

Previous Year Solved Questions

1. The equations of regression lines are $x = 0$, $4y + a$ and $y = 0.5b$. The coefficient of correlation is
 - 1) $-\sqrt{0.2}$
 - 2) 0.4
 - 3) $\sqrt{0.2}$
 - 4) 0.45
2. The probability that A passes a test is $\frac{2}{3}$ and the probability that B passes the same test is $\frac{3}{5}$. The probability that only one of them passes is
 - 1) $\frac{4}{15}$
 - 2) $\frac{2}{5}$
 - 3) $\frac{7}{30}$
 - 4) $\frac{7}{15}$
3. The equation of the regression lines are $x+2y=5$ and $2x+3y=8$ then the correlation coefficient between x and y is
 - 1) $\frac{3}{4}$
 - 2) $-\frac{\sqrt{3}}{4}$
 - 3) $\frac{\sqrt{3}}{2}$
 - 4) $-\frac{\sqrt{3}}{2}$
4. A random variable X has the probability mass function as follows:

X	-2	3	1
$P(X=x)$	$\frac{\lambda}{6}$	$\frac{\lambda}{4}$	$\frac{\lambda}{12}$

 Then the value of λ is
 - 1) 1
 - 2) 2
 - 3) 3
 - 4) 4
5. Variance of the random variable X is 4. Its mean is 2. Then $E(X^2) =$
 - 1) 2
 - 2) 4
 - 3) 6
 - 4) 8
6. A box contains 6 red and 4 white balls. If 3 balls are drawn at random, the probability of getting 2 white balls is
 - 1) $\frac{1}{20}$
 - 2) $\frac{18}{125}$
 - 3) $\frac{4}{25}$
 - 4) $\frac{3}{10}$
7. The marks secured by 600 students in Mathematics test were normally distributed with mean 55. If 100 students get marks above 75, the number of students securing marks between 35 and 55 is
 - 1) 150
 - 2) 200
 - 3) 300
 - 4) 500
8. A lot consists of ten good articles, four with minor defects and two with major defects. Two articles are chosen from the lot at random (without replacement). Then the probability that neither of them good is
 - 1) $\frac{5}{8}$
 - 2) $\frac{7}{8}$
 - 3) $\frac{3}{8}$
 - 4) $\frac{1}{8}$
9. If A, B, C are any three events such that $P(A) = P(B) = P(C) = \frac{1}{4}$; $P(A \cap B) = P(B \cap C) = 0$, $P(C \cap A) = \frac{1}{8}$ Then the probability that atleast one of the events A, B, C occurs, is
 - 1) $\frac{1}{32}$
 - 2) $\frac{3}{32}$
 - 3) $\frac{7}{8}$
 - 4) $\frac{5}{8}$
10. If atleast one child in a family with two children is a boy. then the probability that both children are boys is
 - 1) $\frac{3}{4}$
 - 2) $\frac{1}{3}$
 - 3) $\frac{1}{4}$
 - 4) $\frac{1}{2}$
11. A discrete random variable X takes the values $a, ar, ar^2 \dots ar^{n-1}$ with equal probability. Then Arithmetic mean (A.M) is
 - 1) $a(1-r^n)$
 - 2) $\frac{a(1-r^n)}{n}$
 - 3) $\frac{a(1-r^n)}{n(1-r)}$
 - 4) $\frac{a(r^n-1)}{n(1-r)}$

12. Geometric mean of two observations can be calculated only if
- both the observations are positive
 - one of the two observations is zero
 - one of them is negative
 - both of them are zero
13. For the set of values
- mean deviation is always less than standard deviation
 - mean deviation is always greater than standard deviation
 - mean deviation is always equal to standard deviation
 - none of these
14. A coin is tossed 6 times. The probability of obtaining heads and tails alternately is
- $\frac{1}{64}$
 - $\frac{1}{2}$
 - $\frac{1}{32}$
 - None of these
15. A sample of 25 units from an infinite population with standard deviation 10 results into a total score of 450. The mean of the sampling distribution is
- 45
 - 50
 - 18
 - 1.8
16. The mean and variance of a uniform random variable X in the interval (2, 15) are respectively
- $\frac{17}{2}; \frac{169}{12}$
 - $\frac{17}{2}; \frac{289}{12}$
 - $\frac{17}{2}; \frac{169}{14}$
 - $\frac{17}{2}; 13$
17. If $P(A)=0.5$; $P(B)=0.3$ and $P(A \cap B) = 0.15$ then $P(A/B) =$
- 0.3
 - 0.4
 - 0.9
 - 0.5
18. If 15% of a firm's employees are B.E. degree holders, 25% are MBA degree holders and 5% have both the degrees; then the probability of selecting a B.E. degree holder, when the selection is confined to M.B.A.'s is
- 0.2
 - 0.3
 - 0.4
 - 0.5
19. A and B are two events associated with an experiment. If $P(A)=0.4$, $P(A \cup B)=0.7$, find $P(B)$ when A and B are mutually exclusive
- 0.6
 - 0.75
 - 0.5
 - 0.3
20. From six positive and eight negative numbers, four numbers are chosen at random (without replacement) and multiplied. The probability that the product is positive is
- $\frac{85}{1001}$
 - $\frac{420}{1001}$
 - $\frac{70}{100}$
 - $\frac{505}{1001}$
21. A box contains tags marked 1, 2, n. Two tags are chosen at random without replacement. The probability that the numbers on the tags will be consecutive integers is equal to
- $\frac{n(n-1)}{2}$
 - $\frac{(n-1)2}{n}$
 - $\frac{2}{n}$
 - $\frac{n}{n-2} \cdot \frac{1}{2}$
22. In shooting test, the probability of hitting the target is $\frac{1}{2}$ for A, $\frac{2}{3}$ for B and $\frac{3}{4}$ for C. If all of them fire at the target, then the probability that atleast one of them hits the target is
- $\frac{1}{24}$
 - $\frac{23}{24}$
 - $\frac{1}{12}$
 - $\frac{21}{24}$
23. A discrete random variable X takes the values a, ar, ar², arⁿ⁻¹ with equal probability. Then Geometric Mean (G.M.) is
- $ar^{\frac{n-1}{2}}$
 - $ar^{\frac{n}{2}}$
 - $nar^{\frac{n}{2}}$
 - $\left(\frac{r}{a}\right)^{\frac{n-1}{2}}$

24. If the density function of a random variable X is given by $f(x) = kx(1-x)$ $0 \leq x \leq 1$ then Arithmetic Mean (AM) is
 1) 1 2) 2
 3) $\frac{1}{2}$ 4) $\frac{1}{4}$
25. A bag contains 10 white and 15 black balls. Two balls are drawn in succession. The probability that one of them is white and the other black is
 1) $\frac{1}{4}$ 2) $\frac{1}{2}$
 3) $\frac{3}{4}$ 4) 1
26. The regression lines x on y is $3x+y=10$ and y on x is $3x + 4y=12$. The correlation coefficient is
 1) $\frac{1}{2}$ 2) $-\frac{1}{2}$
 3) $\frac{1}{4}$ 4) $-\frac{1}{4}$
27. In a Poisson distribution if $3P(X=2)=P(X=4)$ then the value of its parameter λ is
 1) 3 2) 4
 3) 5 4) 6
28. The correlation coefficient is the _____ of the regression coefficients.
 1) Arithmetic
 2) Weighted arithmetic mean
 3) Geometric mean
 4) Harmonic mean
29. A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace?
 1) $\frac{1}{2}$ 2) $\frac{13}{52}$
 3) $\frac{4}{13}$ 4) $\frac{1}{13}$
30. The first of the two samples has 100 items with mean 15 and standard deviation 3. If the whole group has 250 items with mean 15.6 and standard deviation $\sqrt{13.44}$, the standard deviation of the second group is
 1) 16 2) 4
 3) 8 4) 0
31. The root mean square deviation of the set of values is the
 1) least about their mean
 2) maximum about their mode
 3) maximum about their mean
 4) least about their median
32. One marks man has an 80% probability of hitting a target while another has only a 70% probability of hitting the target. The probability of the target being hit (atleast once) if both marks men fire at it simultaneously is given by
 1) 0.94 2) 0.95
 3) 0.96 4) 1.00
33. Suppose the probability of hitting a target with a single shot is 0.001. What is the probability of hitting the target 2 or more times in 5,000 shots?
 1) $1-e^{-5}$ 2) $e^{-5}-1$
 3) $6e^{-5}-1$ 4) $1-6e^{-5}$
34. The measure of Kurtosis of the normal curve is
 1) 1 2) 3
 3) -1 4) ∞
35. If the regression lines are $8x+10y + 66 = 0$ and $40x + 18y = 214$, the correlation coefficient is
 1) 0.6 2) 0.5
 3) -0.5 4) -0.6
36. For the bivariate data
- | | | | | | |
|---|---|---|---|---|---|
| x | 1 | 2 | 3 | 4 | 5 |
| y | 5 | 4 | 3 | 2 | 1 |
- the coefficient of correlation is
 1) -1 2) 0
 3) -1 4) 0.5

37. Out of 15 applicants for a job, there are women and 9 men. It is desired to select persons for the job. The probability that atleast one of the selected persons is woman is

1) $\frac{21}{35}$ 2) $\frac{67}{105}$
 3) $\frac{27}{34}$ 4) $\frac{23}{35}$

38. The standard deviation of a set of 10 members is 15. If each value in the set is increased by 4 then the standard deviation of the new set of 10 members is

1) 17 2) 19
 3) 15 4) 13

39. A candidate is required to answer 7 questions out of 12 questions which are divided into 2 groups, each containing 6 questions. He is not permitted to attend more than 5 questions from each group. The number of different ways of answering is

1) 560 2) 780
 3) 920 4) 840

40. The moment generating function of Poisson distribution with parameter λ is

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

41. The conditional probability density function of X given Y for the joint probability density function $f(x, y) = 3-x-y$ for $0 \leq x, y \leq 1$ is

1) $f\left(\frac{x}{y}\right) \frac{3-x-y}{\frac{3}{2}-x}$ 2) $f\left(\frac{x}{y}\right) = \frac{\frac{5}{2}-x}{3-x-y}$
 3) $f\left(\frac{x}{y}\right) \frac{3-x-y}{\frac{5}{2}-y}$ 4) None of these

42. If population variance of an infinite population is σ^2 and a sample of n items is selected from this population, the standard error of sample mean is equal to

1) $\frac{\sigma^3}{n}$ 2) $\frac{\sigma}{\sqrt{n}}$

3) $\frac{\sigma}{n}$ 4) $\frac{\sigma^2}{\sqrt{n}}$

43. If $Z_1, Z_2, Z_3, \dots, Z_n$ are standard normal random variables, the distribution of $\sum_{i=1}^n Z_i^2$ is

1) student -1 with (n-1) D.F.
 2) normal distribution
 3) ψ^2 distribution with n.d.f.
 4) F-distribution with (n-1) and (n-1) d.f.s.

44. For the bivariate data

x	1	2	3	4	5
y	5	4	3	2	1

the coefficient of correlation is given by

1) 1 2) 0
 3) -1 4) 0.5

45. Out of 15 applicants for a job, there are 6 women and 9 men. It is desired to select 2 persons for the job. The probability that atleast one of the selected persons is a woman is

1) $\frac{21}{35}$ 2) $\frac{67}{105}$
 3) $\frac{27}{34}$ 4) $\frac{23}{35}$

46. The standard deviation of a set of 10 numbers is 15. If each value in the set is increased by 4, then the standard deviation of the new set of 10 numbers is

1) 17 2) 19
 3) 15 4) 13

47. If X and Y are two independent random variables the variance of (X-Y) denoted by $\text{var}(X-Y) =$

1) $\text{var}(X)-\text{var}(Y)$ 2) $\text{var}(X)+\text{var}(Y)$
 3) $[\text{var}(X)+\text{var}(Y)]^{1/2}$ 4) $[\text{var } X-\text{var } Y]^{1/2}$

48. A candidate is to required to answer 7 questions out of 12 questions which are divided into 2 groups, each containing 6 questions. He is not permitted to attempt

- more than 5 questions from each group. The number of different values of answering is
- 1) 560
 - 2) 780
 - 3) 920
 - 4) 840
49. An expert hits the target 95% of the time. What is the probability that he will miss the target for the first time on the 15th shot?
- 1) $(0.05)(0.95)^{15}$
 - 2) $(0.95)(0.15)^{14}$
 - 3) $(0.05)(0.95)^{14}$
 - 4) $(0.95)(0.05)^{15}$
50. A problem in statistics is give to three students A, B and C whose chances of solving it are $\frac{1}{3}$, $\frac{1}{8}$ and $\frac{1}{4}$ respectively. The probability that the problem will be solved is
- 1) $\frac{1}{96}$
 - 2) $\frac{9}{16}$
 - 3) $\frac{1}{3}$
 - 4) $\frac{17}{24}$
51. If $P(x) = kx^2$ for $0 \leq x \leq 1$
 $= 0$ otherwise
 is the probability density function of the random variable x, then the value of k is
- 1) $\frac{1}{3}$
 - 2) 2
 - 3) $\frac{1}{2}$
 - 4) 3
52. If the regression lines are $8x+10y + 66 = 0$ and $40x+18y = 214$, the correlation coefficient is
- 1) 0.6
 - 2) 0.5
 - 3) -0.5
 - 4) -0.6
53. The measure of Kurtosis of the normal curve is
- 1) 1
 - 2) 3
 - 3) -3
 - 4) ∞
54. The root mean square deviation of a set of values is the
- 1) least about their mean
 - 2) maximum about their mode
 - 3) maximum about their mean
 - 4) least about their median
55. One marksman has an 80% probability of hitting a target while another has only a 70% probability of hitting the target. The probability that the target being hit (atleast once) if both fire it simultaneously is given
- 1) 0.94
 - 2) 0.95
 - 3) 0.96
 - 4) 1.00
56. Suppose that X is a random variable for which $E(X) = 10$ and $V(X) = 15$. The value of a and b for which $Y=aX-b$ has zero expectation and unit variance is given by
- 1) $\frac{10}{\sqrt{15}}, \frac{1}{\sqrt{15}}$
 - 2) $\frac{1}{\sqrt{15}}, \frac{10}{\sqrt{15}}$
 - 3) $\frac{1}{\sqrt{15}}, \frac{1}{\sqrt{15}}$
 - 4) $\frac{1}{\sqrt{10}}, \frac{1}{\sqrt{10}}$
57. Suppose that the probability of hitting target with a single shot is 0.001. What is the probability of hitting the target 2 or more times in 5,000 shots?
- 1) $1-e^{-5}$
 - 2) $e^{-5}-1$
 - 3) $6e^{-5}-1$
 - 4) $1-6e^{-5}$
58. Two regression lines for x and y are $x= 19-y$ and $y =11-\frac{x}{2}$. The correlation coefficient between x and y will be
- 1) $\frac{1}{\sqrt{2}}$
 - 2) $\frac{-1}{\sqrt{2}}$
 - 3) $\sqrt{2}$
 - 4) $-\sqrt{2}$
59. A card is drawn from a well-shuffled pack of playing cards. What is the probability that it is either a spade or an ace?
- 1) $\frac{1}{2}$
 - 2) $\frac{13}{52}$
 - 3) $\frac{4}{13}$
 - 4) $\frac{1}{13}$
60. The first of the two samples has 100 items with mean 15 and S.D=3. If the whole group has 250 items with mean 15,6 and standard deviation $\sqrt{13.44}$ the standard deviation of the whole group is
- 1) 16
 - 2) 4
 - 3) 8
 - 4) 0

61. The pdf of a random variable X is

$$f(x) = \begin{cases} e^{-x} & x \geq 0 \\ 0 & x < 0 \end{cases}$$
 if F(x) is the distribution function of X then the value of F(3) =
 1) e^{-3} 2) $-e^{-3}$
 3) $1-e^{-3}$ 4) $e^{-3}+1$
62. If X is a normally distributed random variable with mean $\mu=1$ and standard deviation $\sigma=3$ and $P\left(\frac{X-\mu}{\sigma} < 0.81\right)=a$ and
 $P\left(0 < \frac{X-\mu}{\sigma} < 1.73\right)=b$ then
 $P(3.43 < X < 6.19)$ is
 1) $b - a + 0.5$ 2) $a-b$
 3) $b-a$ 4) $b - a+1$
63. If two random variables X and Y have to regression lines with the equations
 $x = 0.7y + 5.2$ and $y = 0.3x + 2.8$ then the correlation coefficient between X and Y is
 1) $\sqrt{(5.2)(2.8)}$ 2) $(5.2)(2.8)$
 3) $(0.7)(0.3)$ 4) $\sqrt{(0.7)(0.3)}$

DETAILED SOLUTIONS

1. (3)
 $x = 0.4y + a$
 $b_{xy} = 0.4$
 $y = 0.5x + b$
 $b_{yx} = 0.5$
 $\therefore r = \sqrt{0.4 \times 0.5} = \sqrt{0.2}$
 Since b_{xy} and b_{yx} both are positive implies r is also positive)
2. (4)
 $P(A) = \frac{2}{3}; P(A') = 1 - \frac{2}{3} = \frac{1}{3}$
 $P(B) = \frac{3}{5}; P(B') = 1 - \frac{3}{5} = \frac{2}{5}$
 Required probability
 $= P(A) P(B') + P(B) P(A')$
 $= \frac{2}{3} \cdot \frac{2}{5} + \frac{3}{5} \cdot \frac{1}{3}$

3. (4)
 $x + 2y = 5$
 $\Rightarrow 2y = -x + 5$
 $\Rightarrow y = -\frac{x}{2} + \frac{5}{2}$
 $\therefore b_{yx} = \frac{-1}{2}$
 Also $2x + 3y = 8$
 $\Rightarrow 2x = -3y + 8$
 $\Rightarrow x = -\frac{3}{2}y + 4$
 $\therefore b_{xy} = \frac{-3}{2}$
 Now $r^2 = \frac{-1}{2} \times \frac{-3}{2} = \frac{3}{4}$
 $\therefore r = \pm \frac{\sqrt{3}}{2}$
 Since b_{xy} and b_{yx} are negative implies $r = \frac{-\sqrt{3}}{2}$
4. (2)
 Given P(x) is a probability mass function
 $\therefore \sum P(x) = 1$
 i.e.. $P(-2) + P(3) + P(1) = 1$
 $\Rightarrow \frac{\lambda}{6} + \frac{\lambda}{4} + \frac{\lambda}{12} = 1$
 $\lambda \left(\frac{1}{6} + \frac{1}{4} + \frac{1}{12} \right) = 1$
 $\lambda \left(\frac{2+3+1}{12} \right) = 1$
 $\lambda \left(\frac{1}{2} \right) = 1$
 $\therefore \lambda = 2$
5. (4)
 Variance = $E(X^2) - (E(X))^2$
 Given variance = 4
 $E(X) = \text{mean} = 2$
 $\therefore 4 = E(X^2) - 2^2$
 $\Rightarrow E(X^2) = 4 + 4 = 8$
6. (4)
 Probability of gelling
 2 white balls = $\frac{{}^4C_2 \times {}^6C_1}{{}^{10}C_3}$

$$= \frac{\frac{4 \times 3}{1 \times 2} \times 6}{\frac{10 \times 9 \times 8}{1 \times 2 \times 3}} = \frac{3}{10}$$

7. (2)

$$P(X \geq 75) = \frac{1}{6} = 0.167$$

$$\Rightarrow P\left(\frac{X-\mu}{\sigma} \geq \frac{75-\mu}{\sigma}\right) = 0.167$$

$$P(Z \geq Z_1) = 0.167$$

$$\therefore P(0 < Z < Z_1) = 0.5 - 0.167$$

$$= 0.333 \quad \dots (1)$$

$$\text{where } z_1 = \frac{75-\mu}{\sigma} = \frac{75-55}{\sigma} [\because \mu = 55]$$

$$= \frac{20}{\sigma}$$

$$\therefore (1) \Rightarrow P\left(0 \leq Z \leq \frac{20}{\sigma}\right) = 0.333$$

$$\Rightarrow \frac{20}{\sigma} = 0.97$$

$$\Rightarrow \sigma = \frac{20}{0.97} = 20.62$$

\therefore Required probability $P(35 \leq X \leq 55)$

$$= P\left(\frac{35-\mu}{\sigma} \leq \frac{x-\mu}{\sigma} \leq \frac{55-\mu}{\sigma}\right)$$

$$= P\left(\frac{35-55}{20.62} \leq Z \leq \frac{55-55}{20.62}\right)$$

$$= P\left(\frac{-20}{20.62} \leq Z \leq 0\right)$$

$$= P(0 \leq z \leq 0.97)$$

$$= (0 \leq z \leq 0.97)$$

$$= 0.3340$$

Therefore, the number of students securing marks between 35 and 55 is

$$= 0.3340 \times 600 = 200.4$$

$$\approx 200$$

8. (4)

Required probability

$$= \frac{{}^6C_2}{{}^{16}C_2} = \frac{\left(\frac{6 \times 5}{1 \times 2}\right)}{\left(\frac{16 \times 15}{1 \times 2}\right)} = \frac{6 \times 5}{16 \times 15} = \frac{1}{8}$$

9. (4)

$$A \cap B \cap C \subseteq AB$$

$$P(A \cap B \cap C) \leq P(A \cap B) = 0$$

$$P(A \cap B \cap C) = 0$$

Required probability

$$P(A \cup B \cup C) = P(A) + P(B) + P(C)$$

$$- P(A \cap B) - P(A \cap C) - P(B \cap C)$$

$$+ P(A \cap B \cap C)$$

$$= \frac{1}{4} + \frac{1}{4} + \frac{1}{4} - 0 - \frac{1}{8} - 0 + 0$$

$$= \frac{3}{4} - \frac{1}{8} = \frac{5}{8}$$

10. (3)

Use Binomial Distribution

$$p = \frac{1}{2}; q = 1 - p$$

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

$$P(X = x) = {}^nC_x p^x q^{n-x}$$

$$n = 2$$

\therefore Required probability

$$= {}^2C_2 \left(\frac{1}{2}\right)^2 \left(\frac{1}{2}\right)^{2-2}$$

$$= 1 \times \frac{1}{4} = \frac{1}{4}$$

11. (3)

$$A.M. = \frac{a + ar + ar^2 + \dots + ar^{n-1}}{n}$$

$$= \frac{a(1 + r + r^2 + \dots + r^{n-1})}{n}$$

$$= \frac{a}{n} \cdot \frac{(1-r^n)}{(1-r)}$$

12. (1)

Geometric mean of $a, b = \sqrt{ab}$

\sqrt{ab} is real if a and b are positive.

13. (2)

$$\text{Mean deviation} = \frac{\sum |x - \bar{x}|}{N}$$

$$\text{Standard deviation} = \sqrt{\frac{\sum (x - \bar{x})^2}{N}}$$

Formula:

$$(a_1 + a_2 + \dots + a_r)^2 > a_1^2 + a_2^2 + \dots + a_r^2$$

$$\Rightarrow (|a_1| + |a_2| + \dots + |a_r|)^2 > a_1^2 + a_2^2 + \dots + a_r^2$$

$$\therefore (\sum |x - \bar{x}|)^2 > \sum (x - \bar{x})^2$$

$$\sum |x - \bar{x}| > \sum (x - \bar{x})^2$$

$$\frac{\sum |X - \bar{X}|}{N} > \sqrt{\frac{\sum (X - \bar{X})^2}{N}} > \sqrt{\frac{\sum (X - \bar{X})^2}{N^2}}$$

$$= \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$$

\Rightarrow Mead deviation > Standard deviation

14. (3)

Required probability = P(Head in first, third and fifth time)

+ P(Head in second, fourth and sixth time)

$$= \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$$

$$= \frac{1}{32}$$

15. (4)

$$\text{Mean} = \frac{450}{25} = 18$$

16. (1)

$$f(x) = \frac{1}{b-a} = \frac{1}{15-2} = \frac{1}{13}$$

$$E(x) = \int_2^{15} x f(x) dx$$

$$= \frac{1}{13} \int_2^{15} x dx$$

$$= \frac{1}{13} \left(\frac{x^2}{2} \right)_2^{15}$$

$$= \frac{1}{26} (225 - 4) = \frac{17}{2}$$

$$\therefore \text{Mean} = E(x) = \int_2^{15} x^2 f(x) dx$$

$$= \frac{1}{13} \int_2^{15} x^2 dx$$

$$= \frac{1}{13} \left(\frac{x^3}{3} \right)_2^{15}$$

$$= \frac{1}{3 \times 13} (15^3 - 3^3)$$

$$= \frac{3367}{3 \times 13} = \frac{259}{3}$$

$$\text{Variance} = E(X^2) - [E(x)]^2$$

$$= \frac{259}{3} - \left(\frac{17}{2} \right)^2$$

$$= \frac{259}{3} - \frac{289}{4}$$

$$= \frac{1036 - 867}{12} = \frac{169}{12}$$

17. (4)

$$P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{0.15}{0.3} = 0.5$$

18. (1)

$$P(A) = 0.15$$

$$P(B) = 0.25$$

$$P(A \cap B) = 0.05$$

Required probability

$$= P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{0.05}{0.25} = 0.2$$

19. (4)

Since A and B are mutually exclusive

$$P(A \cup B) = P(A) + P(B)$$

$$\Rightarrow 0.7 = 0.4 + P(B)$$

$$\Rightarrow P(B) = 0.7 - 0.4 = 0.3$$

20. (4)

Required probability

= P(product of 4 positive numbers)
+ P(Product of 2 positive and 2 negative numbers)
+ P(Product of 4 negative numbers)

$$= \frac{6C_4}{14C_4} + \frac{6C_2 \times 8C_2}{14C_4} + \frac{8C_4}{14C_4}$$

$$= \frac{6 \times 5 \times 4 \times 3}{1 \times 2 \times 3 \times 4} + \frac{6 \times 5}{1 \times 2} \times \frac{8 \times 7}{1 \times 2} + \frac{8 \times 7 \times 6 \times 5}{1 \times 2 \times 3 \times 4}$$

$$= \frac{14 \times 13 \times 12 \times 11}{1 \times 2 \times 3 \times 4} + \frac{14 \times 13 \times 12 \times 11}{1 \times 2 \times 3 \times 4} + \frac{14 \times 13 \times 12 \times 11}{1 \times 2 \times 3 \times 4}$$

$$= \frac{420 + 15 + 70}{1001}$$

$$= \frac{505}{1001}$$

21. (3)

We can choose two consecutive integers from 1, 2, ..., n in .

(n-1) ways

$$\text{Required probability} = \frac{(n-1)}{nC_2}$$

$$= \frac{\frac{(n-1)}{n(n-1)}}{1.2} = \frac{2}{n}$$

22. (2)

$$\text{Required probability} = \frac{6}{24} + \frac{11}{24} + \frac{6}{24} = \frac{23}{24}$$

23. (1)

$$\text{G.M.} = \sqrt[n]{a \cdot ar \cdot ar^2 \dots ar^{n-1}}$$

$$= \sqrt[n]{a^n r^{1+2+3+\dots+(n-1)}}$$

$$= \sqrt[n]{a^n r^{\frac{(n-1)n}{2}}}$$

$$= ar^{\frac{n-1}{2}}$$

24. (3)

For probability density function $f(x)$

$$\int f(x)dx = 1$$

$$\Rightarrow \int_0^1 kx(1-x)dx = 1$$

$$\Rightarrow k \int_0^1 (x - x^2)dx = 1$$

$$\Rightarrow k \left[\frac{x^2}{2} - \frac{x^3}{3} \right]_0^1 = 1$$

$$\Rightarrow k \left[\frac{1}{2} - \frac{1}{3} \right] = 1$$

$$\Rightarrow k \left[\frac{3-2}{6} \right] = 1$$

$$\Rightarrow \frac{k}{6} = 1$$

$$\Rightarrow k = 6$$

$$\therefore f(x) = 6x(1-x)$$

A.M. = Expectation of X

$$= \int_0^1 xf(x)dx$$

$$= \int_0^1 x \cdot 6x(1-x)dx$$

$$= \int_0^1 6x^2(1-x)dx$$

$$= 6 \int_0^1 (x^2 - x^3)dx$$

$$= 6 \left[\frac{x^3}{3} - \frac{x^4}{4} \right]_0^1$$

$$= 6 \left[\frac{1}{3} - \frac{1}{4} \right]$$

$$= 6 \left(\frac{4-3}{12} \right)$$

$$= 6 \left(\frac{1}{12} \right)$$

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

25. (2)

Required probability

$$= \frac{10C_1 \times 15C_1}{25C_2}$$

$$= \frac{10 \times 15}{25 \times 24}$$

$$= \frac{1 \times 2}{25 \times 24} = \frac{1}{2}$$

26. (2)

$$4y = 12 - 3x$$

$$y = 3 - \frac{3}{4}x$$

$$b_{yx} = -\frac{3}{4}$$

Also $3x + y = 10$

$$\Rightarrow x = \frac{10}{3} - \frac{y}{3}$$

$$\therefore b_{xy} = -\frac{1}{3}$$

$$\therefore r = \sqrt{b_{xy} \cdot b_{yx}}$$

$$= -\sqrt{\left(-\frac{1}{3}\right)\left(-\frac{3}{4}\right)}$$

$[\because \text{both } b_{xy} \text{ and } b_{yx} \text{ are negative}]$

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

27. (4)

$$P(X=x) = \frac{e^{-\lambda} \lambda^x}{x!}$$

$$x = 0, 1, 2, \dots$$

Given

$$3P(x=2) = P(x=4)$$

$$\frac{3e^{-\lambda} \lambda^2}{2!} = \frac{e^{-\lambda} \lambda^4}{4!}$$

$$\Rightarrow \frac{3}{2} = \frac{\lambda^2}{24}$$

$$\Rightarrow \lambda^2 = 36$$

$$\Rightarrow \lambda = 6$$

28. (3)

The correlation coefficient is the geometric mean of the regression coefficients.

29. (3)
There are 13 cards of spade in the pack.
 $P(E) = \frac{13}{52}$
4 aces in the pack
 $P(F) = \frac{4}{52}$
There is one ace of spade in the pack.
 $\therefore P(E \cap F) = \frac{1}{52}$
 $\therefore P(E \cup F) = P(E) + P(F) - P(E \cap F)$
 $= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$
 $= \frac{16}{52} = \frac{4}{13}$
30. (2)
 $n_1 = 100$
 $n_1 + n_2 = 250$
 $\Rightarrow n_2 = 150$
 $\bar{x}_1 = 15; \bar{x} = 15.6$
 $\bar{x}_2 = ?$
 $\sigma_1^2 = 9\sigma^2 = 13.44$
 $\sigma_2 = ?$
 $\bar{X} = \frac{n_1\bar{X}_1 + n_2\bar{X}_2}{n_1 + n_2}$
 $\Rightarrow 15.6 = \frac{100 \times 15 + 150\bar{X}_2}{250}$
 $\therefore 150\bar{X}_2 = 2400$
 $\Rightarrow \bar{X}_2 = 16$
 $d_1 = \bar{X}_1 - \bar{X}$
 $= 15 - 15.6$
 $= -0.6$
 $d_2 = \bar{X}_2 - \bar{X}$
 $= 16 - 15.6$
 $= 0.4$
 $(n_1 + n_2)\sigma^2 + n_1\sigma_1^2 + n_2\sigma_2^2 + n_1d_1^2 + n_2d_2^2$
 $\Rightarrow 250 \times 13.44 = 100 \times 9 + 150\sigma_2^2 + 100 \times 0.36 + 150 \times 0.6$
 $\Rightarrow 3360 = 900 + 150\sigma_2^2 + 36 + 24$
 $\Rightarrow 150\sigma_2^2 = 240$
 $\Rightarrow \sigma_2^2 = 16$

- $\Rightarrow \sigma_2^2 = 4$
 \therefore Standard deviation of the second sample = 4
31. (1)
The root mean square deviation is least about their mean.
32. (1)
Required probability
 $= P(A)P(\bar{B}) + P(\bar{A})P(B) + P(A)P(B)$
 $= 0.8 \times 0.3 + 0.2 \times 0.7 + 0.8 \times 0.7$
 $= 0.94$
33. (4)
 $P = 0.001$
 $= \frac{1}{1000}$
 $n = 5000$
 $\lambda = nP$
 $= 5000 \times \frac{1}{1000} = 5$
 $P(X=x) = \frac{e^{-\lambda} \lambda^x}{x!}$
(Poisson Distribution)
Probability of hitting the target 2 or more times
 $P(X \geq 2) = 1 - [P(X=0) + P(X=1)]$
 $= 1 - \left[\frac{e^{-5} 5^0}{0!} + \frac{e^{-5} 5^1}{1!} \right]$
 $= 1 - [e^{-5} + 5e^{-5}]$
 $= 1 - 6e^{-5}$
34. (2)
The measure of Kurtosis of the normal curve = 3.
35. (4)
 $8x + 10y = -66$
 $y = -\frac{8x}{10} - \frac{66}{10}$
 $b_{yx} = -\frac{8}{10}$
 $40x + 18y = 214$
 $x = \frac{-18y}{40} + \frac{214}{40}$

$$b_{xy} = -\frac{18}{40}$$

$$r = \sqrt{\left(\frac{-8}{10}\right)\left(\frac{-18}{40}\right)}$$

$$= -0.6$$

(Since b_{xy} and b_{yx} are negative implies r is negative.)

36. (3)

X	Y	X ²	Y ²	XY
1	5	1	25	5
2	4	4	16	8
3	3	9	9	9
4	2	16	4	8
5	1	25	1	5
$\sum X = 15$	$\sum Y = 15$	$\sum X^2 = 55$	$\sum Y^2 = 55$	$\sum XY = 35$

Co-efficient of correlation

$$r = \frac{N \sum XY - \sum X \sum Y}{\sqrt{N \sum X^2 - (\sum X)^2} \sqrt{N \sum Y^2 - (\sum Y)^2}}$$

$$= \frac{5 \times 35 - 15 \times 15}{\sqrt{5 \times 55 - (15)^2} \sqrt{5 \times 55 - (15)^2}}$$

$$= \frac{175 - 225}{\sqrt{5 \times 55 - (15)^2} \sqrt{5 \times 55 - (15)^2}}$$

$$= \frac{175 - 225}{5 \times 5.5(15)^2} = \frac{-50}{275 - 225}$$

$$= \frac{-50}{50} = -1$$

37. (4)

Required probability

= Probability of selecting one woman + probability of selecting two women

$$= \frac{6C_1 + 9C_1}{15C_2} + \frac{6C_2}{15C_2}$$

$$= \frac{6 \times 9}{\left(\frac{15 \times 14}{1 \times 2}\right)} + \frac{\left(\frac{6 \times 5}{1 \times 2}\right)}{\left(\frac{15 \times 14}{1 \times 2}\right)}$$

$$= \frac{6 \times 9 \times 1 \times 2}{15 \times 14} + \frac{6 \times 5}{15 \times 14}$$

$$= \frac{108 + 30}{210} = \frac{138}{210} = \frac{23}{35}$$

38. (3)

S.D. is independent of change of origin.

\therefore S.D. of x_1, x_2, \dots, x_{10} is same as S.D. of $x_1 + 4, x_2 + 4, \dots, x_{10} + 4$

\therefore S.D. of the new series = 15

39. (2)

S. No.	Group A (out of 6)	Group B (out of 6)	Number of ways
1	5	2	$6C_5 \times 6C_2 = 90$
2	4	3	$6C_4 \times 6C_3 = 300$
3	3	4	$6C_3 \times 6C_4 = 300$
4	2	5	$6C_2 \times 6C_5 = 90$
			Total = 780

\therefore Total number of different ways 780

40. (2)

The moment generating function for Poisson distribution with parameter λ is $e^{\lambda(e^t - 1)}$

41. (3)

Required p.d.f.

$$= \frac{3-x-y}{\text{Integral of } 3-x-y \text{ w.r.to } x}$$

$$= \frac{3-x-y}{\left(3x-xy-\frac{x^2}{2}\right)_0^1}$$

$$= \frac{3-x-y}{3-y-\frac{1}{2}}$$

$$= \frac{3-x-y}{\frac{5}{2}-y}$$

$$\therefore f\left(\frac{x}{y}\right) = \frac{3-x-y}{\frac{5}{2}-y}$$

42. (2)

Required standard error of sample mean $\frac{\sigma}{\sqrt{n}}$

43. (3)

The distribution is ψ^2 distribution with n.d.f.

44. (3)

Refer Problem No. 36 (2002)

45. (4)

Refer Problem No. 37 (2002)

46. (3)

Refer Problem No. 38 (2002)

47. (2)

$\text{Var}(X-Y) = \text{Var } X + \text{Var } Y$

48. (2)

Refer problem no. 39 (2002)

49. (3)

$$P = \frac{95}{100} = 0.95$$

$$q = 1 - 0.95 = 0.05$$

Probability that the target missed for the first time on the 15th shot.

$$= P^{14}q$$

$$= (0.95)^{14} (0.05)$$

50. (2)

Probability that the problem is solved = $P(A \cup B \cup C)$

$$= P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C)$$

$$= \frac{1}{3} + \frac{1}{8} + \frac{1}{4} - \frac{1}{3} \cdot \frac{1}{8} - \frac{1}{8} \cdot \frac{1}{4} - \frac{1}{3} \cdot \frac{1}{4} + \frac{1}{3 \cdot 8 \cdot 4}$$

$$= \frac{1}{3} + \frac{1}{8} + \frac{1}{4} - \frac{1}{24} - \frac{1}{32} - \frac{1}{12} + \frac{1}{96} = \frac{9}{16}$$

51. (4)

Since $P(x)$ is a probability density function of a random variable x

$$\Rightarrow \int P(x) dx = 1$$

$$\Rightarrow \int_0^1 kx^2 dx = 1$$

$$\Rightarrow k \left(\frac{x^3}{3} \right)_0^1 = 1$$

$$\Rightarrow \frac{k}{3} = 1$$

$$\Rightarrow k = 3$$

52. (4)

$$8x + 10y = -66$$

$$y = -\frac{8}{10}x - \frac{66}{10}$$

$$b_{yx} = -\frac{8}{10}$$

$$40x + 18y = 214$$

$$x = -\frac{18}{40}y + \frac{214}{40}$$

$$b_{xy} = -\frac{18}{10}$$

Coefficient of regression

$$\gamma = -\sqrt{\frac{-8}{10} \times \frac{-18}{10}}$$

$$= -0.6$$

[Since b_{yx} and b_{xy} are negative $\Rightarrow \gamma$ is negative]

53. (2)

Measure of Kurtosis of the normal curve = 3

54. (1)

Root mean square deviation is also called as standard deviation. Standard deviation is least about their mean.

55. (1)

Required probability

$$= P(A)P(\bar{B}) + P(B)P(\bar{A}) + P(A)P(B)$$

$$= 0.8 \times 0.3 + 0.7 \times 0.2 + 0.8 \times 0.7$$

$$= 0.24 + 0.14 + 0.56 = 0.94$$

56. (2)

Given $\text{Var } Y = 1$

$$\Rightarrow \text{Var}(aX - b) = 1$$

$$\Rightarrow a^2 \text{Var } X = 1$$

$$\Rightarrow 15a^2 = 1$$

$$\Rightarrow a = \frac{1}{\sqrt{15}}$$

Also $E(Y) = 0$

$$\Rightarrow E(aX - b) = 0$$

$$\Rightarrow a E(X) - b = 0$$

$$10a - b = 0$$

$$\Rightarrow \frac{10}{\sqrt{15}} - b = 0$$

$$\Rightarrow b = \frac{10}{\sqrt{15}}$$

57. (4)

$$p = 0.001$$

$$= \frac{1}{1000}$$

$$n = 5000$$

$$\lambda = nP = 5000 \times \frac{1}{1000}$$

$$= 5$$

$$P(X=x) = \frac{e^{-\lambda} \lambda^x}{x!} \text{ (by Poisson Distribution)}$$

Probability of hitting the target 2 or more times S is

$$P(X \geq 2) = 1 - P(X=0) - P(X=1)]$$

$$\begin{aligned}
 &= 1 - \left[\frac{e^{-5} 5^0}{0!} + \frac{e^{-5} 5^1}{1!} \right] \\
 &= 1 - (e^{-5} + 5e^{-5}) \\
 &= 1 - 6e^{-5}
 \end{aligned}$$

58. (2)
 Given $x = 19 - y$
 $b_{xy} = -1$
 $y = 11 - \frac{x}{2}$
 $\Rightarrow b_{xy} = -\frac{1}{2}$
 $r = \pm \sqrt{(-1) \left(-\frac{1}{2}\right)}$
 $= \pm \frac{1}{\sqrt{2}}$
 Since b_{xy} and b_{yx} are negative
 $\Rightarrow r$ is also negative
 $r = -\frac{1}{\sqrt{2}}$

59. (3)
 There are 13 cards of spade in a pack
 $P(E) = \frac{13}{52}$
 There are 4 aces in the pack.
 $P(F) = \frac{4}{52}$
 There is one ace of spade in the pack
 $P(E \cap F) = \frac{1}{52}$
 $\therefore (E \cup F) = P(E) + P(F) - P(E \cap F)$
 $= \frac{13}{52} + \frac{4}{52} - \frac{1}{52}$

$$\begin{aligned}
 &= \frac{16}{52} = \frac{4}{13}
 \end{aligned}$$

60. (2)
 Refer problem No. 30 (2002)

61. (3)
 $F(x) = \int_0^x e^{-x} dx$
 $= (-e^{-x})_0^x$
 $= -e^{-x} + 1 = 1 - e^{-x}$
 $\therefore F(3) = 1 - e^{-3}$

62. (1)
 $P(3.34 < X < 6.19)$
 $= P\left(\frac{3.34-1}{3} < \frac{X-\mu}{\sigma} < \frac{6.19-1}{3}\right)$
 $= P\left(0.81 < \frac{X-\mu}{\sigma} < 1.73\right)$
 $= P\left(0 < \frac{X-\mu}{\sigma} < 1.73\right)$
 $= -P\left(0 < \frac{X-\mu}{\sigma} < 0.81\right)$
 $= b-(a-0.5)$
 $= b-a+0.5$

63. (4)
 $x = 0.7y + 5.2$
 $\Rightarrow b_{xy} = 0.7$
 $y = 0.3x + 2.3$
 $\Rightarrow b_{xy} = 0.3$
 $\therefore r = \sqrt{b_{yx} b_{xy}}$
 $= \sqrt{(0.7)(0.3)}$

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