

American University of Beirut
STAT 230
Introduction to Probability and Random Variables
Spring 2008

quiz # 2

Name:

ID #:

circle your section please: 1 (TTH 8 am) 2 (TTH 2 pm)

1. In a lot of 10 light bulbs, there are 2 bad bulbs. An inspector examines 5 bulbs, which are selected at random and without replacement. Find the probability of at least one defective bulb among the 5.

2. A certain type of missile has failure probability 0.02. Find the probability that the first launch failure occurs after the 15th attempt.

3. Refer to the previous question, find the mean of the launch number of the fourth failure.

4. An examination consists of 20 multiple choice questions. Each question has 4 possible answers, from which 1 is correct. A student takes this exam and guesses the answers. Let Z be the number of correct answers. If $Z \geq 18$ is a passing score, find the probability that the student passes.
5. Refer to previous question, the scoring includes a penalty for guessing. If each correct answer is worth 2 point, and each wrong answer costs $1/2$ point (*for example, if a student answers 13 questions correctly and 7 questions incorrectly, the total score for this student will be $13 \cdot 2 - (1/2) \cdot 7 = 23.5$*). Find the expected score for a student who answers 15 questions correctly and guesses on the other 5 questions.
6. Suppose that the probability of suffering a side effect from a certain flu vaccine is 0.005. If 1000 persons are inoculated, approximate the probability that at most 1 persons suffers.

7. An urn initially contains one black and one white ball. At each stage a ball is randomly chosen and then replaced along with another of the same color. Let X denote the selection number of the first black ball chosen. Find the pdf of X .

8. Show that $E(X)$ does not exist for the random variable in the previous question.

9. Let X have a geometric distribution. Show that

$$P(X > k + j | X > k) = P(X > j)$$

10. The pdf of time X (in minutes) to failure of an electric component is

$$f(x) = \frac{2x}{1000^2} e^{-(x/1000)^2} \quad 0 < x < \infty$$

Find the probability that the component will last at least 2000 minutes

11. Refer to previous question, if 5 such components are selected, what's the probability that exactly 3 of them will last at least 2000 minutes ?