

Name: _____ SID: _____

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Time of section (circle one): 9 10 11 12 1 2 3 4 5

Show your calculations or give reasons. Leave numerical answers unsimplified. You may use the normal c.d.f. Φ in your answers, but **you must simplify any infinite sums.**

1. In a population, 20% of the people are senior citizens. Among the senior citizens, 65% are female, but among those who are not senior citizens, 50% are female. One person is picked at random. Find $P(\text{person is a senior citizen} \mid \text{person is female})$.

2. A city has over a million people. Their ages have an average of 28 years and an SD of 15 years. A simple random sample of 400 people is chosen from the city. Find or approximate the chance that the average age of the sampled people is more than 28.5 years.

3. A random number generator draws at random with replacement from the 10 digits 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9. The generator will be run 19 times. Find the chance that three of the digits appear 4 times each and the other seven digits appear 1 time each.

4. I have k dice, each of which has 2 red faces and 4 blue faces. I roll each die once. Those that **do not** land red I roll again, once each. Let R be the total number of times red faces appear in all of the rolls. Find the distribution of R .

5. A class of 60 students includes 20 seniors. For a group project, the class is split at random without replacement into 10 groups of 6 students each. Find the expected number of groups that contain no seniors.

6 (continuing Problem 5). Find the variance of the number of groups that contain no seniors.

7. Suppose the random variable X has the geometric (p) distribution on $\{1, 2, 3, \dots\}$ and let $p > 2/3$. Find $E(3^X)$. If you use infinite sums, you must simplify them.

8. Let X_1, X_2, \dots be independent and identically distributed, each with Poisson (0.01) distribution. Let $S = X_1 + X_2 + \dots + X_{100}$. Sketch the probability histogram of S . Give decimal values for $E(S)$ and $SD(S)$, and show the interval $E(S) \pm SD(S)$ on the horizontal axis.