

1. A sampling a large number of parts manufactured by a machine, the Mean number of defectives in a sample of 20 is 2. Out of 1000 such samples, how many would be expected to contain exactly two defective parts? **Ans: 285 approximately [GTU Summer-2015]**
2. A multiple-choice test consists of 8 questions with 3 answers to each question (of which only one is correct). A student answer each question by rolling a balanced die and checking the first answer if he gets 1 or 2, the second answer if he gets 3 or 4, and the third answer if he gets 5 or 6. To get a distinction, the student must secure at least 75% correct answers. If there is no negative marking, what is the probability that the student secures a distinction? **Ans: 0.0197 [GTU Summer-2015]**
3. A discrete random variable X has mean 6 and variance 2. If it is assumed that the distribution is Binomial, find $P(5 \leq X \leq 7)$. **Ans: 0.7121**
4. A university warehouse has received a shipment of 25 printers, of which 10 are laser printers and 15 are inkjet models. If 6 of these 25 are selected at random to be checked by a particular technician, what is the probability that exactly 3 of those selected are laser printers (so that the other 3 are inkjets)?
5. If 5 of 20 tires in storage are defective and 5 of them are randomly chosen for inspection (that is, each tire has the same chance of being selected), what is the probability that the two of the defective tires will be included?
6. Each sample of water has a 10% chance of containing a particular organic pollutant. Assume that the samples are independent with regard to the presence of the pollutant. Find the probability that in the next 18 samples, at least 4 samples contain the pollutant
7. The probability of a man hitting a target is $1/3$. (i) If he fires 5 times, what is the probability of his hitting the target at least twice? (ii) How many times must he fire so that the probability of his hitting the target at least once in more than 90%? **Ans: (i) 0.5391, (ii) 6 times**
8. Fit a Binomial Distribution to the following data: **Ans: 17, 67, 96, 61, 15**

x	0	1	2	3	4
f	12	66	109	59	10

9. Fit a Poisson Distribution to the following data:

X	0	1	2	3	4	5
f	142	156	69	27	5	1

Ans: Expected Frequency: 147, 147, 74, 24, 6, 2.

10. If a publisher of nontechnical books takes great pains to ensure that its books are free of typographical errors, so that the probability of any given page containing at least one such error is 0.005 and errors are independent from page to page, what is the probability that one of its 400-page novels will contain (i) exactly one page with errors? (ii) At most three pages with errors?
11. The number of accidents in a year attributed to taxi drivers in a city follows Poisson distribution with a Mean of 3. Out of 1000 taxi drivers, find approximately the number of drivers with (i) no accidents in a year, and (ii) more than 3 accidents in a year. **Ans: (i) Approx. 50, (ii) Approx. 353**
12. A manufacturer of electric bulbs sends out 500 lots each consisting of 100 bulbs. If 5% bulbs are defective, in how many lot can we expect (i) 97 or more good bulbs? (ii) Less than 96 good bulbs? **Ans: (i) 62 (ii) 132**
13. It is known that 0.5% of ball pen refills produced by a factory are defective. These refills are dispatched in packaging of equal numbers. Using a Poisson distribution, determine the number of refills in a packaging to be sure that at least 95% of them contain no defective refills. **Ans: 10**

14. Assume that the probability of an individual coal miner being killed in a mine accident during a year is $\frac{1}{2400}$. Use appropriate statistical distribution to calculate the probability that in a mine employing 200 miners, there will be at least one fatal accident every year. **Ans: 0.07**
15. The marks obtained by students in a college are normally distributed with a Mean of 65 and a variance of 25. If 3 students are selected at random from this college, what is the probability that at least one of them would have scored more than 75 marks? **Ans: 0.0668**
16. If X is a Normal variate with a Mean of 2 and a S.D. of 0.1, find $P(|X - 2| \geq 0.01)$. **Ans: 0.9204**
17. If X is a Normal variate with a Mean of 120 and a Standard Deviation of 10, find c such that
(i) $P(X > c) = 0.02$, & (ii) $P(X < c) = 0.05$. **Ans: (i) c=140.05, (ii) c=103.6**

18. Fit a Normal Distribution to the following data:

X	125	135	145	155	165	175	185	195	205
Y	1	1	14	22	25	19	13	3	2

It is given that $\mu=165.5$ and $\sigma=15.26$.

Ans: Expected Frequency: 1, 4, 11, 21, 25, 21, 12, 4, 1.

19. In an examination, minimum 40 marks for passing and 75 marks for distinction are required. In this examination 45% students passed and 9% obtained distinction. Find average marks and standard deviation of this distribution of marks. [$P(z=0.125)=0.05$ and $P(z=1.34)=0.41$]
20. Distribution of height of 1000 students is normal with mean 165 cms and standard deviation 15 cms. How many soldiers are of height (i) less than 138 cms (ii) more than 198 cms (iii) between 138 and 198 cms. [$P(z=1.8)=0.4641$, $P(z=2.2)=0.4861$]
21. The weights of 4000 students are found to be normally distributed with a mean of 50 kg and a SD of 5 kg. Find the probability that a student selected at random will have weight (i) less than 45 kg, and (ii) between 45 and 60 kg. **Ans: (i) 0.1587 (ii) 0.8185**
22. The life of army shoes is normally distributed with mean 6 months and SD of 2 months. If 5000 pairs are issued, how many pairs would be expected to need replacement after 12 months? **Ans: 2386**
23. The average time it takes to serve a customer at a petrol pump is 6 minutes. The service time follows exponential distribution. Calculate the probability that (i) A customer will take less than 2 minutes to complete the service. (ii) A customer will take between 4 and 5 minutes to get the service. (iii) A customer will take more than 10 minutes for his service. **Ans: (i) 0.2835 (ii) 0.0788 (iii) 0.1889**
24. The daily consumption of milk in excess of 20000 gallons is approximately exponentially distributed with $\lambda = \frac{1}{3000}$. The city has a daily stock of 35000 gallons. What is the probability that of 2 days selected at random, the stock is insufficient for both the days. **Ans: 0.0067**
25. The life of electronic components follows exponential distribution with mean of 4 years. The manufacturer of this component gives a replacement warranty of 3 years. (i) What proportion of components will be replaced in the period of warranty? (ii) What is the probability that a randomly selected component will have life within two standard deviations of the mean life? **Ans: (i) 0.5276 (ii) 0.9502**
26. Find the probabilities that the value of a random variable will exceed 4, if it has gamma distribution with (i) $\lambda = \frac{1}{3}, r = 2$ (ii) $\lambda = \frac{1}{4}, r = 3$. **Ans: (i) 0.5551 (ii) 4**
27. Consumer demand for milk in a certain locality, per month, is known to be a general gamma random variable. If the average demand is 'a' litres and the most likely demand is 'b' litres ($b < a$), what is the variance of the demand? **Ans: Var(X) = a(a-b)**