqrt{331} = \frac{1}{4} \times 18.2$ **= 4.54**

33. **Given the marks of 25 students in the class as {m_1, m_2, ..., m_{25}}. Marks lie in the range of [1 – 100] and** $\overline{m}$ **is the mean. Which of the following quantity has the value zero?** **CUET-2022**

(a) $\sum_{i=1}^{25} |m_i - \overline{m}|$ **(b)** $\sum_{i=1}^{25} (m_i - \overline{m})$

(c) $\sum_{i=1}^{25} (m_i - \overline{m})^2$ **(d)** $\sum_{i=1}^{25} \frac{m_i}{\overline{m}}$

33. **Ans. (b)** Only (b) choice as
Sum of deviations about mean = 0

34. **The terms 1, $\log_y(x)$, $\log_z(y)$ and $-15\log_x(z)$ are in AP. Based on this information answer the following questions.**
The common difference of AP is: CUET-2022
(a) 2 (b) –2 (c) 1/2 (d) –1/2

34. **Ans. (b)** As 1, $\log_y x$, $\log_y y$, - $15\log_x z$ are in A.P.
$\Rightarrow \log_y x = 1 + d \Rightarrow x = y^{1+d}$ …(1)
$\log_z y = 1 + 2d \Rightarrow y = z^{1+2d}$ …(2)

$$-15\log_x z = 1+3d \Rightarrow \log_x z = -\left(\frac{1+3d}{15}\right)$$

$$\Rightarrow z = x^{-\left(\frac{1+3d}{15}\right)} \quad \text{…(3)}$$

From (2), (3) $\Rightarrow y = x^{-\left(\frac{1+3d}{15}\right)(1+2d)}$

Put in (1)

$$x = x^{-(1+d)\left(\frac{1+3d}{15}\right)(1+2d)}$$

$$\Rightarrow -(1+d)\left(\frac{1+3d}{15}\right)(1+2d) = 1$$

$\Rightarrow$ - $(1 + 4d + 3d^2)(1 + 2d) = 15$
- $(1 + 2d + 4d + 8d^2 + 3d^2 + 6d^3) = 15$
$6d^3 + 11d^2 + 6d + 16 = 0$
$\Rightarrow$ d = - 2 satisfies above.

35. **The terms 1, logy (x), logz (y) and –15 logx (z) are in AP. Based on this information answer the following questions.**
The value of xy is: CUET-2022
(a) 1 (b) –1 (c) z^2 (d) z^3

35. **Ans. (a)** As $x = y^{1+d}$ from (1) in above question.
as d = - 2 $\Rightarrow x = y^{-1} \Rightarrow xy = 1$

36. **The terms 1, $\log_y(x)$, $\log_z(y)$ and $-15\log_x(z)$ are in AP. Based on this information answer the following questions. yz is equal to CUET-2022**
(a) x (b) x^2 (c) z^{-2} (d) z^{-3}

36. **Ans. (c)**
(3) of question no. (83)
$y = z^{1+2(-2)} = z^{-3} \Rightarrow \quad y = \frac{1}{z^3} \Rightarrow yz = \frac{1}{z^2}$

37. **Consider n events $E_1, E_2, \ldots\ldots\ldots E_n$, with respective probabilities $p_1, p_2, \ldots\ldots p_n$. If**
$P(E_1, E_2, \ldots\ldots E_n) = \prod_{i=1}^{n} p_i$ **then: CUET-2022**
(a) The events are mutually exclusive
(b) The events are independent
(c) The events are dependent
(d) The events are mutually exclusive and independent

37. **Ans. (b)** $P(E_1, E_2, \ldots\ldots E_n) = \prod_{i=1}^{n} p_i$
$\Rightarrow E_1, E_2, E_3, \ldots\ldots E_n$ are independent.
As $P(A \cap B) = P(A) \cdot P(B)$
$\Rightarrow$ A, B are independent.

38. **Given a set of events E_1........E_n, defined on the sample space S such that:**
(i) $\forall$ i and j, $i \neq j$, $E_i \cap E_j = \phi$
(ii) $\bigcup_{i=1}^{n} E_i = S$
(iii) $P(E_i) > 0, \forall i = 1, n$
Then the events are: **CUET-2022**
(a) Pairwise disjoint and exhaustive
(b) Pairwise disjoint and independent
(c) Dependent and mutually exclusive
(d) Independent and mutually exclusive

38. **Ans. (a)**
$E_i \cap E_j = \phi \Rightarrow$ E_i's are mutually exclusive or pairwise disjoint
i, j = 1, 2, ….., n
Also $\bigcup_{i=1}^{n} E_i = S$
$\Rightarrow E_i$'s are exhaustive
$\Rightarrow E_i$'s are Exclusive and exhaustive

39. **4 Indians, 3 Americans and 2 Britishers are to be arranged around a round table.**
Answer the following Questions.
The number of ways of arranging them is
CUET-2022
(a) 9! (b) 9!/2 (c) 8! (d) 8!/2

39. **Ans. (c)** **As we have 4 $\to$ Indians**
3 $\to$ Americans and 2 $\to$ Britishers
$\Rightarrow$ Total persons = 9 persons to be arranged on circular table in $= \underline{|9-1} = \underline{|8}$ **ways.**

40. **4 Indians, 3 Americans and 2 Britishers are to be arranged around a round table.**
Answer the following questions.
The number of ways arranging them so that the two Britishers should never come together is:
CUET-2022
(a) 7! × 2! (b) 6! × 2! (c) 7! (d) 6! $^7P_2$

40. **Ans. (d)** **As 2-Britishers never sit together**
So At first we have to arrange 4 Indians and 3 – Americans on circular table in $= \underline{|4+3-1} = \underline{|6}$ **ways.**
Now between 7-persons, 2-britishers persons can be arranged in $^7P_2$ ways on circular table.-
So total ways $= \underline{|6}.\,{}^7P_2$

41. **4 Indians, 3 Americans and 2 Britishers are to be arranged around a round table.**
Answer the following questions.
The number of ways of arranging them so that the three Americans should sit together is:
CUET-2022
(a) 7! × 3! (b) 6! × 3! (c) 6! $^6P_3$ (d) 6! $^7P_3$

41. **Ans. (b)** **As three Americans sit together so take them as one**
Now 4 Indians, 2 Britishers, three Americans taken as one can be arranged on circular table in
$= \left(\underline{|4+2+1-1}\right)\underline{|3}$ **ways**
$= \underline{|6}\,\underline{|3}$ **ways.**

42. **Given three identical boxes B_1, B_2 and B_3 each containing two balls. B_1 contains two golden balls, B_2 contains two silver balls and B_3 contains one silver and one golden ball. Conditional probabilities that the golden ball is drawn from B_1, B_2, B_3 are _______________ respectively.**

CUET-2022

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

42. **Ans. (c)** **As B_1 contains 2 golden balls**

⇒ P(golden ball from B_1) $= \frac{2}{2} = 1$

B_2 contain no golden ball

⇒ P(golden ball from B_2) $= \frac{0}{2} = 0$

B_3 contain one golden ball

P(golden ball from B_3) $= \frac{1}{2}$

43. **Match List I with List II**

List I

A. In a GP, the third term is 24 and 6^{th} term is 192.
The common ratio is _________

B. Let S_n denote the sum of the first n terms of an AP.
If $S_{2n} = 3n$, then S_{3n}/S_n equals to __________.

C. The sum of the first 3 terms of a GP is 13/12 and their product is –1. The first term is __________.

D. The least value of n for which the sum 3 + 6 + 9 ..... + n is greater than 1000 is

List II

I. 78
II. 6
III. –1
IV. 2

Choose the correct answer from the options given below: **CUET-2022**

(a) A – III; B – I; C – II; D – IV
(b) A – III; B – IV; C – I; D – II
(c) A – IV; B – II; C – III; D – I
(d) A – IV; B – III; C – II; D – I

43. **Ans. (none)** **A : As $T_3 = 24 = ar^2$**

$T_6 = 192 = ar^5$

Divide these two $\Rightarrow r^3 = \frac{192}{24} = 8$ **⇒ r = 2**

B : As $S_{2n} = 3n$

$$\Rightarrow S_k = 3.\frac{k}{2} = \frac{3k}{2}$$

$$\Rightarrow \frac{S_{3n}}{S_n} = \frac{\frac{3(3n)}{2}}{\frac{3n}{2}} = 3$$

C : As $a + ar + ar^2 = \frac{13}{12}$ **and** $a.ar.ar^2 = \frac{13}{12}$

$a.ar.ar^2 = -1 \Rightarrow a^3r^3 = -1$

⇒ ar = - 1

⇒ $a + ar + ar^2 = a + (-1) + ar.r$

= a – 1 – r

$$= a - 1 + \frac{1}{a} = \frac{13}{12} \Rightarrow a + \frac{1}{a} = \frac{25}{12}$$

So none of choices satisfies A,B,C

44. Match List I with List II
$w \neq 1$ is a cube root of unity.

List I

A. The value of $\frac{1}{9}(1-w)(1-w^2)(1-w^4)(1-w^8)$ **is**

B. $w(1 + w - w^2)^7$ ________ is equal to

C. The least positive integer n such that $(1 + w^2)^n = (1 + w^4)^n$ is

D. $(1 + w + w^2)$ is equal to

List II

I. 0
II. 1
III. – 128
IV. 3

Choose the correct answer from the options given below: CUET-2022

(a) A – II; B – III; C – I; D – IV
(b) A – II; B – III; C – IV; D – I
(c) A – III; B – II; C – IV; D – I
(d) A – III; B – II; C – I; D – IV

44. Ans. (b) **A :** $\frac{1}{9}(1-w)(1-w^2)(1-w^4)(1-w^8)$

$\frac{1}{9}(1-w)(1-w^2)(1-w)(1-w^2)$

$\frac{1}{9}\left((1-w)(1-w^2)\right)^2$

$= \frac{1}{9}\left(1-(w+w^2)+w^3\right)^2 = \frac{1}{9}(1+1+1)^2 = 1$

B : $w(1 + w - w^2)^7$

$w(-w^2 - w^2)^7 = w(-2w^2)^7$

$= -2^7 . ww^{14} = -2^7.w^{15} = -2^7 = -128$

C: $(1 + w^2)^n = (1 + w^4)^n$

$(1 + w^2)^n = (1 + w)^n$ $\Rightarrow \left(\frac{1+w^2}{1+w}\right)^n = 1$

$\left(\frac{-w}{-w^2}\right)^n = 1 \Rightarrow \left(\frac{1}{w}\right)^n = 1$ **$\Rightarrow w^n = 1 \Rightarrow n = 3$**

D : $(1 + w + w^2) = 0$

45. Match List I with List II

List I	List II
A. $\log_4 (\log_3 81) =$	I. 0
B. $3^4 \log_9{}^7 = 7^k$, then k	II. 3
C. $2^{\log_3 5} - 5^{\log_3 2}$	III. 1
D. $\log_2 [\log_2(256)]$	IV. 2

Choose the correct answer from the options given below: CUET-2022

(a) A – I; B – III; C – II; D – IV
(b) A – I; B – III; C – IV; D – II
(c) A – III; B – IV; C – II; D – I
(d) A – III; B – IV; C – I; D – II

45. Ans. (d) **A : $\log_4\log_3 81 = \log_4\log_3 3^4 = \log_4(4\log_3 3)$**

$= \log_4 4 = 1 \Rightarrow A \to III$

$D = \log_2 (\log_2 256) = \log_2 (\log_2 2^8) = \log_2(8 \log_2 2)$

$= \log_2 8 = \log_2 2^3 = 3\log_2 2 = 3$

$\Rightarrow$ **D $\rightarrow$ II**

B : $3^{4\log_9 7} = 7^k$

$3^{\frac{4}{2}\log_3 7} = 3^{2\log_3 7} = 3^{\log_3 7^2} = 7^2 = 7^k \Rightarrow$ **k = 2**

C : Let A

$= 2^{\log_3 5} \Rightarrow \log A = (\log_3 5)\log 2 = \dfrac{\log 5.\log 2}{\log 3}$

B $= 5^{\log_3 2} \Rightarrow \log B = (\log_3 2).\log 5 = \dfrac{(\log 5)\log 2}{\log 3}$

$\Rightarrow$ **A = B** $\Rightarrow$ **A – B** $= 2^{\log_3 5} - 5^{\log_3 2} = 0$