Previous IPE

SOLVED PAPERS

MARCH -2026(TG)

PREVIOUS PAPERS

IPE: MARCH-2026 (TG)

MATHS-2A

Time : 3 Hours | Max.Marks : 75

SECTION-A

I. Answer ALL the following VSAQ: **$10 \times 2 = 20$**

1. Write the complex number $\frac{a-ib}{a+ib}$ in the form A+iB.
2. If $z_1 = (6, 3)$ $z_2 = (2, -1)$ find z_1/z_2.
3. If $x = cis\theta$, then find the value of $\left(x^6 + \frac{1}{x^6}\right)$.
4. Form a quadratic equation whose roots are $\frac{m}{n}, -\frac{n}{m}, (m \neq 0, n \neq 0)$
5. If 1, 1, α are the roots of $x^3 - 6x^2 + 9x - 4 = 0$ then find α.
6. If ${}^{12}P_r = 1320$ find r.
7. Find the number of ways of selecting 4 English, 3 Telugu and 2 Hindi books out of 7 English, 6 Telugu and 5 Hindi books.
8. Find the 7^{th} term in $\left(\frac{4}{x^3} + \frac{x^2}{2}\right)^{14}$
9. Find the mean deviation about the mean for the following data 3, 6, 10, 4, 9, 10
10. A poisson variable satisfies $P(X = 1) = P(X = 2)$. Find $P(X = 5)$

SECTION-B

II. Answer any FIVE of the following SAQs: **$5 \times 4 = 20$**

11. If $|z - 3 + i| = 4$, determine the locus of z.
12. If x is real, prove that $\frac{x}{x^2 - 5x + 9}$ lies between $\frac{-1}{11}$ and 1.
13. Find the sum of all 4 digited numbers that can be formed using the digits 1, 2, 4, 5, 6 without repetition.
14. Find the number of ways of selecting 11 member cricket team from 7 batsmen, 6 bowlers and 2 wicket keepers so that the team contains 2 wicket keepers and atleast 4 bowlers.
15. Resolve $\frac{x^2+5x+7}{(x-3)^3}$ into partial fractions
16. If A and B are independent events with $P(A) = 0.2$, $P(B) = 0.5$, then find

    (i) $P(A/B)$ (ii) $P(B/A)$ (iii) $P(A \cap B)$ (iv) $P(A \cup B)$
17. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is (i) an even number (ii) an odd number.

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SECTION-C

III. Answer any FIVE of the following LAQs: **$5 \times 7 = 35$**

18. If n is a positive integer then show that
$(1 + \cos\theta + i \sin\theta)^n + (1 + \cos\theta - i \sin\theta)^n = 2^{n+1}\cos^n(\theta/2) \cos(n\theta/2)$

19. Solve $8x^3 - 36x^2 - 18x + 81 = 0$ given that the roots are in Arithmetic Progression.

20. If P and Q are the sum of odd terms and the sum of even terms respectively, in the expansion of $(x + a)^n$ then prove that (i) $P^2 - Q^2 = (x^2 - a^2)^n$ (ii) $4PQ = (x + a)^{2n} - (x - a)^{2n}$

21. Find the sum of the infinite series $\frac{3}{4}+\frac{3.5}{4.8}+\frac{3.5.7}{4.8.12}+......$

22. Find the mean deviation about mean for the following distribution.

x_i	10	30	50	70	90
f_i	4	24	28	16	8

23. State and prove addition theorem on Probability.

24.

$X = x$	-2	-1	0	1	2	3
$P(X = x)$	0.1	k	0.2	$2k$	0.3	k

is the probability distribution of a random variable X. Find the value of k and the variance of X.

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SOLUTIONS

SECTION-A

1. Write the complex number $\frac{a-ib}{a+ib}$ in the form A+iB

Sol: $\frac{a-ib}{a+ib}=\frac{(a-ib)}{(a+ib)}\frac{(a-ib)}{(a-ib)}=\frac{(a-ib)^2}{a^2+b^2}$

$=\frac{(a^2+i^2b^2-2abi)}{a^2+b^2}=\frac{(a^2-b^2)-2abi}{a^2+b^2}$

$=\left(\frac{a^2-b^2}{a^2+b^2}\right)+\left(\frac{-2ab}{a^2+b^2}\right)i$

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2. f z_1 = (6, 3) z_2 = (2, –1) find z_1/z_2.

Sol: $\frac{z_1}{z_2}=\frac{(6,3)}{(2,-1)}=\frac{6+3i}{2-i}=\frac{(6+3i)(2+i)}{(2-i)(2+i)}=\frac{(12-3)+i(6+6)}{(2^2+1^2)}$

$=\frac{9+i(12)}{5}=\left(\frac{9}{5},\frac{12}{5}\right)$

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3. If x = cosθ + i sinθ then find $x^6+\frac{1}{x^6}$

Sol: $x^6=(\cos\theta+i\sin\theta)^6=\cos6\theta+i\sin6\theta$

$\Rightarrow \frac{1}{x^6}=\cos6\theta-i\sin6\theta \qquad \therefore x^6+\frac{1}{x^6}=2\cos6\theta$

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4. Find the quadratic equation whose roots are $\frac{m}{n},-\frac{n}{m},(m\neq0,n\neq0)$

Sol: Let $\alpha=\frac{m}{n}$ and $\beta=\frac{-n}{m}$ $\Rightarrow\alpha+\beta=\frac{m}{n}-\frac{n}{m}=\frac{m^2-n^2}{mn}$ and $\alpha\beta=\left(\frac{\cancel{m}}{\cancel{n}}\right)\left(\frac{-\cancel{n}}{\cancel{m}}\right)=-1$

$\therefore$ The required quadratic equation is $x^2-(\alpha+\beta)x+\alpha\beta=0$

$\Rightarrow x^2-\left(\frac{m^2-n^2}{mn}\right)x-1=0$

$\Rightarrow (mn)x^2-(m^2-n^2)x-mn=0$

5. If 1, 1, α are the roots of $x^3 - 6x^2 + 9x - 4 = 0$ then find α.

Sol: From the given equation we get, $a_0 = 1$, $a_1 = -6$, $a_2 = 9$, $a_3 = -4$

Product of roots $1.1.\alpha = S_3 = \frac{-a_3}{a_0} = \frac{4}{1}$ $\therefore \alpha = 4$.

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6. If $^{12}P_r = 1320$ find r.

Sol: $1320 = 12 \times 11 \times 10 = {}^{12}P_3$

$\therefore r = 3$

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7. Find the number of ways of selecting 4 English, 3 Telugu and 2 Hindi books out of 7 English, 6 Telugu and 5 Hindi books.

Sol: The number of ways of selecting

4 English books out of 7 books = $^7C_4$.

3 Telugu books out of 6 books = $^6C_3$.

2 Hindi books out of 5 books = $^5C_2$.

Hence, the number of required ways $^7C_4 \times {}^6C_3 \times {}^5C_2 = 35 \times 20 \times 10 = 7000$.

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8. Find the 7^{th} term in $\left(\frac{4}{x^3} + \frac{x^2}{2}\right)^{14}$

Sol: We know in $(x+y)^n$, $T_{r+1} = {}^nC_r x^{n-r} y^r$.

$$T_7 = T_{6+1} = {}^{14}C_6 \left(\frac{4}{x^3}\right)^{14-6}\left(\frac{x^2}{2}\right)^6 = {}^{14}C_6 \frac{4^8}{2^6}.\frac{x^{12}}{x^{24}} = {}^{14}C_6 \frac{4^8}{4^3}.\frac{x^{12}}{x^{24}} = {}^{14}C_6 \frac{4^5}{x^{12}}$$

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9. Find the mean deviation about mean for the data 3, 6, 10, 4, 9, 10.

Sol: **Given data:** 3, 6, 10, 4, 9, 10. Here n= 6

Mean $\bar{x} = \frac{3+6+10+4+9+10}{6} = \frac{42}{6} = 7$

Deviations from the mean:

$3-7 = -4$; $6-7 = -1$; $10-7 = 3$; $4-7 = -3$; $9-7 = 2$; $10-7 = 3$

Absolute values of these deviations: 4, 1, 3, 3, 2 3

$\therefore$ M.D from Mean is $M.D. = \frac{\Sigma|x_i - \bar{x}|}{6}$

$$= \frac{4+1+3+3+2+3}{6} = \frac{16}{6} = 2.67$$

10. A Poisson variable satisfies P(X=1)=P(X=2), find P(X=5)

Sol: We have $P(X=r)=\frac{e^{-\lambda}\lambda^r}{r!}, \lambda>0$

Given that P(X=1)=P(X=2)

$$\Rightarrow \frac{\lambda e^{-\lambda}}{1!}=\frac{\lambda^2 e^{-\lambda}}{2!} \Rightarrow \frac{\lambda}{1}=\frac{\lambda^2}{2} \Rightarrow \lambda^2=2\lambda \Rightarrow \lambda(\lambda-2)=0 \Rightarrow \lambda=2\ (\because \lambda>0)$$

$$\therefore P(X=5)=\frac{e^{-2}2^5}{5!}$$

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SECTION-B

11. If |z–3+i|=4,determine the locus of z.

Sol: Let $z = x + iy \Rightarrow |z-3+i| = 4 \Rightarrow |x+iy-3+i| = 4$

$\Rightarrow |(x-3)+i(y+1)| = 4$

$\Rightarrow \sqrt{(x-3)^2+(y+1)^2} = 4$

$\Rightarrow (x-3)^2 + (y+1)^2 = 16$

$\Rightarrow (x^2-6x+9) + (y^2+2y+1)-16 = 0$

$\Rightarrow x^2 + y^2-6x + 2y-6 = 0$

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12. If x is real, prove that $\frac{x}{x^2-5x+9}$ lies between 1 and $\frac{-1}{11}$.

Sol: Let $y = \frac{x}{x^2-5x+9} \Rightarrow y(x^2-5x+9) = x \Rightarrow yx^2-5yx+9y-x = 0$

$\Rightarrow yx^2-(5y+1)x+9y = 0$ .... (1)

(1) is a quadratic in x and its roots are reals.

$\therefore \Delta = b^2-4ac \geq 0$

$\Rightarrow (5y+1)^2-4(y)(9y) \geq 0$

$\Rightarrow (25y^2+10y+1)-36y^2 \geq 0$

$\Rightarrow -11y^2+10y+1 \geq 0$

$\Rightarrow 11y^2-10y-1 \leq 0$

$\Rightarrow 11y^2-11y+y-1 \leq 0$

$\Rightarrow 11y(y-1)+(y-1) \leq 0$

$\Rightarrow (11y+1)(y-1) \leq 0$

$\Rightarrow y \in \left[-\frac{1}{11}, 1\right] \Rightarrow \frac{-1}{11} \leq y \leq 1$

$\therefore$ The given expression lies between $\frac{-1}{11}$ and 1

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13. Find the sum of all four digited numbers that can be formed using the digits 1, 2, 4, 5, 6 without repetition.

Sol : First we find the sum contributed by 6 in the **'total sum'**

The sum contributed by 6 when it is in units place is $\square\,\square\,\square\,\boxed{6} = {}^4P_3 \times 6$

The sum contributed by 6 when it is in tens place is $\square\,\square\,\boxed{6}\,\square = {}^4P_3 \times 60$

The sum contributed by 6 when it is in hundreds place is $\square\,\boxed{6}\,\square\,\square = {}^4P_3 \times 600$

The sum contributed by 6 when it is in thousands place is $\boxed{6}\,\square\,\square\,\square = {}^4P_3 \times 6000$

$\therefore$ The sum contributed by 6 in the total sum is ${}^4P_3 \times (6+60+600+6000)$

$= {}^4P_3 \times 6(1+10+100+1000) = {}^4P_3 \times 6(1111)$ ....(1)

Similarly, the sum contributed by 5 is ${}^4P_3 \times 5(1111)$ ....(2)

the sum contributed by 4 is ${}^4P_3 \times 4(1111)$ ....(3)

the sum contributed by 2 is ${}^4P_3 \times 2(1111)$ ....(4)

the sum contributed by 1 is ${}^4P_3 \times 1(1111)$ ....(5)

Hence from (1), (2), (3), (4), (5), the sum of all 4 digited numbers is ${}^4P_3 \times 1111(6+5+4+2+1)$
$= (4\times3\times2) \times 1111 \times (18) = 4,79,952$

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14. Find the number of ways of selecting 11 member cricket team from 7 batsmen, 6 bowlers and 2 wicket keepers so that the team contains 2 wicket keepers and atleast 4 bowlers.

Sol: A team of 11 players with 2 wicket keepers and atleast 4 bowlers can be selected in the following compositions.

Keepers (2)	Bowlers (6)	Batsmen (7)	No. of selections
2	4	5	${}^2C_2 \times {}^6C_4 \times {}^7C_5 = 1 \times 15 \times 21 = 315$
2	5	4	${}^2C_2 \times {}^6C_5 \times {}^7C_4 = 1 \times 6 \times 35 = 210$
2	6	3	${}^2C_2 \times {}^6C_6 \times {}^7C_3 = 1 \times 1 \times 35 = 35$

$\because {}^6C_4 = {}^6C_2 = \frac{6\times5}{2\times1} = 15$

${}^7C_5 = {}^7C_2 = \frac{7\times6}{2\times1} = 21$

${}^7C_4 = {}^7C_3 = \frac{7\times6\times5}{3\times2\times1} = 35$

$\therefore$ the total number of selections $= 315 + 210 + 35 = 560$

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15. Resolve $\dfrac{x^2+5x+7}{(x-3)^3}$ into partial fractions

Sol: Put x–3 = y then x = y+3

$$\therefore \frac{x^2+5x+7}{(x-3)^3}=\frac{(y+3)^2+5(y+3)+7}{y^3}=\frac{y^2+6y+9+5y+15+7}{y^3}=\frac{y^2+11y+31}{y^3}$$

$$=\frac{1}{y}+\frac{11}{y^2}+\frac{31}{y^3}=\frac{1}{x-3}+\frac{11}{(x-3)^2}+\frac{31}{(x-3)^3}$$

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16. If A and B are independent events with P(A) = 0.2, P(B) = 0.5, find (i) P(A/B) (ii) P(B/A) (iii) P(A∩B) (iv) P(A∪B)

Sol: Given that A,B are independent, hence

i) P(A/B) = P(A) = 0.2

ii) P(B/A) = P(B) = 0.5

iii) P(A∩B) = P(A).P(B) = 0.2 x 0.5 = 0.1

iv) P(A∪B) = P(A)+P(B)–P(A∩B) = 0.2 + 0.5 – 0.1 = 0.6

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17. If two numbers are selected randomly from 20 consecutive natural numbers, find the probability that the sum of the two numbers is (i) an even number (ii) an odd number.

Sol: Let E be the event of choosing two numbers such that their sum is even.

The total number of ways of choosing any 2 out of 20 is n(S) $={}^{20}C_2=190$

Any 20 consecutive natural numbers contain 10 even numbers and 10 odd numbers.

i) To get an even sum, either both must be odd or both must be even.

So the number of favourable cases to E is n(E) = ${}^{10}C_2+{}^{10}C_2=45+45=90$

$$\therefore P(\text{even sum})=P(E)=\frac{n(E)}{n(S)}=\frac{90}{190}=\frac{9}{19}$$

ii) Getting an 'even sum' and an 'odd sum' are both complementary events

$$\therefore P(\text{odd sum})=P(\bar{E})=1-P(E)=1-\frac{9}{19}=\frac{19-9}{19}=\frac{10}{19}$$

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SECTION-C

18. If n is a positive integer then show that
$(1+\cos\theta+i\sin\theta)^n + (1+\cos\theta-i\sin\theta)^n = 2^{n+1}\cos^n(\theta/2)\cos(n\theta/2)$

Sol: First we find the mod-amp form of $1+\cos\theta+i\sin\theta$

$$1+\cos\theta+i\sin\theta = 2\cos^2\frac{\theta}{2}+i2\sin\frac{\theta}{2}\cos\frac{\theta}{2} = 2\cos\frac{\theta}{2}(\cos\frac{\theta}{2}+i\sin\frac{\theta}{2})$$

$$\therefore (1+\cos\theta+i\sin\theta)^n = \left(2\cos\frac{\theta}{2}\left(\cos\frac{\theta}{2}+i\sin\frac{\theta}{2}\right)\right)^n = 2^n\cos^n\frac{\theta}{2}\left(\cos n\frac{\theta}{2}+i\sin n\frac{\theta}{2}\right) \quad ....(1)$$

Similarly, $(1+\cos\theta-i\sin\theta)^n = 2^n\cos^n\frac{\theta}{2}\left(\cos n\frac{\theta}{2}-i\sin n\frac{\theta}{2}\right) \quad ....(2)$

Adding (1) & (2), $(1+\cos\theta+i\sin\theta)^n+(1+\cos\theta-i\sin\theta)^n$

$$=2^n\cos^n\frac{\theta}{2}\left(\left(\cos n\frac{\theta}{2}+\cancel{i\sin n\frac{\theta}{2}}\right)+\left(\cos n\frac{\theta}{2}-\cancel{i\sin n\frac{\theta}{2}}\right)\right)$$

$$=2^n\cos^n\frac{\theta}{2}\left(2\cos\frac{n\theta}{2}\right)=2^{n+1}\cos^n\frac{\theta}{2}.\cos\frac{n\theta}{2}$$

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19. Solve the equation $8x^3-36x^2-18x+81=0$ the roots being in A.P.

Sol: Let the roots of $8x^3-36x^2-18x+81=0$ in A.P be taken as a–d, a, a+d

$$\text{Now, } S_1=(a-d)+a+(a+d)=\frac{36}{8}=\frac{9}{2}$$

$$\Rightarrow 3a=\frac{9}{2}\Rightarrow a=\frac{3}{2}$$

$$S_3=(a-d)a(a+d)=\frac{-81}{8}$$

$$\Rightarrow a(a^2-d^2)=\frac{-81}{8}$$

$$\Rightarrow \frac{3}{2}\left(\frac{9}{4}-d^2\right)=\frac{-81}{8}\Rightarrow\left(\frac{9}{4}-d^2\right)=\frac{-81}{8}\times\frac{2}{3}=\frac{-27}{4}$$

$$\Rightarrow\frac{9}{4}-d^2=-\frac{27}{4}\Rightarrow d^2=\frac{9}{4}+\frac{27}{4}=\frac{36}{4}=9\ \Rightarrow d=\pm3$$

$$\therefore \text{the roots of the equation are } a-d, a, a+d\Rightarrow\frac{3}{2}-3,\frac{3}{2},\frac{3}{2}+3\Rightarrow-\frac{3}{2},\frac{3}{2},\frac{9}{2}$$

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20. If P and Q are the sum of odd terms and the sum of even terms respectively, in the expansion of $(x+a)^n$ then prove that (i) $P^2-Q^2 = (x^2-a^2)^n$ (ii) $4PQ= (x + a)^{2n}-(x-a)^{2n}$

Sol: We know that $(x+a)^n = {}^nC_0x^n + {}^nC_1x^{n-1}a + {}^nC_2x^{n-2}a^2 + {}^nC_3x^{n-3}a^3 + \dots\dots\dots + {}^nC_na^n$

$$= \left({}^nC_0x^n + {}^nC_2x^{n-2}a^2 + {}^nC_4x^{n-4}a^4 + \dots\dots\right) + \left({}^nC_1x^{n-1}a + {}^nC_3x^{n-3}a^3 + {}^nC_5x^{n-5}a^5 + \dots\dots\right) = P + Q$$

Also, $(x-a)^n = {}^nC_0x^n - {}^nC_1x^{n-1}a + {}^nC_2x^{n-2}a^2 - {}^nC_3x^{n-3}a^3 + \dots\dots\dots + {}^nC_n(-1)^na^n$

$$= \left({}^nC_0x^n + {}^nC_2x^{n-2}a^2 + {}^nC_4x^{n-4}a^4 + \dots\dots\right) - \left({}^nC_1x^{n-1}a + {}^nC_3x^{n-3}a^3 + {}^nC_5x^{n-5}a^5 + \dots\dots\right) = P - Q$$

i) $P^2-Q^2 = (P+Q)(P-Q) = (x + a)^n (x-a)^n = [(x + a)(x-a)]^n = (x^2-a^2)^n$

ii) $4PQ = (P+Q)^2 - (P-Q)^2 = [(x + a)^n]^2 - [(x-a)^n]^2 = (x + a)^{2n} - (x-a)^{2n}$

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21. Find the sum of the infinite series $\frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots\dots$

Sol: Let $S = \frac{3}{4} + \frac{3.5}{4.8} + \frac{3.5.7}{4.8.12} + \dots\dots = \frac{3}{1}.\frac{1}{4} + \frac{3.5}{1.2}\left(\frac{1}{4}\right)^2 + \frac{3.5.7}{1.2.3}\left(\frac{1}{4}\right)^3 + \dots\dots$

$$\Rightarrow 1 + S = 1 + \frac{3}{1}.\frac{1}{4} + \frac{3.5}{1.2}\left(\frac{1}{4}\right)^2 + \dots\dots$$

Comparing the above series with $1 + \frac{p}{1!}\left(\frac{x}{q}\right) + \frac{p(p+q)}{2!}\left(\frac{x}{q}\right)^2 + \dots\dots = (1-x)^{-p/q}$

we get p = 3, p+q=5 ⇒ 3+q=5 ⇒ q = 2. Also, $\frac{x}{q} = \frac{1}{4} \Rightarrow x = \frac{q}{4} = \frac{2}{4} = \frac{1}{2}$

$$\therefore 1 + S = (1-x)^{-p/q} = \left(1 - \frac{1}{2}\right)^{-3/2} = \left(\frac{1}{2}\right)^{-3/2} = 2^{3/2} = (2^3)^{1/2} = 8^{1/2} = \sqrt{8} = 2\sqrt{2}$$

Hence, $S = 2\sqrt{2} - 1$

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22. Find the mean deviation about mean for the following data

x_i	10	30	50	70	90
f_i	4	24	28	16	8

Sol: We form the following table from the given data.

x_i	f_i	f_ix_i	$\lvert x_i - \bar{x}\rvert$	$f_i\lvert x_i - \bar{x}\rvert$
10	4	40	40	160
30	24	720	20	480
50	28	1400	0	0
70	16	1120	20	320
90	8	720	40	320
	80	**4000**		**1280**

Here, $N = \Sigma f_i = 80$; $\Sigma f_i x_i = 4000$ ⇒ Mean $\bar{x} = \frac{\Sigma f_ix_i}{N} = \frac{4000}{80} = 50$

From the table $\Sigma f_i\lvert x_i - \bar{x}\rvert = 140$

∴ Mean deviation about mean is $M.D = \frac{\Sigma f_i\lvert x_i - \bar{x}\rvert}{N} = \frac{1280}{80} = 16$

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23. State and prove addition theorem on Probability. (or)
If E_1, E_2 are any two events of a random experiment and P is probability function then prove that $P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$

Sol: **Statement:** **If E_1, E_2 are the 2 events of a sample space S then $P(E_1 \cup E_2) = P(E_1) + P(E_2) - P(E_1 \cap E_2)$**

Proof: **Case (i):** When $E_1 \cap E_2 = \phi$

$$E_1 \cap E_2 = \phi \Rightarrow P(E_1 \cap E_2) = 0$$

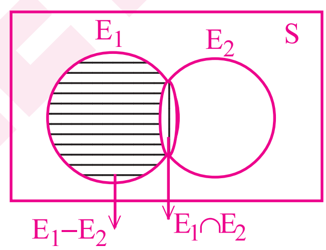
$$\therefore P(E_1 \cup E_2) = P(E_1) + P(E_2) \quad \text{[From the Union axiom]}$$

$$= P(E_1) + P(E_2) - 0 = P(E_1) + P(E_2) - P(E_1 \cap E_2)$$

Case (ii) : When $E_1 \cap E_2 \neq \phi$

$E_1 \cup E_2$ is the union of disjoint sets $(E_1 - E_2)$, E_2

$\therefore P(E_1 \cup E_2) = P[(E_1 - E_2) \cup E_2] = P(E_1 - E_2) + P(E_2)$ ....(1)



E_1 is the union of disjoint sets $(E_1 - E_2)$, $(E_1 \cap E_2)$.

$\therefore P(E_1) = P[(E_1 - E_2) \cup (E_1 \cap E_2)] = P(E_1 - E_2) + P(E_1 \cap E_2)$

$\Rightarrow P(E_1 - E_2) = P(E_1) - P(E_1 \cap E_2)$

$\therefore$ from (1), $P(E_1 \cup E_2) = [P(E_1) - P(E_1 \cap E_2)] + P(E_2)$

$$= P(E_1) + P(E_2) - P(E_1 \cap E_2).$$ Hence proved.

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24. A random variable X has the following probability distribution.

$X=x_i$	–2	–1	0	1	2	3
$P(X=x_i)$	0.1	k	0.2	2k	0.3	k

Find the value of k and the variance of X.

Sol: We know that the sum of the probabilities $\sum_{i=1}^{6} P(X=x_i)=1$

$\Rightarrow 0.1+k+0.2+2k+0.3+k=1 \Rightarrow 4k+0.6=1 \Rightarrow 4k=1-0.6=0.4 \Rightarrow k=\frac{0.4}{4}=0.1$

Mean $\mu = \sum_{i=1}^{6} x_i.P(X=x_i) = (-2)(0.1)+(-1)k+0(0.2)+1(2k)+2(0.3)+3k$

$= -0.2-k+0+2k+0.6+3k = 4k+0.4 = 4(0.1)+0.4 = 0.4+0.4 = 0.8$

Variance $\sigma^2 = \sum_{i=1}^{n} x_i^2.P(x=x_i)-\mu^2 = 4(0.1)+1(k)+0(0.2)+1(2k)+4(0.3)+9k-\mu^2$

$= 0.4+k+0+2k+4(0.3)+9k-\mu^2 = 12k+0.4+1.2-(0.8)^2$

$= 12(0.1)+1.6-0.64 = 1.2+1.6-0.64 = 2.8-0.64=2.16$

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