

**PRACTICE MAKES A MAN PERFECT
&
PRACTICE KEEPS A STUDENT TOP**

IPE SCANNER

Total Textual Bits

- * Practice without peeping for solutions enhances Grip & Confidence levels.
- * All together this IPE Scanner is a confidence booster.
- * "Spot- Answers" are provided to avoid 'waste of time' for checking answers.
- * This IPE Scanner is very useful to EAMCET, IIT-JEE Aspirants, because practising this IPE Scanner strengthens the basic 'funda' of the textual content, which is a strong pre-requisite for entrance exams.

IPE SCANNER

EXCLUSIVE FOR REAL TOPPERS

VERY SHORT QUESTIONS (2 Marks)	Spot-Answers
COMPLEX NUMBERS	
1. Write the conjugate of $(3+4i)(2-3i)$ [AP M 22][AP J 16]	18+i
2. Find a square root of the complex number $7+24i$ [AP 18,23][TS J 16]	$\pm(4+3i)$
3. Find a square root of $-5+12i$ [MP][AP J 17]	$\pm(2+3i)$
4. Express the $1+i\sqrt{3}$ in the modulus- amplitude form. [TS M 17]	$2\text{cis}\frac{\pi}{3}$
5. Express the $1-i$ in the modulus- amplitude form. [AP M 15][TS J 16]	$\sqrt{2}$
6. If $z_1 = -1, z_2 = i$ find $\text{Arg}\left(\frac{z_1}{z_2}\right)$ [TS M 16,17][TS J 19] [MP][AP 23]	$\pi/2$
7. If $\text{Arg } \bar{z}_1, \text{Arg } z_2$ are $\pi/5$ & $\pi/3$ respectively, then find: $(\text{Arg}z_1 + \text{Arg}z_2)$ [AP J 18]	$2\pi/15$
8. If $z = x+iy$ and if the point P in the Argand plane represents z, find the locus of z satisfying the equation $ z-2-3i =5$	$(x-2)^2+(y-3)^2=25$
9. Write the complex number i^9 in the form $A+iB$	$0+1(i)$
10. Write the complex number $(2-3i)(3+4i)$ in the form $A+iB$. [TS M 20,22]	$18-i$
11. Find real and imaginary parts of complex number $\frac{a+ib}{a-ib}$ [TS M 15]	
12. Write the complex number $(1+2i)^3$ in the form $A+Bi$. [TS M 17][AP M 22]	$-11-2i$
13. If $4x+i(3x-y)=3-6i$ where x and y are real numbers, then find x and y.	$x = 3/4, y = 33/4$
14. Write the conjugate of $\frac{5i}{7+i}$ [TS J 19] [AP M 15]	$\frac{1-7i}{10}$
15. Find the multiplicative inverse of $7+24i$ [AP J 19] [TS M 16]	$\frac{7}{625} - \frac{24i}{625}$
16. Find the multiplicative inverse of $(\sin\theta, \cos\theta)$.	$\sin\theta - i\cos\theta$
17. Write $z = -\sqrt{7} + i\sqrt{21}$ in the polar form. [AP J 15]	$\sqrt{7}\text{cis}\frac{2\pi}{3}$
18. If $z = \frac{1+2i}{1-(1-i)^2}$ then find $\text{Arg } z$.	0
19. The point P represents the complex number z in the Argand plane.	$y = x$
20. If the amplitude of z is $\pi/4$, determine the locus of P.	
21. Find the locus of z in the Argand plane if $\text{Arg}(z-1) = \frac{\pi}{2}$ [TS J 15]	$x - 1 = 0$

22. Represent the complex number $2+3i$ in argand plane [TS M 15]
 23. If $z=x+iy$, $|z|=1$, find the locus of z . [TS M 19]
 24. If $|z-3+i|=4$, determine the locus of z .
 25. If $|z+ai|=|z-ai|$, find the locus of z .
 26. Show that the complex numbers z satisfying $z^2 + \bar{z}^2 = 2$ constitute a hyperbola.
 27. If $x+iy=cis\alpha.cis\beta$, then find the value of x^2+y^2 .
 28. Find $i^2 + i^4 + i^6 + \dots + (2n+1)$ terms. [AP J 19]
 29. Simplify $i^{18} - 3i^7 + i^2(1+i^4)(-i)^{26}$
 30. If $(a+ib)^2 = x+iy$, find (x^2+y^2) . [TS J 15]
 31. If $(1-i)(2-i)(3-i)\dots(1-ni)=x-iy$, then prove that $2.5.10\dots(1+n^2)=x^2+y^2$.
 32. If $(\sqrt{3} + i)^{100} = 2^{99}(a + ib)$, show that $a^2+b^2 = 4$. [AP M 16,19]
 33. Find the least positive integer n satisfying $\left[\frac{1+i}{1-i}\right]^n = 1$
 34. If $z=2-3i$, show that $z^2-4z+13=0$ [AP M 19]

DE MOIVRE'S THEOREM

35. Find the value of $(1+i)^{16}$. [MP]
 36. If A,B,C are angles of a triangle, $x=cisA$, $y=cisB$, $Z=cisC$, [TS J 15] then find the value of xyz . [AP M 18] [AP M,J 15,16][TS M 22]
 37. If $x=\cos\theta+isin\theta$, then find $x^6 + \frac{1}{x^6}$ [AP J 17,19][TS 18,23][AP M 22]
 38. Find $\left(\frac{\sqrt{3}}{2} + \frac{i}{2}\right)^5 - \left(\frac{\sqrt{3}}{2} - \frac{i}{2}\right)^5$
 39. Simplify $\frac{(\cos\alpha + i \sin\alpha)^4}{(\sin\beta + i \cos\beta)^8}$ [A: $\cos(4\alpha + 8\beta) + i \sin(4\alpha + 8\beta)$]
 40. Find the cube roots of 8.
 41. If the cube roots of unity are $1,\omega,\omega^2$ then find the roots of the equation $(x-1)^3+8=0$
 42. Prove that $-\omega$ and $-\omega^2$ are the roots of $z^2-z+1=0$ where ω and ω^2 are cube roots of unity.
 43. If $1,\omega,\omega^2$ are the cube roots of unity, find the value of $(1-\omega+\omega^2)^3$ [TS M 19]
 44. If $1,\omega,\omega^2$ are the cube roots of unity, find the value of $(1+\omega)^3+(1+\omega^2)^3$.
 45. If $1,\omega,\omega^2$ are the cube roots of unity, find $(1-\omega+\omega^2)^5+(1+\omega-\omega^2)^5$. [AP 19,23]
 46. If $1,\omega,\omega^2$ are the cube roots of unity, S.T $(1-\omega+\omega^2)^6+(1+\omega-\omega^2)^6=128$ [TS M 16]
 47. If $1,\omega,\omega^2$ are the cube roots of unity, find $(1-\omega)(1-\omega^2)(-\omega^4)(1-\omega^8)$

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$$x^2+y^2 = 1$$

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

$$y=0$$

1

-1

1+3i

$(a^2+b^2)^2$

4

256

-1

$2\cos 6\theta$

i

$2, 2\omega, 2\omega^2$.

$-1, 1-2\omega, 1-2\omega^2$.

-8

-2

32

[TS M 16]

9

48. If $1, \omega, \omega^2$ are the cube roots of unity, then [TS M 17]
 prove that $(2-\omega)(2-\omega^2)(2-\omega^{10})(2-\omega^{11})=49$.

49. If α, β are the roots of the equation $x^2+x+1=0$ then [AP J 15]
 prove that $\alpha^4+\beta^4+\alpha^{-1}\beta^{-1}=0$

50. If $1, \omega, \omega^2$ are cube roots of unity, then P.T. $\frac{1}{1+2\omega} + \frac{1}{2+\omega} = \frac{1}{1+\omega}$ [TS J 18]

51. If $1, \omega, \omega^2$ are the cube roots of unity, find $\frac{a+b\omega+c\omega^2}{c+a\omega+b\omega^2} + \frac{a+b\omega+c\omega^2}{b+c\omega+a\omega^2}$ -1

52. If $1, \omega, \omega^2$ are the cube roots of unity, S.T $x^2+4x+7=0$ where $x=\omega-\omega^2-2$

53. If $1, \omega, \omega^2$ are the cube roots of unity, S.T $(a+b)(a\omega+b\omega^2)(a\omega^2+b\omega)=a^3+b^3$ [TS J 19]

54. Find the value of $(1+i\sqrt{3})^3$ -8

55. Find the value of $(1-i)^8$. [TS M 20][AP M 18] 16

56. Find the values of $(1-\sqrt{3}i)^{1/3}$ [A: $2^{1/3} \text{cis}(6k-1)\frac{\pi}{9}, k=0,1,2$]

57. Find the values of $(1+i)^{2/3}$ [A: $2^{1/3} \text{cis}(4k+1)\frac{\pi}{6}, k=0,1,2$]

QUADRATIC EXPRESSIONS

58. Prove that the roots of $(x-a)(x-b)=h^2$ are always real. [AP J 15]

59. Form a quadratic equation, whose roots are $7 \pm 2\sqrt{5}$ [TS J 16][TS M 18] $x^2-14x+29=0$

60. If α, β are the roots of $ax^2+bx+c=0$ then find $\alpha^2+\beta^2$. [TS J 19] [IPE 13] $\frac{b^2-2ac}{a^2}$

61. If α, β are the roots of $ax^2+bx+c=0$ then find $\frac{1}{\alpha^2} + \frac{1}{\beta^2}$ [AP 22][APTS M 16] $\frac{b^2-2ac}{c^2}$

62. If α, β are the roots of $ax^2+bx+c=0$ then find $\frac{1}{\alpha} + \frac{1}{\beta}$ [TS M 22] $-\frac{b}{c}$

63. If $x^2-15-m(2x-8)=0$ has equal roots then find m. [APTS J 17] [AP M 19] $m=3,5$

64. Find the maximum or minimum value of $2x-7-5x^2$ where $x \in \mathbb{R}$. [IPE 12,14] $-39/5$

65. For what values of x the expression x^2-5x+6 is positive. [IPE 11][AP J 18] $x < 2$ or $x > 3$

66. Find the roots of the equation $4x^2-4x+17 = 3x^2-10x-17$. $-3+5i, -3-5i$

67. Find the nature of the roots of $3x^2+7x+2=0$ [AP J 16] rational

68. Show that the roots of the equation $x^2-2px+p^2-q^2+2qr-r^2=0$ are rational where p,q,r are rational.

69. Form a quadratic equation, whose roots are $(-3 \pm 5i)$ [AP 23] $x^2 + 6x + 34 = 0$

70. Find the quadratic equation whose roots are $\frac{m}{n}, -\frac{n}{m}, (m \neq 0, n \neq 0)$ $x^2 - (\alpha + \beta)x + \alpha\beta = 0$

71. Obtain a quadratic equation whose roots are $\frac{p-q}{p+q}, -\frac{p+q}{p-q}$ [AP J 19]
 [Ans: $(p^2-q^2)x^2+4pqx-(p^2-q^2)=0$]

72. Find the quadratic equation, the sum of whose roots is 1 and sum of the squares of the roots is 13. $x^2 - x - 6 = 0$
73. Find the quadratic equation, the sum of whose roots is 7 and sum of the squares of the roots is 25. [AP M 20] $\frac{3abc - b^3}{a^3}$
 $x^2 - 7x + 12 = 0$ $m = 2$ or $-10/9$
74. If α and β are the roots of $ax^2 + bx + c = 0$, find the value $\alpha^3 + \beta^3$. $m = -5, 3$
75. For what values of m , $x^2 - 2(1+3m)x + 7(3+2m) = 0$ will have equal roots? $m = 1/3$
76. For what values of m , $x^2 + (m+3)x + (m+6) = 0$ will have equal roots?
77. For what values of m , $(m+1)x^2 + 2(m+3)x + (m+8) = 0$ will have equal roots?
78. If the equations $x^2 + bx + c = 0$, $x^2 + cx + b = 0$ have a common root then show that $b+c+1 = 0$
79. If the quadratic equations $ax^2 + 2bx + c = 0$ and $ax^2 + 2cx + b = 0$ have a common root then show that $a+4b+4c = 0$
80. If the equations $x^2 + ax + b = 0$ and $x^2 + cx + d = 0$ have a common root and the first equation has equal roots then prove that $2(b+d) = ac$.
81. If $x^2 + 4ax + 3 = 0$ and $2x^2 + 3ax - 9 = 0$ have a common root then find the values of a and the common roots. $a = \pm 1, x = -3$
82. If the equations $x^2 - 6x + 5 = 0$, $x^2 - 3ax + 35 = 0$ have a common root then find a . $a = 4, 12$
83. If $x^2 - 6x + 5 = 0$ and $x^2 - 12x + p = 0$ have a common root then find p . [TS J 15] $P = 11, 35$
84. Find the condition that one root of the quadratic equation $ax^2 + bx + c = 0$ shall be n times the other. $nb^2 = ac(1+n)^2$
85. Find the maximum or minimum value of $ax^2 + bx + a$ ($a, b \in \mathbb{R}$ and $a \neq 0$) $\frac{4a^2 - b^2}{4a}$
86. State the sign of $4x - 5x^2 + 2$ for $x \in \mathbb{R}$
 [Positive for $\frac{2 - \sqrt{14}}{5} < x < \frac{2 + \sqrt{14}}{5}$; Negative for $x < \frac{2 - \sqrt{14}}{5}$ or $x > \frac{2 + \sqrt{14}}{5}$]
87. For what values of x , the expression $15 + 4x - 3x^2$ is negative. [AP M 15] $x < -5/3$ or $x > 3$

THEORY OF EQUATIONS

88. If $1, 1, \alpha$ are the roots of $x^3 - 6x^2 + 9x - 4 = 0$ then find α . [TS 18,20][AP M, J 18,20] $\alpha = 4$
89. If $-1, 2, \alpha$ are the roots of $2x^3 + x^2 - 7x - 6 = 0$ then find α . [AP 22][TS M 22][AP J 17] $-3/2$
90. If the product of roots of $4x^3 + 16x^2 - 9x - a = 0$ is 9, find a . [TS 19,22][AP M 19,20,23] $a = 36$
91. If $\alpha, \beta, 1$ are roots of $x^3 - 2x^2 + 5x + 6 = 0$ then find α, β . [AP M, J 16][TS J 17] $\alpha = 3, \beta = -2$
92. Find the algebraic equation whose roots are 2 times the roots of [MP]
 $x^5 - 2x^4 + 3x^3 - 2x^2 + 4x + 3 = 0$ [AP J 19][A: $x^5 - 4x^4 + 12x^3 - 16x^2 + 64x + 96 = 0$]
93. Find the polynomial equation whose roots are the reciprocals of roots of
 $x^4 - 3x^3 + 7x^2 + 5x - 2 = 0$ [A: $2x^4 - 5x^3 - 7x^2 + 3x - 1 = 0$] [IPE 11][TS M 15]
94. If $1, -2, 3$ are the roots of $x^3 - 2x^2 + ax + 6 = 0$ then find a . [TS J 15] $a = -5$
95. If α, β, γ are the roots of $4x^3 - 6x^2 + 7x + 3 = 0$ then find $\alpha\beta + \beta\gamma + \gamma\alpha$ [TS M 19] $7/4$

96. Find an algebraic equation of degree 4 whose roots are 3 times the roots of the equation $6x^4 - 7x^3 + 8x^2 - 7x + 2 = 0$
 [A: $6x^4 - 21x^3 + 72x^2 - 189x + 162 = 0$]
97. Find the polynomial equation of degree 4 whose roots are the negatives of the roots of $x^4 - 6x^3 + 7x^2 - 2x + 1 = 0$ [Ans: $x^4 + 6x^3 + 7x^2 + 2x + 1 = 0$]
98. Find the polynomial equation of degree 4 whose roots are the negatives of the roots of $x^4 + 5x^3 + 11x + 3 = 0$ [AP M 15] [Ans: $x^4 - 5x^3 - 11x + 3 = 0$]
99. Form the monic polynomial equation of degree 3 whose roots are 2, 3, 6.
 [A: $x^3 - 11x^2 + 36x - 36 = 0$] [IPE 14]
100. If 1, 2, 3 and 4 are the roots of $x^4 + ax^3 + bx^2 + cx + d = 0$, then find the values of a, b, c and d. [A: $a = -10, b = 35, c = -50$ and $d = 24$] [AP J 15]
101. Find s_1, s_2, s_3 and s_4 for the equation $8x^4 - 2x^3 - 27x^2 - 6x + 9 = 0$
 [Ans: $s_1 = 1/4, s_2 = -27/8, s_3 = 3/4, s_4 = 9/8$]

102. If a, b, c are the roots of $x^3 - px^2 + qx - r = 0$ then find $\frac{1}{a^2} + \frac{1}{b^2} + \frac{1}{c^2}$

$$\frac{q^2 - 2rp}{r^2}$$

PERMUTATIONS & COMBINATIONS

103. If ${}^{12}P_r = 1320$ find r. [AP J 15] [IPE 09]
104. If ${}^{(n+1)}P_5 : {}^n P_5 = 3:2$ then find n. [IPE 12]
105. If ${}^n P_7 = 42$. ${}^n P_5$ then find n. [AP J 17] [AP M 20,22] [TS M 15,17]
106. If ${}^{10}C_2 = 3$. ${}^{n+1}C_3$ find n. [IPE 12] [AP M 15]
107. If ${}^n P_r = 5040$, ${}^n C_r = 210$ then find n and r. [AP M 17] [MP]
108. If ${}^{15}C_{2r-1} = {}^{15}C_{2r+4}$ then find r [AP J 19] [IPE 11,14]
109. If ${}^n C_5 = {}^n C_6$, then find ${}^{13}C_n$ [AP 19,23] [TS M, J 18] [IPE 13,14]
110. Find the number of permutations that can be made by using all the letters of the word INDEPENDENCE [TS J 16, 23] [IPE 09]
111. Find the number of permutations that can be made by using all the letters of the word MATHEMATICS. [AP M 18] [TS M 18, 20]
112. Find the no. of permutations of INTERMEDIATE. [AP J 16] [AP M 19,22]
113. Find the number of ways of selecting 3 vowels and 2 consonents from the letters of the word EQUATION. [IPE 11]
114. Find the number of positive divisors of 1080. [AP M 20] [AP M, J 16]

- 3
14
12
9
n=10, r=4
r=3
78

$$\frac{12!}{4!3!2!}$$

$$\frac{11!}{2!2!2!}$$

$$\frac{(12)!}{2!.2!.3!}$$

- 30
32

115. If ${}^n P_4 = 1680$ find n	[IPE 14]	8
116. If $(n + 1)P_5 : {}^n P_6 = 2:7$ find n.		n=11
117. If ${}^{18} P_{(r-1)} : {}^{17} P_{(r-1)} = 9:7$ Find r.		r =5
118. If ${}^{12} P_5 + 5 \cdot {}^{12} P_4 = {}^{13} P_r$ Find r.	[TS J 15]	r=5
119. If ${}^n C_4 = 210$ find n	[TS M 19]	n=10
120. If ${}^{12} C_r = 495$ find r		r=4 or 8
121. If ${}^n C_4 = {}^n C_6$ find n	[TS M 22, 23]	n=10
122. If ${}^{12} C_{(s+1)} = {}^{12} C_{(2s-5)}$ then find s		s=6
123. If ${}^{12} C_{r+1} = {}^{12} C_{3r-5}$, find r.	[TS J 19][TS M 16]	r=3
124. Prove that ${}^{10} C_3 + {}^{10} C_6 = {}^{11} C_4$		
125. If ${}^n C_{21} = {}^n C_{27}$, then find $50C_n$		1225
126. If ${}^9 C_3 + {}^9 C_5 = {}^{10} C_r$ then find r	[TS J 17]	r=4
127. Find the value of ${}^{10} C_5 + 2 \cdot {}^{10} C_4 + {}^{10} C_3$	[TS M 17]	792
128. Find the number of ways of arranging the letters of the word $a^4 b^3 c^5$ in its expanded form.		$\frac{12!}{4! 3! 5!}$
129. Find the number of 7-digit number that can be formed using 2,2,2,3,3,4,4		$\frac{7!}{3! 2! 2!}$
130. There are 4 copies alike each of 3 different books. Find the number of ways of arranging these 12 books in a shelf in a single row.		$\frac{12!}{4! 4! 4!}$
131. Find the number of functions from set A containing 5 elements into a set B containing 4 elements.	[AP J 19]	1024
132. Find the number of bijections from set A containing 7 elements onto itself.		5040
133. Find the number of injections of a set A with 5 elements to a set B with 7 elements.	[TS J 17]	2520
134. A man has 4 sons and there are 5 schools within his reach. In how many ways can he admit his sons in the schools so that no two of them will be in the same school.		120
135. Find the number of ways in which 4 letters can be put in 4 addressed envelopes so that no letter goes into the envelope meant for it.	[TS J 16]	9
136. Find the number of different chains that can be prepared using 6 different coloured beads.	[TS M 16, 23]	120
137. Find the number of ways of arranging 7 persons around a circle.		720
138. Find the number of ways arranging the Chief Minister and 10 Cabinet ministers at a circular table so that the chief minister always sits in a particular seat.		36,28,800

139. A number lock has 3 rings and each ring has 9 digits 1,2,3,...9 Find the maximum number of unsuccessful attempts that can be made by a person who tries to open the lock without knowing the key code.	728
140. Find the number of 4 letter words that can be formed using the letters of the word PISTON in which atleast one letter is repeated.	936
141. Find the number of ways of forming a committee of 5 members from 6 men and 3 ladies. [AP M 22]	126
142. Find the number of ways of selecting 3 girls and 3 boys out of 7 girls and 6 boys.	700
143. Find the number of ways of selecting 7 members from a contingent of 10 soldiers.	120
144. Find the number of diagonals of a polygon with 12 sides.[AP J 15][AP M 18]	54
145. If set A has 8 elements, find the number of subsets of A, containing at least 6 elements.	37
146. In a class there are 30 students. If each student plays a chess game with each of the other student, then find the total number of chess games played by them.	435
147. In a class there are 30 students. On the New year day, every student posts a greeting card to all his/her classmates. Find the total number of greeting cards posted by them.	870
148. If there are 25 railway stations on a railway line, how many types of single second class tickets must be printed, so as to enable a passenger to travel from one station to another.	600
149. In how many ways 9 mathematics papers can be arranged so that the best and the worst (i) may come together (ii) may not come together?[A: (i) $8!2!$.(ii) $8! \times 7!$]	
150. Find the number of ways of arranging 8 persons around a circular table, if 2 particular persons were to sit together.	1440
151. Find the number of 5 digit numbers that can be formed using the digits 1,1,2,2,3. How many of them are even?	12
152. Find the number of ways of selecting a committee of 6 members out of 10 members which always includes a specified member.	9C_5
153. Find the number of ways of forming a committee of 4 members out of 6 boys and 4 girls such that there is atleast one girl in the committee.	195
154. If there are 5 alike pens, 6 alike pencils and 7 alike erasers, find the number of ways of selecting number of (one or more) things out of them.	335
155. To pass an examination a student has to pass in each of the three papers. In how many ways can a student fail in the examination?	7
156. If a set of 'm' parallel lines intersect another set of 'n' parallel lines (not parallel to the lines first set), then find the number of parallelograms formed in this lattice structure.	${}^mC_2 \times {}^nC_2$
157. 14 persons are seated at a round table. Find the number of ways of selecting two persons out of them who are not seated adjacent to each other.	77
158. Find the number of zeros in $100!$.	24

BINOMIAL THEOREM

159. Find the 6th term in $\left(\frac{2x}{3} + \frac{3y}{2}\right)^9$ [AP M 19] [IPE 13] $189x^4y^5$
160. Find the 7th term in the expansion of: $\left(\frac{4}{x^3} + \frac{x^2}{2}\right)^{14}$ [AP J 16] $^{14}C_6 \frac{4^5}{x^{12}}$
161. Find the middle term (s) in the expansion of $\left(\frac{3x}{7} - 2y\right)^{10}$ [IPE 10,12][AP 23] $^{-10}C_5 \left(\frac{6}{7}\right)^5 \cdot x^5 \cdot y^5$
162. Find the coeff. of x^{11} in $\left(2x^2 + \frac{3}{x^3}\right)^{13}$ [TS M 20] $^{13}C_3 \cdot 2^{10} \cdot 3^3$
163. If $^{22}C_r$ is the largest binomial coefficient in the expansion of $(1+x)^{22}$ find the value of $^{13}C_r$. [AP J 19] [AP, TS J 15] [AP M 16,20] 78
164. Find the number of terms in the expansion of $(2x+3y+z)^7$. [AP,TS J17][TS M 19,22] 36
165. Find the set E of x for which the binomial expansion $(3-4x)^{3/4}$ is valid. [TS J 19] $\left(-\frac{3}{4}, \frac{3}{4}\right)$
166. Find the set E of x for which the expansion $(2+3x)^{-2/3}$ is valid. [TS M 16,17] $(-2/3, 2/3)$
167. Find the 4th term from the end in the expansion $(2a+5b)^8$. $^8C_3 \cdot 2^3 \cdot 5^5 \cdot a^3 b^5$
168. Find the middle term(s) in the expansion of $(4x^2 + 5x^3)^{17}$
[A: $T_9 = ^{17}C_8 \cdot 4^9 \cdot 5^8 \cdot x^{42}$; $T_{10} = ^{17}C_9 \cdot 4^8 \cdot 5^9 \cdot x^{43}$]
169. Find the term independent of x in $\left(\frac{3}{\sqrt[3]{x}} + 5\sqrt{x}\right)^{25}$ $^{25}C_{10} \cdot 3^{15} \cdot 5^{10}$
170. Find the coefficient of x^9 and x^{10} in the expansion of $\left(2x^2 - \frac{1}{x}\right)^{20}$ $0, ^{20}C_{10} \cdot 2^{10}$.
171. Find the largest binomial coefficients in the expansions of
(i) $(1+x)^{24}$ (ii) $(1+x)^{19}$. (i) $^{24}C_{12}$ (ii) $^{19}C_{10}$
172. If the coefficients of $(2r+4)^{\text{th}}$, $(3r+4)^{\text{th}}$ terms in the expansion of $(1+x)^{21}$ are equal, find r. [TS M 15] 0 (or) 3
173. Find the number of terms with non zero coefficients in $(4x-7y)^{49} + (4x+7y)^{49}$ 25
174. If A and B are the coefficients of x^n in the expansion of $(1+x)^{2n}$ and $(1+x)^{2n-1}$ respectively, then find the value of A/B. [TS J 18] 2
175. Find the sum of last 20 coefficients in the expansion of $(1+x)^{39}$. 2^{38}
176. Prove that $2 \cdot C_0 + 7 \cdot C_1 + 12 \cdot C_2 + \dots + (5n+2)C_n = (5n+4)2^{n-1}$.
177. Prove that $C_0 + 2 \cdot C_1 + 2^2 \cdot C_2 + \dots + 2^n \cdot C_n = 3^n$. [TS M 18][AP M 15]
178. Prove that $C_0 + 3 \cdot C_1 + 3^2 \cdot C_2 + \dots + 3^n \cdot C_n = 4^n$
179. If $(1+x+x^2)^n = a_0 + a_1x + a_2x^2 + \dots + a_{2n}x^{2n}$ then P.T $a_0 + a_1 + \dots + a_{2n} = 3^n$ [TS J 18]

MEASURES OF DISPERSION

- 180. The variance of 20 observations is 5. If each of the observations is multiplied by 2, find the variance of the resulting observations. [MP] 20
- 181. Find the mean deviation about mean for the data 6,7,10,12,13,4,12,16 3.25
[IPE 14][TS J 16,19][AP J 19]
- 182. Find the mean deviation about mean for 3,6,10,4,9,10 [TS 17,18,22][AP 20,22] 2.67
- 183. Find the mean deviation about mean for the data [AP J 15] 8.4
38,70, 48, 40, 42, 55, 63, 46, 54, 44
- 184. Find the mean deviation about median for data 4, 6, 9, 3, 10, 13, 2 [TS M,J 15][AP 19,23] 3.29
- 185. Find the mean deviation about median for the data 6,7,10,12,13,4,12,16 [AP M 18] 3.25
- 186. Find the mean deviation about median for the following data 2.45
13, 17, 16, 11, 13, 10, 16, 11, 18, 12, 17 [AP M 16]
- 187. Find the variance for the discrete data : 6,7,10,12,13,4,8,12 [TS M 23] 9.25
- 188. Find the variance and standard deviation for the discrete data : 24.25, 4.95
5,12,3,18,6,8,2,10 [TS M 19][AP M 15]
- 189. Find the variance for the discrete data : 183.2
350,361,370,373,376,379,385,387,394,395
- 190. Coefficient of variation of two distributionis are 60 and 70, and their standard deviation are 21 and 16 respectively. 35, 22.85
What are their arithmetic means?
- 191. Define the "Range" for an ungrouped data and also [TS M 16] 32
find the range of the given data: 38, 70, 48, 40, 42, 55, 63, 46, 54, 44

RANDOM VARIABLES

- 192. A poisson variable satisfies $P(X=1)=P(X=2)$. Find $P(X=5)$ [TS 16,18,22,23] [AP 16,23] $\frac{e^{-2}2^5}{5!}$
- 193. The mean and variance of a bionomial distribution are 4 and 3 respectively. Find the distribution and find $P(X \geq 1)$ [AP J 15,17] [TS M 15,17,19,22] $1 - \left(\frac{3}{4}\right)^{16}$
[A: $p=1/4, q=3/4, n=16$; $1 - \left(\frac{3}{4}\right)^{16}$] [AP M 16,19]
- 194. The probability that a person chosen at random is left-handed (in hand writing) is 0.1. What is the probability that in a group of 10 people, there is one who is left-handed? [IPE 12][AP M 15][TS M 16] $\left(\frac{9}{10}\right)^9$
- 195. For a binomial distribution with mean 6 and variance 2. Find the first two terms of the distribution. [AP,TS M 20] $\frac{2}{3^7}$

196. 8 coins are tossed simultaneously. Find the probability of getting atleast 6 heads. [TS J 19]

$$\frac{37}{256}$$

197. On an average rain falls on 12 days in every 30 days, find the probability that, rain will fall on just 3 days of a given week. [AP M 22]

$$[A: \frac{35 \times 2^3 \times 3^4}{5^7}]$$

198. In a city 10 accidents take place in a span of 50 days. Assuming that the number of accidents follows the poisson distribution, find the probability that there will be 3 or more accidents in a day.

$$[A: \sum_{k=3}^{\infty} e^{-\lambda} \cdot \frac{\lambda^k}{K!}, \lambda = 0.2]$$

199. If the mean and variance of a binomial variable X are 2.4 & 1.44 respectively, then find $P(1 < x \leq 4)$ [TS J 15,17]

$$\frac{2268}{3125}$$

PROBABILITY

200. An integer is picked from 1 to 20, both inclusive.

Find the probability that it is a prime.

$$2/5$$

201. A page is opened at random from a book containing 200 pages. What is the probability that the number on the page is a perfect square?

$$7/100$$

202. Find the probability of obtaining two tails and one head when 3 coins are tossed.

$$3/8$$

203. When two dice are thrown, find the probability of getting the same number on both the faces.

$$1/6$$

204. When two dice are thrown find the probability of getting a sum 7?

$$1/6$$

205. A bag contains 4 red, 5 black and 6 blue balls. Find the probability that two balls drawn at random simultaneously from the bag are a red and a black ball.

$$4/21$$

206. Ten dice are thrown. Find the probability that none of the dice shows the number 1.

$$(5/6)^{10}$$

207. Find the probability of drawing an Ace or a spade from a well shuffled pack of 52 playing cards.

$$4/13$$

208. A, B are among 20 persons who sit at random along a round table.

Find probability that there are any six persons between A and B.

$$2/19$$

209. A fair coin is tossed 200 times. Find the probability of getting a head an odd number of times.

$$1/2$$

210. Out of 30 consecutive integers, two integers are drawn at random.

Find the probability that their sum is odd.

$$15/29$$

211. A pair of dice is thrown.

Find the probability that either of the dice shows 2 when their sum is 6.

$$2/5$$