1. Given a random variable $X \sim b(n, p)$, and $E(X) = 2.4, D(X) = 1.44$, then the values of n, p are

A. $n = 4,\ p = 0.6$ B. $n = 6,\ p = 0.4$ C. $n = 8,\ p = 0.3$ D. $n = 24,\ p = 0.1$

2. Given a random variable $X \sim U(-1,1)$, and $Y = X^3$, then variables X, Y are

A. uncorrelated and independent B. uncorrelated and dependent

C. correlated and independent D. correlated and dependent

3. Given random variables X, Y satisfying $E(XY) = E(X)E(Y)$, which of the following is true?

A. $D(XY) = D(X)D(Y)$ B. $D(X + Y) = D(X) + D(Y)$

C. X and Y are independent D. X and Y are dependent

4. Given random variables X, Y satisfying $P\{Y = aX + b\} = 1$, where a, b are nonzero constant and $0 < D(X) < +\infty$, then ρ_{XY}

A. $= 1$ B. $= -1$ C. $= \frac{a}{|a|}$ D. < 1

5. Given independent random variables $X_1 \sim U(0,6), X_2 \sim \mathcal{N}(0,4)$, and $X_3 \sim \pi(3)$, $D(X_1 - 2X_2 + 3X_3)$ =________________.

6. In 100 Bernoulli trials, let p be the probability of success in each experiment. Let K be the number of successes, the maximum value of $D(K) =$ ____________ which is achieved when $p =$____________.

7. Given $E(X) = -2, E(Y) = 2, D(X) = 1, D(Y) = 4$ and $\rho_{XY} = -0.5$, find the following probability with Chebyshev's inequality $P\{|X + Y| \geq 6\} \leq$____________.

8. Given a random variable $X \sim \pi(\lambda)$, and $E[(X - 1)(X - 2)] = 1$, then $\lambda =$__________________.

9. Given $E(X) = 2, E(Y) = 4, D(X) = 4, D(Y) = 9$ and $\rho_{XY} = 0.5$, then $E(3X^2 - 2XY + Y^2 - 3) =$________________, $D(3X - Y) =$_______________.

10. Given random variables $X \sim U(0,1), Y \sim U(1,3)$, assuming X and Y are independent, then $E(XY) =$_______________, $D(XY) =$______________.

11. An airline sells 200 tickets for a certain flight on an airplane that has only 198 seats because, on average, 1 percent of purchasers of airline tickets do not appear for the departure of their flight. Determine the probability that every who appears for the departure of this flight will have a seat.

12. Suppose that 75 percent of the people in a certain metropolitan area live in the city and 25 percent of the people live in the suburbs. If 1200 people attending a certain concert represent a random sample from the metropolitan area, what is the probability that the number of people from the suburbs attending the concert will be fewer than 270? **Hint:** no continuity correction is needed.

13. A random sample of n items is to be taken from a distribution with mean μ and standard deviation σ.
a. Use the Chebyshev inequality to determine the smallest number of items n that must be taken in order to satisfy the relation:$\Pr\left(|\overline{X_n} - \mu| \leq \frac{\sigma}{4}\right) \geq 0.99$.
b. Use the central limit theorem to determine the smallest number of items n that must be taken in order to satisfy the relation in part (a) approximately.

Think: Why both results are different? Which one is more reasonable?