Indira Gandhi Delhi Technical University For Women

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PROBABILITY AND STATISTICS (BAS-103)
TUTORIAL SHEET -5
(Distributions)

1) Comment on the following:
   The mean of a binomial distribution is 3 and variance is 4.

   [Ans. The statement is wrong]

2) If the independent random variables X, Y are binomially distributed, respectively with n= 3, p=1/3, and n = 5, p= 1/3, write down P($X + Y \geq 1$). [Ans. 0.96098]

3) In a book of 520 pages, 390 typo-graphical errors occur. Assuming Poisson law for the number of errors per page, find tile probability that a random sample of 5 pages will contain no error. [Ans. 0.023517]

4) If X is a Poisson variable such that P(X=2) =9 P(X=4) + 90 P(X=6). Find the mean and variance of X. [Ans. 1,1]

5) A person plays a game where they roll a fair die repeatedly. The game ends when they roll a 6. The number of rolls required to get a 6 follows a geometric distribution with parameter p=1/6 .
   a) If the person has already rolled the die 4 times without getting a 6, what is the probability that they will get a 6 on the next roll?
   b) What is the probability that it will take exactly 3 more rolls to get a 6, given that they have already rolled 4 times without getting a 6?

   [Ans. $\frac{1}{6}, \frac{25}{216}$]

6) In a production of iron rods let the diameter *X* be normally distributed with mean 2 inch and standard deviation 0.008 inch. What percentage of defectives can we expect if we set the tolerance limits at 2 ± 0.02 inch? [Ans. 0.9876]

7) Let *X* be normal with mean 5 and variance 0.04. Find *k* corresponding to the given probability:
   (i) P(X $\leq$ k) = 95%   (ii) P(X $\geq$ k) = 1% [Ans. 5.329, 5.465]

8) If the lifetime *X* of a certain kind of automobile battery is normally distributed with a mean of 5 years and a standard deviation of 1 year, and the manufacturer wishes to guarantee the battery for 4 years, what percentage of the batteries will he have to replace under the guarantee? [Ans.0.1587]

9) A random variable X has a uniform distribution over (-3,3), find k for which
$P[X > k] = \frac{1}{3}$. Also compute $P[X < 2]$ and $P[|X - 2| < 2]$.   [Ans. $1, \frac{5}{6}, 0.5$]

10) If X is uniformly distributed with mean 1 and variance $\frac{4}{3}$, Find P[X<0].   [Ans. $\frac{1}{4}$]

11) If X is uniformly distributed over [1,2], find z so that $P[X > z + \mu] = \frac{1}{4}$ [Ans. z=$\frac{1}{4}$]

12) Suppose a very large number of identical radioactive particles have decay times which are exponentially distributed with some parameter 2. If one half of the particles decay during the first second, how long will it take for 75% of the particles to decay? [Ans. $\frac{\ln 4}{2}$]

13) Let X be normally distributed with parameters **μ** and σ^2. Find numbers a and b such that a + bX has the standard normal distribution.   [Ans. b=$\frac{1}{\sigma}, a = \frac{-\mu}{\sigma}$]