41. 8 coins are tossed 256 times. In how may tosses do you expect exactly 6 heads?

42. Mean and standard deviation of a Binomial distribution are 8 and 2. Find the parameters.

43. X is a Binomial variate with $E(X)=3/2$ and $Var(X) = 3/4$. Find the probability function.

44. In a Binomial distribution, $n = 9$ and $p = 1/2$. Find the standard deviation.

45. The mean and the variance of a Binomial variate are 12 and 8 respectively. Find n and p.

46. On an average 3 deaths occur in a city in a day. Find the probability that on a randomly selected day no deaths occur.

47. If the number of mistakes made by a typist follows a Poisson distribution with mean 3, what is the probability that he makes (i) 2 mistakes (ii) at least 2 mistakes?

48. The chances of contracting tuberculosis by a worker in Beedi industry are $1/20$. Find the probability that out of 10 workers in the industry, 4 will escape from the disease. [Given $e^{-0.5} = 0.6065$]

49. On an average 3 street-lights of a municipality fail everyday. Find the standard deviation of number of failures per day.

50. The number of accidents occurring in a factory in an year is a Poisson variate with mean 5. Find the probability that (i)more than 2 (ii) more than 4 accidents occur in one year.

51. It is known by experience that 2% articles manufactured by a firm are defective. Articles are supplied in packets of 50 each. (i) What is the probability that a randomly selected packet is free of defective articles? (ii) Among 10,000 packets, how may are expected to be free of defective articles?

52. At 10 a.m. there is a city bus service. The number of passengers getting in at the first stop is a Poisson variate with parameter 6. What is the probability that on a particular day nobody gets in at the stop? On how many days of an year would you expect this to happen?

53. A receptionist at an office, receives on an average 3 telephone calls between 10 a.m. and 10.05 a.m. Find the probability that on a particular day (i) she does not receive any call (ii) she receives at least two calls in that time period.

54. A box has 300 pins. If on an average 1% of pins is defective, find the probability that the box has (i) at least one defective pin (ii) more than 3 defective pins.

55. On an average a box contains 2 defective items. Calculate the probability of (i) 3 defective items (ii) 4 defective items in a randomly selected box. Use Poisson distribution.

56. On an average, 1 in every 50 valves manufactured by a firm is substandard. If valves are supplied in packets of 20 each, in how many of a lot of 1000 packets would you expect substandard valves?

57. For the following data regarding births occurring in a hospital, fit a Poisson distribution.

No. of births per day :	0	1	2	3	4	5	≥6	Total
No. of days:	98	110	62	24	6	0	0	300

58. To the following data, fit a Poisson distribution and find the expected frequencies.

No. of printing mistakes :	0	1	2	3	4	5
No. of pages:	42	33	14	6	4	1

59. In a Poisson distribution, $P[X = 1] = P[X = 2]$. Find $P[X = 3]$.

60. In a Poisson distribution, $P[X = 2] = 4P[X = 3]$. Then, find $P[X = 4]$.

61. In a Poisson distribution, the first probability term is 0.2725. Find the next probability term.

62. For a Poisson distribution, $P[X = 3] = P[X = 4]$. Then, find the mean and standard deviation.

63. In a Poisson distribution the third probability term is thrice the second probability term. Find the mean and standard deviation.

64. In a Poisson distribution, the second and the third frequency terms are equal to 150 each. Find the fourth frequency term.

65. In a Poisson distribution, the first frequency term is 80 and the second frequency term is 40. Find the third frequency term.

66. The weights of 1000 students are normally distributed with mean 40 kgs. And standard deviation 4 kgs. Find the number of students with weight (i) less than 50 kgs (ii) between 40 and 45 kgs.

67. The customers' accounts at a departmental store have average balance of Rs.1200 and standard deviation of Rs.400. Assuming that the account balance are normally distributed, find (i) proportion of accounts with balance over Rs.1500 (ii) proportion of accounts with balance between Rs.1000 and Rs.1500.

68. Assuming that heights of soldiers is distributed normally with mean 68 inches and standard deviation 3 inches, find the number of soldiers in a regiment of 1000 with height (i) below 65 inches. (ii) above 72 inches (iii) between 65 inches and 72 inches.

69. The Institute of Bankers conducted a competitive examination for 1200 bank employees to promote them to the next higher ranks. It was found that the mean marks was 51 and the

standard deviation was 14. Assuming that the marks follow normal distribution, find (i) the number of employees who scored more than 70 marks. (ii) the number of employees who scored between 58 and 80 marks.

70. A random vaiable X follows normal distribution with mean 80 and standard deviation 10. Find the probability that the variable takes value (i) less than 80 (ii) greater than 100 (iii) between 53 and 62 (iv) between 53 and 82.

71. Weight at birth of babies is a normal variate with mean3.5 kgs. and standard deviation 0.9 kgs. Find the probability that a new born baby weighs less than 2 kgs. What percentage of babies would you expect to weigh between 2.5 and 4.5 kgs.?

72. The distribution of monthly income of 3000 workers of a factory confirms Normal law with mean Rs.900 and standard deviation Rs.100. Find (i) the percentage of workers having more than Rs.800 income (ii) the number of workers having less than Rs.600 income.

73. X is a Normal variate with mean 64 and variance 144. Find the probability that (i) $X \geq 67$ (ii) $60 \leq X < 67$ (iii) $67 \leq X < 76$ (iv) $X < 60$.

74. The quartiles Q_1 and Q_3 of a Normal distribution are 25 and 50 respectively. Find the mean.

75. 1200 students took an examination. Their mean marks is 53. The standard deviation is 15. Assume Normal distribution of marks.

    a. If 50 is the marks required for passing. what is the probability that a randomly selected student passes?

    b. How many students are expected to score above 50?

    c. If only 40% of the students are required to be promoted, what should be the marks for promotion?

76. If Z is a standard normal variate, find –
(i) $P[Z > 2.58]$ (ii) $P[Z < -2.58]$
(iii) $P[|Z| < 2.58]$ (iv) $P[|Z| > 2.58]$

77. If Z is a standard normal variate, find k such that
(i) $P[Z > k] = 0.05$ (ii) $P[|Z| > k] = 0.05$
(iv) $P[|Z| < k] = 0.95$.

78. In a city 20% people are non-vegetarians. Find the probability that a random sample consisting of 20 people from the city has at least 2 non-vegetarians. (Use normal approximation)

79. 30% candidates who took the S.S.L.C. examination are girls. Use normal approximation to find the probability that among 50 randomly selected candidates at the most 10 are girls.

80. In a library, half the books are Kannada books. Find the probability that among 20 books selected from the library, at least 5 are kannada books. (Use normal approximation).

81. Write down the mean and variance of chi-square variate with 14 d.f.

82. For chi-square variate with 8 d.f., write down the (i) 5% two-tail values (ii) 1% upper-tail value.

83. For a chi-square variate with 11 d.f., write down the (i) two-tail 0.05 ciritical values. (ii) upper-tail 0.01 critical value.

84. For a chi-square variate with 3 d.f., write down (i) 5% upper – tail value (ii) 1% two-tail values.

85. If $Z_1, Z_2, \ldots Z_8$ are independent standard normal variates, find the mean and variance of $Z_1^2 + Z_2^2 + \ldots Z_8^2$

86. Write down the mean and variance of a t-variate with 13 d.f.

87. For a t-variate with 16 d.f., write down the 5% two-tail values and 1% two-tail values. Also find the 5% lower-tail and 1% upper-tail values.

ANSWERS

4. $B(n,p)$ **7.** 8, 16 **8.** 0,1.2 **10.** Chi-square with 1 d.f.,1,2. **11.** $N(0,1), x^2(1)$ **12.** $x^2(3),3,6$

23. (a) $x = 0,1$ (b) $x = 0,1,...7$ (c) $x = 0,1,2...$ (d) $(-\infty,\infty)$ (e) $(-\infty,\infty)$ (f) $(0,\infty)$ (g) $(-\infty,\infty)$

24. (a) $p(x) = (0.2)^x (0.8)^{1-x}$, $x = 0,1, p = 0.2$, $pq = 0.16$

(b) $p(x) = {}^7C_x (0.4)^x (0.6)^{7-x}$, $x = 0,1,2,...,7, 2.8, 1.68$

(c) $P(x) = \frac{e^{-5}5^x}{x!}, x = 0,1,2,..., \lambda = 5, \lambda = 5$

(d) $f(x) = \frac{1}{5\sqrt{2\pi}} e^{-\frac{1}{2}\left(\frac{x-10}{5}\right)^2}$ $-\infty < x < \infty$ $E(X) = 10, V(X) = 25$

(e) $f(z) = \frac{1}{\sqrt{2\pi}} e^{-z^2/2}$ $-\infty < x < \infty$ $E(X) = 0, V(X) = 1$ (ix) $E(\chi^2) = 5, V(\chi^2) = 10$

25. 0.2 , 0.16 **26.** 0.3,0.21, 0.7 **27.** 0.45, 0.55 **28.** $np = 2.4$ **29.** 24,4.8 **30.** 5.6, 1.83

31. 0.0313, 0.3125, 0.1875 **32.** 0.01696 **33.** 0.2617,0.0039 **34.** 0.0012

35. 0.68 **36.** 0.0039 **36.** 0.1142 **37.** 0.064 **38.** 0.7407, **39.** 4,16,24,16,4

40. 8,26,35,23,7,1 **41.** 28 **42.** 16,0.5 **43.** $p(x) = {}^3C_x (\frac{1}{2})^3, x = 0,1,2,3.$

44. 1.5 **45.** 36,1/3 **46.** 0.0498 **47.** 0.2241, 0.8008 **48.** 0.000013

49. $\sqrt{3}$ **50.** 0.8761,0.562 **51.** 0.3679, 3679 **52.** 0.0025, 1 **53.** 0.0498, 0.8008

54. 0.9502,0.3526 **55.** 0.1804, 0.0902 **56.** 330 **57.** 100,110,61,22,6,1,0

58. 37,37,18,6,2,0 **59.** 0.1804 **60.** 0.006227 **61.** 0.3543 **62.** 4,2 **63.** $6,\sqrt{6} = 2.45$

64. 100 **65.** 10 **66.** 994,394 **67.** 0.2266, 0.4648 **68.** 159,92,749 **69.** 105,347

70. 0.5,0.0228, 0.0324, 0.5758 **71.** 0.0475, 73.3% **72.** 84,13,4

73. 0.4013, 0.2280, 0.2426, 0.3707 **74.** 37.5 **75.** 0.5793, 695, 56.75

76. 0.0049, 0.0049, 0.9902, 0.0098 **77.** 1.65, 1.96, 1.96,. **78.** P[Z>-1.4] = 0.9192

79. P[Z<-1.39]=0.0823 **80.** P[Z>-2.46]=0.9931, **81.** 14,28 **82.** 2.18, 17.53, 20.09

83. 3.82, 21.92, 24.72 **84.** 7.81, 0.07, 12.84 **85.** 8.16 **86.** 0, 13/11

87. –2.120, 2.120, -2.921, 2.921, -1.746, 2.583