REDUCED Probability Distributions

12th Standard

Business Maths

40 x 1 = 40

1) Normal distribution was invented by
(a) Laplace (b) De-Moivre (c) Gauss (d) all the above

2) If X ~N(9,81) the standard normal variate Z will be
(a) $Z = \frac{X-81}{9}$ (b) $Z = \frac{X-9}{81}$ (c) $Z = \frac{X-9}{9}$ (d) $Z = \frac{9-X}{9}$

3) If Z is a standard normal variate, the proportion of items lying between Z = –0.5 and Z = –3.0 is
(a) 0.4987 (b) 0.1915 (c) 0.3072 (d) 0.3098

4) If X ~N(μ, σ^2), the maximum probability at the point of inflexion of normal distribution is
(a) $\left(\frac{1}{\sqrt{2\pi}}\right)^{e^{\frac{1}{2}}}$ (b) $\left(\frac{1}{\sqrt{2\pi}}\right)^{e^{\left(-\frac{1}{2}\right)}}$ (c) $\left(\frac{1}{\sigma\sqrt{2\pi}}\right)^{e^{\left(\frac{1}{2}\right)}}$ (d) $\left(\frac{1}{\sqrt{2\pi}}\right)$

5) In a parametric distribution the mean is equal to variance is :
(a) binomial (b) normal (c) poisson (d) all the above

6) In turning out certain toys in a manufacturing company, the average number of defectives is 1%. The probability that the sample of 100 toys there will be 3 defectives is
(a) 0.0613 (b) 0.613 (c) 0.00613 (d) 0.3913

7) The parameters of the normal distribution $f(x) = \left(\frac{1}{\sqrt{72\pi}}\right)\frac{e^{-(x-10)^2}}{72}$ $-\infty < x < \infty$
(a) (10,6) (b) (10,36) (c) (6,10) (d) (36,10)

8) A manufacturer produces switches and experiences that 2 per cent switches are defective. The probability that in a box of 50 switches, there are atmost two defective is :
(a) 2.5 e^{-1} (b) e^{-1} (c) $2e^{-1}$ (d) none of the above

9) An experiment succeeds twice as often as it fails. The chance that in the next six trials, there shall be at least four successes is
(a) 240/729 (b) 489/729 (c) 496/729 (d) 251/729

10) If for a binomial distribution b(n,p) mean = 4 and variance = 4/3, the probability, P(X ≥ 5) is equal to :
(a) $(2/3)^6$ (b) $(2/3)^5(1/3)$ (c) $(1/3)^6$ (d) $4(2/3)^6$

11) The average percentage of failure in a certain examination is 40. The probability that out of a group of 6 candidates atleast 4 passed in the examination are:
(a) 0.5443 (b) 0.4543 (c) 0.5543 (d) 0.4573

12) Forty percent of the passengers who fly on a certain route do not check in any luggage. The planes on this route seat 15 passengers. For a full flight,

what is the mean of the number of passengers who do not check in any luggage?

(a) 6.00 (b) 6.45 (c) 7.20 (d) 7.50

13) Which of the following statements is/are true regarding the normal distribution curve?

(a) it is symmetrical and bell shaped curve | (b) it is asymptotic in that each end approaches the horizontal axis but never reaches it | (c) its mean, median and mode are located at the same point | (d) all of the above statements are true.

14) Which of the following cannot generate a Poisson distribution?

(a) The number of telephone calls received in a ten-minute interval | (b) The number of customers arriving at a petrol station | (c) The number of bacteria found in a cubic feet of soil | (d) The number of misprints per page

15) The random variable X is normally distributed with a mean of 70 and a standard deviation of 10. What is the probability that X is between 72 and 84?

(a) 0.683 (b) 0.954 (c) 0.271 (d) 0.340

16) The starting annual salaries of newly qualified chartered accountants (CA's) in South Africa follow a normal distribution with a mean of Rs.180,000 and a standard deviation of Rs. 10,000. What is the probability that a randomly selected newly qualified CA will earn between Rs.165,000 and Rs.175,000 per annum?

(a) 0.819 (b) 0.242 (c) 0.286 (d) 0.533

17) In a large statistics class the heights of the students are normally distributed with a mean of 172cm and a variance of 25cm. What proportion of students are between 165cm and 181cm in height?

(a) 0.954 (b) 0.601 (c) 0.718 (d) 0.883

18) A statistical analysis of long-distance telephone calls indicates that the length of these calls is normally distributed with a mean of 240 seconds and a standard deviation of 40 seconds. What proportion of calls lasts less than 180 seconds?

(a) 0.214 (b) 0.094 (c) 0933 (d) 0.067

19) Cape town is estimated to have 21% of homes whose owners subscribe to the satelite service, DSTV. If a random sample of your home in taken, what is the probability that all four home subscribe to DSTV?

(a) 0.2100 (b) 0.5000 (c) 0.8791 (d) 0.0019

20) The area under the standard normal curve between $Z=-\infty$ and $z=\infty$ is

(a) 0 (b) 0.5 (c) 1 (d) 0.75

21) The standard normal distribution is represented by

(a) N(0,0) (b) N(1,0) (c) N(0,1) (d) N(1,1)

22) In 8 throws of a die, 1 or 3 is considered a success. Then the mean number of successes is

(a) $\frac{8}{3}$ (b) $\frac{4}{3}$ (c) $\frac{2}{3}$ (d) $\frac{5}{3}$

23) In a poison distribution, mean is 16, then standard deviation is

(a) 4 (b) 128 (c) 256 (d) 20

24) If Z is a standard normal variate, then $p(0< Z< \infty)$ is

(a) 0.5 (b) 1 (c) 0.25 (d) 0.75

25) In a binomial distribution if the mean is 8 and the variance is 6, then the number of trials is
(a) 32 (b) 48 (c) 16 (d) 12

26) The probability that a normal variate X lies in the interval (μ-σ, μ+σ) is
(a) 0.0027 (b) 0.9973 (c) 0.6826 (d) 0.9544

27) If the mean of the binomial distribution is 25, then its standard deviation lies in the interval
(a) [0,5) (b) (0,5] (c) [0,25] (d) (0,25]

28) The probability that a person will hit a target in shooting practice is 0.3. If he shoots 10 times, the probability that he hits the target is
(a) 1 (b) $1-(0.7)^{10}$ (c) $(0.7)^{10}$ (d) $(0.3)^{10}$

29) The variance of a binomial distribution is
(a) equal to its mean (b) less than its mean (c) greater than its mean (d) none

30) A die is tossed 5times. Getting an odd number is considered a success. Then the variance of distribution of number of success is
(a) $\frac{8}{3}$ (b) $\frac{3}{8}$ (c) $\frac{4}{5}$ (d) $\frac{5}{4}$

31) In a Poisson distribution mean is 25, then S.D is
(a) 5 (b) 625 (c) 125 (d) $\sqrt{5}$

32) In a binomial distribution, n=4, p(X=0) = $\frac{16}{81}$, then p(X=4) is
(a) $\frac{1}{16}$ (b) $\frac{1}{81}$ (c) $\frac{1}{27}$ (d) $\frac{1}{8}$

33) A coin is tossed 3 times. The probability of getting exactly 2 heads is _____
(a) $\frac{1}{2}$ (b) $\frac{1}{8}$ (c) $\frac{3}{8}$ (d) $\frac{1}{4}$

34) If the mean and variance of a binomial variate are 2 and 1 respectively, the probability that X takes a value greater than one is equal to _____
(a) $\frac{5}{16}$ (b) $\frac{11}{16}$ (c) $\frac{10}{16}$ (d) $\frac{1}{2}$

35) The sum of the mean and variance of a binomial distribution for 6 trial is 2.16. Then p = _____
(a) 0.4 (b) 0.6 (c) 0.8 (d) 0.2

36) A die is thrown 10 times. Getting a number greater than 3 is considered a success. The S.D of the number of successes is
(a) 2.5 (b) 1.58 (c) 5 (d) 25

37) If the mean is λ and variance is σ^2 in a Poisson distribution, then
(a) $\lambda = \frac{\sigma^2}{2}$ (b) $\sigma^2 = \frac{\lambda}{2}$ (c) $\lambda = \sigma^2$ (d) $\sigma^2 = \lambda$

38) If the variance of a Poisson distribution is 0.5. Then p(X = 3) is _____ ($e^{-0.5} = 0.6066$)
(a) 0.1206 (b) 0.0126 (c) 0.1260 (d) 12.60

39) For a binomial distribution with mean 2 and variance $\frac{4}{3}$, p = _____
(a) $\frac{2}{3}$ (b) $\frac{1}{3}$ (c) $\frac{3}{4}$ (d) $\frac{2}{\sqrt{3}}$

40) In a binomial distribution if n=5, p(x=3) =2. p(x=2), then p= _____
(a) 2q (b) 2p (c) q (d) $\frac{2q}{3}$

27 x 2 = 54

41) A fair coin is tossed 6 times. Find the probability that exactly 2 heads occurs.
42) Verfy the following statement:
The mean of a Binomial distribution is 12 and its standard deviation is 4.
43) In tossing of a five fair coin, find the chance of getting exactly 3 heads.
44) In a Poisson distribution the first probability term is 0.2725. Find the next Probability term

45) In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of errors per page, find the probability that a random sample of 5 pages will contain no error.
46) Define Binomial distribution.
47) Define Bernoulli trials.
48) Write down the conditions for which the binomial distribution can be used.
49) In a family of 3 children, what is the probability that there will be exactly 2 girls?
50) If the probability of success is 0.09, how many trials are needed to have a probability of atleast one success as 1/3 or more ?
51) A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of 2 successes.
52) The mean of a binomial distribution is 5 and standard deviation is 2. Determine the distribution.
53) Determine the binomial distribution for which the mean is 4 and variance 3. Also find P(X=15).
54) Define Poisson distribution.
55) Write any 2 examples for Poisson distribution.
56) Write the conditions for which the poisson distribution is a limiting case of binomial distribution.
57) Mention the properties of poisson distribution.
58) In a Poisson distribution 3 P(X = 2) = P(X = 4), then find the parameter of the distribution.
59) If the mean of the binomial distribution with 9 trial is 6, then find the variance.
60) If the mean of the binomial distribution is 20 and standard deviation is 4, then find the number of events.
61) Suppose X is a binomial variate X ~ B (5, p) and P(X = 2) = P(X = 3), then find p.
62) If 10 coins are tossed, find the probability that exactly 5 heads appears.
63) Students of a class were given an aptitude test. Marks were found to be normally distributed with mean 60 and S.D. 5. Find the percentage of students who scored more than 60 marks.
64) In a packet of 50 pens, 10 are defective, 10 pens are selected at random. What is the probability that atleast one is defective.
65) The random variable X has the normal distribution f(x) =$Ce^{-\left(\frac{x-100}{50}\right)^2}$, then find the value of C.

66) If you buy a lottery ticket in 50 lotteries, in each which your chance of winning a prize is $\frac{1}{100}$. What is the approximate probability that you will win a prize at least once (e-0.5 =0.6066).

67) The probability of the happening of an event X is 0.002 in an experiment. If an experiment is reported 1000 times, find the probability that the event X happens exactly twice? (e^{-2} =0.1353)

68) A and B play a game in which their chance of winning are in the ratio 3:2 Find A's chance of winning atleast three games out of five games played.

69) The probability that a student get the degree is 0.4 Determine the probability that out of 5 students
(i) one will be graduate
(ii) atleast one will be graduate

70) The mean of Binomials distribution is 20 and standard deviation is 4. Find the parameters of the distribution.

71) If x is a binomially distributed random variable with E(x) =2 and van (x)=4/3 Find P(x=5)

72) What is the probability of guessing correctly atleast six of the ten answers in a TRUE/FALSE objective test?

73) If the chance of running a bus service according to schedule is 0.8, calculate the probability on a day schedule with 10 services :
(i) exactly one is late
(ii) atleast one is late

74) Suppose A and B are two equally strong table tennis players. Which of the following two events is more probable:
(a) A beats B exactly in 3 games out of 4 or
(b) A beats B exactly in 5 games out of 8 ?

75) A pair of dice is thrown 4 times. If getting a doublet is considered a success, find the probability of 2 successes.

76) When counting red blood cells, a square grid is used, over which a drop of blood is evenly distributed. Under the microscope an average of 8 erythrocytes are observed per single square. What is the probability that exactly 5 erythrocytes are found in one square?

77) Assuming one in 80 births is a case of twins, calculate the probability of 2 or more sets of twins on a day when 30 births occur.

78) Mention the properties of binomial distribution.

79) Defects in yarn manufactured by a local mill can be approximated by a distribution with a mean of 1.2 defects for every 6 metres of length. If lengths of 6 metres are to be inspected, find the probability of less than 2 defects.

80) Among 28 professors of a certain department, 18 drive foreign cars and 10 drive local made cars. If 5 of these professors are selected at random, what is the probability that atleast 3 of them drive foreign cars?

81) Assume that a drug causes a serious side effect at a rate of three patients per one hundred. What is the probability that atleast one person will have side effects in a random sample of ten patients taking the drug?
82) Consider five mice from the same litter, all suffering from Vitamin A deficiency. They are fed a certain dose of carrots. The positive reaction means recovery from the disease. Assume that the probability of recovery is 0.73. What is the probability that atleast 3 of the 5 mice recover.
83) The mortality rate for a certain disease is 7 in 1000. What is the probability for just 2 deaths on account of this disease in a group of 400? Given $e^{(-2.8)} = 0.06$
84) It is given that 5% of the electric bulbs manufactured by a company are defective. Using poisson distribution find the probability that a sample of 120 bulbs will contain no defective bulb.
85) Assuming that a fatal accident in a factory during the year is 1/1200, calculate the probability that in a factory employing 300 workers there will be atleast two fatal accidents in a year. (given $e^{-0.25} = 0.7788$).
86) Hospital records show that of patients suffering from a certain disease 75% die of it. What is the probability that of 6 randomly selected patients, 4 will recover?
87) If electricity power failures occur according to a Poisson distribution with an average of 3 failures every twenty weeks, calculate the probability that there will not be more than one failure during a particular week.
88) Entry to a certain University is determined by a national test. The scores on this test are normally distributed with a mean of 500 and a standard deviation of 100. Raghul wants to be admitted to this university and he knows that he must score better than at least 70% of the students who took the test. Raghul takes the test and scores 585. Will he be admitted to this university?
89) The probability that an event A happens in one treat of an experiment is 0.4. Three independent treats of the experiment are performed. Find the p!probability that the event A happens at least once.
90) The standard deviation of a binomial distribution $(q + p)^{16}$ is 2. Find its mean.
91) If a random variable X follows Poisson distribution such that P(X = 2) = 9. P(X = 4) + 90 P(X = 6) then find the mean and variance.
92) Find the value of K if X is a normal variate whose p.d.f is given by f(x) = $\frac{1}{K}$ e^{8x-4x2}, -∞
93) Obtain K,μ and σ2 of of the normal distribution whose probability distribution function is f(x)=Ke^{-2x^2+4x-2}, -∞< x< ∞.
94) A die is thrown 120 times and getting 1 or 5 is considered a success. Find the mean and variance of the number of successes.
95) If on an average 1 ship out of 10 do not arrive safely to ports. Find the mean and the standard deviation of ships returning safely out of a total of 500 ships.
96) Alpha particles are emitted by a radio active source at an average rate of 5 in a 20 minutes interval. Using Poisson distribution find the probability that there will be atleast 2 emission in a particular 20 minutes interval ($e^{-5} = 0.0067$).

28 x 5 = 140

97) If on the average rain falls on 9 days in every thirty days, find the probability that rain will fall on atleast two days of a given week.
98) The sum and product of the mean and variance of a binomial distribution are 24 and 128. Find the distribution.
99) An insurance company has discovered that only about 0.1 per cent of the population is involved in a certain type of accident each year. If its 10,000 policy holders were randomly selected from the population, what is the probability that not more than 5 of its clients are involved in such an accident next year? (e^{-10}=.000045)
100) One fifth percent of the the blades produced by a blade manufacturing factory turn out to be defective. The blades are supplied in packets of 10. Use Poisson distribution to calculate the approximate number of packets containing no defective, one defective and two defective blades respectively in a consignment of 1,00,000 packets ($e^{-0.2}$ =.9802)
101) If the probability that an individual suffers a bad reaction from injection of a given serum is 0.001, determines the probability that out of 2,000 individuals (a) exactly 3, and (b) more than 2 individuals will suffer a bad reaction.
102) What is the probability that a standard normal variate Z will be
(i) greater than 1.09
(ii) less than -1.65
(iii) lying between -1.00 and 1.96
(iv) lying between 1.25 and 2.75
103) If X is a normal variate with mean 30 and SD 5. Find the probabilities that
(i) $26 \leq X \leq 40$
(ii) $X > 45$
104) The average daily sale of 550 branch offices was Rs.150 thousand and standard deviation is Rs. 15 thousand. Assuming the distribution to be normal, indicate how many branches have sales between
(i) Rs. 1,25,000 and Rs. 1, 45, 000
(ii) Rs. 1,40,000 and Rs. 1,60,000
105) The marks obtained in a certain exam follow normal distribution with mean 45 and SD 10. If 1,300 students appeared at the examination, calculate the number of students scoring
(i) less than 35 marks and
(ii) more than 65 marks.
106) 900 light bulbs with a mean life of 125 days are installed in a new factory. Their length of life is normally distributed with a standard deviation of 18 days. What is the expected number of bulbs expire in less than 95 days?
107) A bank manager has observed that the length of time the customers have to wait for being attended by the teller is normally distributed with mean time of 5 minutes and standard deviation of 0.6 minutes. Find the probability that a customer has to wait
(i) for less than 6 minutes
(ii) between 3.5 and 6.5 minutes
108) A sample of 125 dry battery cells tested to find the length of life produced the following resultd with mean 12 and sd 3 hours. Assuming that the data to be normal distributed , what percentage of battery cells are expected to have

life
(i) more than 13 hours
(ii) less than 5 hours
(iii) between 9 and 14 hours

109) Derive the mean and variance of binomial distribution.

110) If 5% of the items produced turn out to be defective, then find out the probability that out of 10 items selected at random there are
(i) exactly three defectives
(ii) atleast two defectives
(iii) exactly 4 defectives
(iv) find the mean and variance

111) In a particular university 40% of the students are having news paper reading habit. Nine university students are selected to find their views on reading habit. Find the probability that
(i) none of those selected have news paper reading habit
(ii) all those selected have news paper reading habit
(iii) atleast two third have news paper reading habit.

112) If 18% of the bolts produced by a machine are defective, determine the probability that out of the 4 bolts chosen at random
(i) exactly one will be defective
(ii) none will be defective
(iii) atmost 2 will be defective

113) Out of 750 families with 4 children each, how many families would be expected to have
(i) atleast one boy
(ii) atmost 2 girls
(iii) and children of both sexes? Assume equal probabilities for boys and girls.

114) Forty percent of business travellers carry a laptop. In a sample of 15 business travelers,
(i) what is the probability that 3 will have a laptop?
(ii) what is the probability that 12 of the travelers will not have a laptop?
(iii) what is the probability that atleast three of the travelers have a laptop?

115) An experiment succeeds twice as often as it fails, what is the probability that in next five trials there will be
(i) three successes and
(ii) at least three successes

116) Derive the mean and variance of poisson distribution.

117) A car hiring firm has two cars. The demand for cars on each day is distributed as a Poisson variate, with mean 1.5. Calculate the proportion of days on which
(i) Neither car is used
(ii) Some demand is refused

118) The average number of phone calls per minute into the switch board of a company between 10.00 am and 2.30 pm is 2.5. Find the probability that during one particular minute there will be
(i) no phone at all

(ii) exactly 3 calls
(iii) atleast 5 calls

119) The distribution of the number of road accidents per day in a city is poisson with mean 4. Find the number of days out of 100 days when there will be
(i) no accident
(ii) atleast 2 accidents and
(iii) at most 3 accidents.

120) The average number of customers, who appear in a counter of a certain bank per minute is two. Find the probability that during a given minute
(i) No customer appears
(ii) three or more customers appear .

121) A manufacturer of metal pistons finds that on the average, 12% of his pistons are rejected because they are either oversize or undersize. What is the probability that a batch of 10 pistons will contain
(a) no more than 2 rejects?
(b) at least 2 rejects?

122) Vehicles pass through a junction on a busy road at an average rate of 300 per hour.
1. Find the probability that none passes in a given minute.
2. What is the expected number passing in two minutes?

123) Four coins are tossed simultaneously. What is the probability of getting
a) atleast 2 heads
b) atmost 2 heads.

124) 20% of the bolts produced in a factory are found to be defective. Find the probability that in a sample of 10 bolts chosen at random exactly 2 will be defective using
(i) Binomial distribution
(ii) Poisson distribution ($e^{-2} = 0.1353$)

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