

Econ 311: Statistical Methods and Interpretation

Sample Midterm II

Multiple choice Questions

1. Consider the following probability distribution. Which of the following is true?

x	0	1	2	3	4	5	6
$P(x)$	0.07	0.19	0.23	0.17	0.16	0.14	0.04

- A) $P(X > 3) = 0.51$
B) $P(2 \leq X \leq 5) = 0.33$
C) $P(X \geq 3) = 0.51$
D) $P(X < 6) = 1$

ANSWER: C

2. Which of the following is an example of a discrete random variable?

- A) The distance you can drive in a car with a full tank of gas.
B) The number of cows on a cattle ranch.
C) The weight of a package at the post office.
D) The amount of rain that falls over a 24-hour period.

ANSWER: B

QUESTIONS 3 AND 4 ARE BASED ON THE FOLLOWING INFORMATION:

On average, there are 3.2 defects in a sheet of rolled steel. Assume that the number of defects follows a Poisson distribution.

3. What is the probability of having exactly 3 defects in a roll?

- A) 0.412
B) 0.223
C) 0.318
D) 0.335

ANSWER: B

4. What is the probability of having more than 3 defects in a roll?

- A) 0.354
B) 0.412
C) 0.621
D) 0.398

ANSWER: D

QUESTIONS 5 AND 6 ARE BASED ON THE FOLLOWING INFORMATION:

Suppose you know that the number of complaints coming into a phone center averages 4.2 every ten minutes. Assume that the number of calls follows the Poisson distribution.

5. What is the probability that there are three or fewer calls during the next ten minutes?

- A) 0.211
- B) 0.372
- C) 0.395
- D) 0.425

ANSWER: C

6. What is the probability that there are exactly four calls during the next ten minutes?

- A) 0.194
- B) 0.172
- C) 0.156
- D) 0.134

ANSWER: A

QUESTIONS 7 AND 8 ARE BASED ON THE FOLLOWING INFORMATION:

In an office of 18 people, there are 7 men and 11 women. A sub-committee of four people will be formed from this group.

7. What is the probability that the sub-committee contains two men and two women?

- A) 0.377
- B) 0.522
- C) 0.261
- D) 0.755

ANSWER: A

8. How many different ways can you select four people from a group of 18?

- A) 1386
- B) 1584
- C) 3280
- D) 3060

ANSWER: D

9. Let $a = -\mu_x / \sigma_x$ and $b = 1 / \sigma_x$ in the linear function $Z = a + bX$. Which of the following statements is true?

- A) $\mu_z = \mu_x$
- B) $\mu_z = 0$
- C) $\sigma_z = a + b\sigma_x$

D) $\sigma_z = \sigma_x$

ANSWER: B

QUESTIONS 10 AND 11 ARE BASED ON THE FOLLOWING INFORMATION:

A computer store receives a shipment of 14 computers, 5 of which already have modem installed. Unfortunately, the boxes are not labeled so you are unsure which computers are which. Assume you select 4 computers.

10. What is the probability that exactly two of them have modems?

A) 0.3288

B) 0.3704

C) 0.3596

D) 0.3012

ANSWER: C

11. What is the probability that no more than two of them have modems?

A) 0.802

B) 0.871

C) 0.834

D) 0.905

ANSWER: D

QUESTIONS 12 AND 13 ARE BASED ON THE FOLLOWING INFORMATION:

70% of the customers at the local ice cream shop order their ice cream on a sugar cone. Assume that the next ten customers order independently of one another.

12. What is the probability that more than half of them order sugar cones?

A) 0.95

B) 0.85

C) 0.05

D) 0.15

ANSWER: B

13. What is the probability that exactly seven of them order sugar cones?

A) 0.2668

B) 0.5000

C) 0.6500

D) 0.3500

ANSWER: A

14. Which of the following is a measure of the linear relationship between two variables?

A) The covariance

- B) The correlation coefficient
- C) The variance
- D) Both A and B

ANSWER: D

15. Generally speaking, if two variables are unrelated (as one increases, the other shows no pattern), the covariance between the variables will be

- A) a large positive number.
- B) a large negative number.
- C) a positive or negative number close to zero.
- D) None of the above.

ANSWER: C

16. Given that $s_x^2 = 400$, $s_y^2 = 625$, $\text{Cov}(X, Y) = 375$, and $n = 10$, then the correlation coefficient is:

- A) 0.75
- B) 0.70
- C) 0.85
- D) 0.80

ANSWER: A

17. Which of the following statements regarding a binomial experiment is false, where n is the number of trials, and p is the probability of success in each trial?

- A) The n trials are independent.
- B) The standard deviation is $np(1 - p)$.
- C) The mean is np .
- D) There are only two possible outcomes.

ANSWER: B

18. Which of the following is an example of a binomial experiment?

- A) A shopping mall is interested in the income level of its customers and is taking a survey to gather information.
- B) A business firm introducing a new product wants to know how many purchases its clients will make each year.
- C) A sociologist is researching an area in an effort to determine the proportion of households with a male head of household.
- D) A study is concerned with the average number of hours worked by high school students.

ANSWER: C

19. If X and Y are independent random variables, which of the following identities is false?

- A) $\text{Cov}(X, Y) = 1$
- B) $\text{Cov}(X, Y) = 0$
- C) $E(X + Y) = E(X) + E(Y)$
- D) $\text{Var}(X - Y) = \text{Var}(X) + \text{Var}(Y)$

ANSWER: A

20. Which of the following experiments can be modeled by the Poisson distribution?
- A) The number of calls received by a switchboard during a given period of time.
 - B) The number of bacteria per small volume of fluid.
 - C) The number of customer arrivals at a checkout counter during a given minute.
 - D) All of the above.

ANSWER: D

21. Which probability distribution is appropriate when the events of interest occur randomly, independently of one another, and rarely?
- A) Binomial distribution
 - B) Hypergeometric distribution
 - C) Poisson distribution
 - D) Any discrete probability distribution

ANSWER: C

22. Which probability distribution is appropriate when sampling without replacement?
- A) Hypergeometric distribution.
 - B) Binomial distribution.
 - C) Poisson distribution.
 - D) All of the above answers are correct.

ANSWER: A

23. The mean of a Poisson random variable x , where λ is the average number of times that an event occurs in a certain period of time or space, is
- A) λ .
 - B) λ^2 .
 - C) $\sqrt{\lambda}$.
 - D) $\lambda + 1$.

ANSWER: A

24. Which of the following cannot generate a Poisson distribution?
- A) The number of telephone calls received by a switchboard in a specified time period.
 - B) The number of customers arriving at a gas station in Christmas day.
 - C) The number of bacteria found in a cubic yard of soil.
 - D) The number of children in a family.

ANSWER: D

25. If X and Y are any random variables, which of the following identities is not always true?

- A) $E(X+Y) = E(X) + E(Y)$
- B) $\text{Var}(X+Y) = V(X) + V(Y)$
- C) $E(4X+5Y) = 4E(X) + 5 E(Y)$
- D) $\text{Var}(4X+5Y) = 16V(X) + 25V(Y) + 40\text{COV}(X,Y)$

ANSWER: B

26. If X and Y are random variables with $E(X) = 5$ and $E(Y) = 8$, then $E(2X+3Y)$ is:

- A) 34.
- B) 13.
- C) 18.
- D) 40.

ANSWER: A

27. If X and Y are random variables with $\text{Var}(X) = 7.5$, $\text{Var}(Y) = 6$ and $\text{Cov}(X,Y) = 4$, then $\text{Var}(2X+3Y)$ is:

- A) 132.
- B) 37.
- C) 88.
- D) 33.

ANSWER: A

28. If X and Y are any random variables with $E(X) = 50$, $E(Y) = 6$, $E(XY) = 21$, $\text{Var}(X) = 9$ and $\text{Var}(Y) = 10$, then the relationship between X and Y is a :

- A) strong positive relationship.
- B) strong negative relationship.
- C) weak positive relationship.
- D) weak negative relationship

ANSWER: B.

29. Which of the following identities is true If X and Y are independent random variables?

- A) $E(2X+3Y) = E(X) + E(Y) + 5$
- B) $\text{Var}(2X+3Y) = 2\text{Var}(X) + 3\text{Var}(Y)$
- C) $\text{Var}(2X+3Y) = 4\text{Var}(X) + 9\text{Var}(Y)$
- D) $E(2X+3Y) = 5E(X+Y)$

ANSWER: C

30. The covariance of two variables X and Y

- A) must be between -1 and +1.
- B) must be positive.
- C) can be positive or negative.
- D) must be less than +1.

ANSWER: C

QUESTIONS 31 THROUGH 32 ARE BASED ON THE FOLLOWING INFORMATION:

The amount of time you have to wait at a particular stoplight is uniformly distributed between zero and two minutes.

31. What is the probability that you have to wait more than 30 seconds for the light?

- A) 0.25
- B) 0.50
- C) 0.75
- D) 1.01

ANSWER: C

32. What is the probability that you have to wait between 15 and 45 seconds for the light?

- A) 0.15
- B) 0.25
- C) 0.35
- D) 0.45

ANSWER: B

QUESTIONS 33 AND 34 ARE BASED ON THE FOLLOWING INFORMATION:

You have recently joined a country club. The number of times you expect to play golf in a month is represented by a random variable with a mean of 10 and a standard deviation of 2.2. Assume you pay monthly membership fees of \$500 per month and pay an additional \$50 per round of golf.

33. What is your average monthly bill from the country club?

- A) \$700
- B) \$800
- C) \$900
- D) \$1000

ANSWER: D

34. What is the standard deviation for your average monthly bill from the country club?

- A) \$220
- B) \$110
- C) \$324
- D) \$180

ANSWER: B

QUESTIONS 35 THROUGH 36 ARE BASED ON THE FOLLOWING INFORMATION:

Let the random variable Z follow a standard normal distribution.

35. What is $P(Z > 1.2)$?

- A) 0.1112
- B) 0.8849

C) 0.1151

D) 0.6112

ANSWER: C

36. What is $P(0.33 < Z < 0.45)$?

A) 0.5443

B) 0.0443

C) 0.4557

D) 0.1515

ANSWER: B

QUESTIONS 37 AND 38 ARE BASED ON THE FOLLOWING INFORMATION:

Let the random variable X follow a normal distribution with a mean of 17.1 and a standard deviation of 3.2.

37. What is $P(X > 16)$?

A) 0.3401

B) 0.6331

C) 0.3669

D) 0.8326

ANSWER: B

38. What is $P(15 < X < 20)$?

A) 0.5581

B) 0.1814

C) 0.5640

D) 0.2546

ANSWER: C

QUESTIONS 39 AND 40 ARE BASED ON THE FOLLOWING INFORMATION:

Investment A has an expected return of 8% with a standard deviation of 2.5%. Investment B has an expected return of 6% with a standard deviation of 1.2%. Assume you invest equally in both investments and that the rates of return are independent.

39. What is the expected return of your portfolio?

A) 8%

B) 7%

C) 6%

D) 4%

ANSWER: B

40. What is the standard deviation of the return on your portfolio? Assume that the returns on the two investments are independent.
- A) 2.77
 - B) 2.50
 - C) 7.69
 - D) 6.25
- ANSWER: A**

QUESTIONS 41 AND 42 ARE BASED ON THE FOLLOWING INFORMATION:

During a professor's office hours, students arrive, on average, every ten minutes. Assume that the distribution of the time between arrivals follows an exponential distribution. Suppose that a student has just left.

41. What is the probability that the professor has more than 20 minutes before the next student shows up?
- A) 0.8187
 - B) 0.8647
 - C) 0.1353
 - D) 0.1813
- ANSWER: C**
42. Suppose that a student has just left. Only 25% of the time will the professor have to wait approximately how long or longer before the next student shows up?
- A) 13.9 minutes
 - B) 14.6 minutes
 - C) 2.9 minutes
 - D) 15.3 minutes
- ANSWER: A**
43. Investment *A* has an expected return of 7.8% with a standard deviation of 2%. Investment *B* has an expected return of 7.2% with a standard deviation of 3.1%. Assume the returns on both of these stocks are normally distributed. Which stock is more likely to have a return greater than 10%?
- A) Stock *A*
 - B) Stock *B*
 - C) The probability is the same for both *A* and *B*.
 - D) Unable to determine.
- ANSWER: B**

44. Which of the following is not a characteristic for a normal distribution?

- A) It is symmetrical distribution
- B) The mean is always zero
- C) The mean, median, and mode are all equal
- D) It is a bell-shaped distribution

ANSWER: B

45. Let the random variable Z follow a standard normal distribution, and let z_1 be a possible value of Z that is unknown but identifiable by position and area. Find z_1 if the area to the right of z_1 is 0.0869:

- A) -1.36.
- B) 1.71.
- C) 1.36.
- D) 1.80.

ANSWER: C

46. A very large logging operation has serious problems keeping their skidders operating properly. The equipment fails at the rate of 3 breakdowns every 48 hours. . Assume that x is time between breakdowns and is exponentially distributed. The probability of two or less breakdowns in the next 48-hour period is

- A) 0.9672.
- B) 0.0307.
- C) 0.2231.
- D) 0.7769.

ANSWER: B

47. If the random variable x is exponentially distributed with parameter $\lambda = 1.5$, then the probability $P(2 \leq X \leq 4)$ is equal to

- A) 0.6667.
- B) 0.5000.
- C) 0.0473.
- D) 0.2500.

ANSWER: C

48. Which of the following is not true for an exponential distribution with parameter λ ?

- A) Mean = $1/\lambda$.
- B) Standard deviation = $1/\lambda$.
- C) The distribution is completely determined once the value of λ is known
- D) The distribution is symmetric around the mean.

ANSWER: D