



Practice Set – IV

Sub: Statistical Methods & Data Analysis (MA 231)

1. Most computer languages have a function that can be used to generate random number. In Microsoft's Excel, the RAND function can be used to generate random numbers between 0 and 1. If we let x denote the random number generated, then x is a continuous random variable with the probability density function

$$f(x) = \begin{cases} 1, & \text{for } 0 \leq x \leq 1 \\ 0, & \text{elsewhere.} \end{cases}$$

- What is the probability of generating a random number between 0.25 and 0.75?
 - What is the probability of generating a random number with a value less than or equal to 0.30?
 - What is the probability of generating a random number with a value greater than 0.60?
2. An email message will arrive at a time uniformly distributed between 9:00AM and 11:00AM. You check email at 9:15AM and every 30 minutes afterward.
- What is the s.d. of arrival time (in mins.)?
 - What is the prob. that the message arrives less than 5mins before you view it?
 - What is the prob. that the message arrives more than 15mins before you view it?
3. *Internet Magazine* monitors internet service providers (ISPs) and provides statistics of their performance. The average time to download a web page for free ISPs is approximately 20 seconds for European Web pages. Assume the time to download a Web page follows an exponential distribution.
- What is the probability it will take less than 10 seconds to download a Web page?
 - What is the probability it will take more than 30 seconds to download a Web page?
 - What is the probability it will take between 10 and 30 seconds to download a Web page?
4. The CPU of a personal computer has a lifetime that is exponentially distributed with a mean lifetime of 8yrs. You have owned this CPU for 4yrs. What is the prob that the CPU fails in the next 4yrs.? Assume that a bank has owned 10 such CPUs that fail independently. What is the prob that at least one fails within the next 4yrs. ?
5. The marks obtained by 187 students of Real Analysis & Calculus are assumed to be approximately normally distributed with mean value 65 and with a standard deviation of 5. If 3 students are taken at random from this set, what is the probability that exactly 2 of them will have marks over 70?
6. Dennis Hogan is the supervisor for the Conowingo Hydroelectric Dam. Mr. Hogan knows that the dam's turbines generate electricity at the peak rate only when at least 1,000,000 gallons of water pass through the dam each day. He also knows, from experience, that the daily flow is normally distributed, with the mean equal to the previous day's flow and a standard deviation of 200.000 gallons. Yesterday, 850,000 gallons flowed through the dam. What is the probability that the turbines will generate at peak rate today?

7. Mr. Chatterjee, VP of personnel for the Life Insurance Corporation of India, has developed a new training program that is entirely self-paced. New employees work various stages at their own pace; completion occurs when the material is learned. Chatterjee's program has been especially effective in speeding up the training process, as an employee's salary during training is only 67% of that earned upon completion of the program. In the last several years, average completion time of the program was 44 days, and the standard deviation was 12 days.
- Find the probability an employee will finish the program in 33 to 42 days.
 - What is the probability of finishing the program in fewer than 30 days?
 - Find the probability of finishing the program in fewer than 25 or more than 60 days.
8. The results of a particular examination are: passed with distinction 10, passed 60, failed 30. It is known that a candidate fails if he obtains less than 40 marks (out of 100), while he must obtain at least 75 marks in order to pass with distinction. Determine the mean and standard deviation of marks assuming normal distribution.
9. In a referendum 60% of voters voted in favour. A random sample of 200 voters was selected. What is the probability that in the sample *i.* more than 130 voted in favour ? *ii.* between 105 and 130 inclusive voted in favour ? and *iii.* 120 voted in favour ?
10. The length of time (in seconds) that a user views a page on a Web site before moving to another page follows lognormal distribution with parameters $\mu = 0.5$ and $\sigma^2 = 2$.
- What is the prob. That a page is viewed for more than 10 seconds?
 - By what length of time have 50% of the users moved to another page?
 - What are the mean and s.d. of the time until a user moves from the page?
11. Evaluate the mean and variance of a lognormal distribution with the parameters μ and σ^2 .

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