

American University of Beirut

STAT 230

Introduction to Probability and Random Variables

Fall 2010-2011

Final Exam

1. The amount of soft drink in a bottle is a normal random variable. Suppose that in 7% of the bottles containing this soft drink there are less than 15.5 ounces, and in 10% of them there are more than 16.3 ounces. Find the mean and standard deviation of the amount of soft drink in a randomly selected bottle.
2. The joint pdf of a couple of random variables is given in the following table:

$x \setminus y$	0	1	6
0	3/27	3/27	1/27
2	3/27	1/27	5/27
4	4/27	4/27	3/27

- Find the marginal pdf of Y
- Find $P(|X - Y| \leq 1)$
- Find $E(X^2Y)$

3. The distributions of the grades of the students of probability and calculus at a certain university are $\mathcal{N}(65, 418)$ and $\mathcal{N}(72, 448)$, respectively. The calculus section has 28 students and the probability section has 22 students. Find the probability that the difference between the averages of the final grades of these two classes is at least 2.
4. Let X and Y be a couple of random variable with joint pdf

$$f(x, y) = x^2 e^{-x(y+1)}, \quad x > 0, \quad y > 0$$

Are X and Y independent ?

5. Suppose that the scores on a certain manual dexterity test are normal with mean 12 and standard deviation 3. If eight randomly selected individuals take the test, what is the probability that none will make a score less than 14 ?

6. Let X and Y be a couple of random variables with joint pdf

$$f(x, y) = \frac{1}{2}, \quad 0 < x < 1, \quad 0 < y < 2$$

Find the pdf of $U = X/Y$.

7. Let X_1 and X_2 be independent exponential random variables both with mean 1.

Let $Y = \max(X_1, X_2)$. Find $E(Y)$.

8. If 20 random numbers are selected independently from the interval $(0, 1)$, what is the approximate probability that the sum of these numbers is at least eight ?