Exam #2

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Multiple Choice (5 points for each question #'s: 1-30)

Directions: Make one selection for each question (unless otherwise stated).

1.A statistical experiment is a process that, when performed:

A) Results in one and only one of two observations
B) Results in at least two of many observations
C) May not lead to the occurrence of any outcome
D) Results in one and only one of many observations

2. A sample point is

A) A collection of many sample spaces
B) A point that represents a population in a sample
C) An element of a sample space
D) A collection of observations

3. An event

A) Is the same as a sample space
B) Includes exactly one outcome
C) Includes one or more outcomes
D) Includes all possible outcomes

4.A simple event

A) Is a collection of exactly two outcomes
B) Includes one and only one outcome
C) Does not include any outcome
D) Includes all possible outcomes

5.A compound event includes

A) At least three outcomes
B) At least two outcomes
C) One and only one outcome
D) All outcomes of an experiment

6.The experiment of tossing a coin 3 times has

A) 2 outcomes B) 8 outcomes C) 6 outcomes D) 5 outcomes

7.You randomly select two households and observe whether or not they own a telephone answering machine. Which of the following is a simple event?

A) Exactly one of them owns a telephone answering machine.
B) At least one of them owns a telephone answering machine.
C) At most one of them owns a telephone answering machine.
D) Neither of the two owns a telephone answering machine.

8.A conditional probability is a probability

A) Of a sample space based on a certain condition
B) That an event will occur given that another event has already occurred
C) That an event will occur based on the condition that no other event is being considered
D) That an event will occur based on the condition that no other event has already occurred

9.Two mutually exclusive events

A) Always occur together
B) Can sometimes occur together
C) Cannot occur together
D) Can occur together, provided one has already occurred

10. Two events A and B are independent if

A) $P(A)$ is equal to $P(B)$
B) $P(B|A)$ is equal to $P(A)$
C) $P(A|B)$ is equal to $P(A)$
D) $P(A|B)$ is equal to $P(B)$

11. A random variable is a variable whose value is determined by the:

A) Outcome of a random experiment
B) Random population
C) Random space
D) Random subjective probability

12. Which of the following is true for the probability distribution of a discrete random variable x?

A) $\sum P(x) < 0$ B) $\sum P(x) = 1$ C) $\sum P(x) = 2$ D) $\sum P(x) > 1$

13. For the probability distribution of a discrete random variable x, the sum of the probabilities of all values of x must be:

A) Equal to zero B) In the range zero to 1 C) Equal to 0.5 D) Equal to 1

14. Which of the following is true for the probability of a discrete random variable x?

A) $P(x) < 0$ B) $P(x) > 1$ C) $P(x) = 2$ D) $0 \le P(x) \le 1$

15. For a discrete random variable x, the probability of any value of x is:

A) always greater than 1
B) always less than zero
C) always in the range zero to 1
D) never greater than zero

16. The probability distribution table of a discrete random variable lists:

A) The bottom half of the values that the random variable can assume and their corresponding probabilities
B) All of the values that the random variable can assume and their corresponding probabilities
C) all of the values that the random variable can assume and their corresponding frequencies
D) The top half of the values that the random variable can assume and their corresponding frequencies

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

A) The weight of a box of cookies
B) The length of a window frame

C) The number of horses owned by a farmer
D) The distance from home to work for a worker

18. Which of the following is not an example of a discrete random variable?

A) The number of days it rains in a month in New York
B) The number of stocks a person owns
C) The number of persons allergic to penicillin
D) The time spent by a physician with a patient

19. A continuous random variable is a random variable:

A) That can assume any value in one or more intervals
B) Whose set of values is countable?
C) That is derived from a random population
D) That is determined by random probability

20. A discrete random variable is a random variable:

A) That can assume any value in one or more intervals
B) Whose set of values is countable
C) That is derived from a random population
D) That is determined by random probability

21. For a normal distribution, the *z* value for the mean is always:

A) equal to zero B) negative C) equal to 1 D) positive

22. For a normal distribution, the *z* value for an *x* value that is to the left of the mean is always:

A) equal to zero B) negative C) less than 1 D) positive

23. For a normal distribution, the *z* value for an *x* value that is to the right of the mean is always:

A) equal to zero B) negative C) greater than 1 D) positive

24. For the standard normal distribution, the *z* value gives the distance between the mean and a point in terms of the:

A) mean B) standard deviation C) variance D) center of the curve

25. For the standard normal distribution, the mean is:

A) 1 and the standard deviation is zero
B) 0.5 and the standard deviation is 0.5
C) zero and the standard deviation is 1
D) 1 and the standard deviation is 1

26. For a normal distribution, the spread of the curve decreases and its height increases as:

A) The sample size decreases
B) The standard deviation decreases
C) The ratio of the mean and standard deviation increases
D) The mean increases

27. The parameters of the normal distribution are:

A) μ and σ B) $\mu, x,$ and σ C) $\mu, \sigma,$ and z D) $\mu, x, z,$ and σ

28. The tails of a normal distribution curve:

A) Meet the horizontal axis at $z = 3.0$
B) Never meet or cross the horizontal axis
C) Cross the horizontal axis at $z = 4.0$
D) Are non-symmetric

29. Which of the following is *not* a characteristic of the normal distribution?

A) The total area under the curve is 1.0
B) The curve is symmetric about the mean
C) The value of the mean is always greater than the value of the standard deviation
D) The two tails of the curve extend indefinitely

30. The total area under a normal distribution curve to the left of the mean is always:

A) equal to 1 B) equal to zero C) equal to 0.5 D) greater than .5

Short Response (10 points for each question #'s: 31-35)

31. In a group of 88 students, 16 are seniors. If you select one student randomly from this group, the probability (rounded to three decimal places) that this student is a senior is: 0.182

32. The following table lists the probability distribution of a discrete random variable *x*:

X	0	1	2	3	4	5	6	7
P(*x*)	0.04	0.11	0.18	0.22	0.12	0.21	0.09	0.03

a. The probability that *x* is less than 5 is: 0.67
b. The probability that *x* is greater than 3 is:0.37
c. The probability that *x* is less than or equal to 5 is:0.97
d. The probability that *x* is greater than or equal to 4 is:0.44
e. The probability that *x* assumes a value from 2 to 5 is:0.63

33. The net weights of all boxes of Top Taste cookies produce a distribution that is approximately normal with a mean of 31.74 and a standard deviation of 0.58.

    a. The probability that the net weight of a randomly selected box of these cookies is more than 32.6 ounces, rounded to four decimal places, is: 0.0062

    b. The probability that the net weight of a randomly selected box of these cookies is less than 31.58 ounces, rounded to four decimal places, is:0.0170
    c. The probability that the net weight of a randomly selected box of these cookies is between 31.8 and 32.5 ounces, rounded to four decimal places, is:0.2467

34. How many different four letter words can you make from the word, PEPPERMINT?

10P4 = 10! / (10 - 4)!

= 10! / 6!
= 10 x 9 x 8 x 7
= 5,040
Where n= the total number of items (the ten letters in the word PEPPERMINT)
r = number of items selected

35. A person buys a ticket for a draw that is comprised of five digits from 0 to 9 and four letters; and one winning ticket is drawn. Assuming that all the tickets have been sold, determine the probability of a person winning the draw.

There are 10 possible digits (0-9) and 26 possible letters (A-Z) for each of the four letter spaces, so there are:

10 * 10 * 10 * 10 * 26 * 26 * 26 * 26 = 456,976,000 possible tickets

Only one ticket will be drawn as the winning ticket, so there is only one winning outcome.

Therefore, the probability of winning the draw is:

1 / 456,976,000

Extended Response (25 points for each question #'s: 36-37

36. A pollster asked 1000 adults whether Republicans or Democrats have better domestic economic policies. The following table gives the two-way classification of their opinions.

Sex	Republicans	Democrats	No Opinion
Male	205	350	39
Female	185	190	31

The pollster then randomly selected one adult from these 1,000 adults.

a. The probability that the selected adult is a male is: (round your answer to three decimal places)

P(male) = (205 + 350 + 39) / 1000 = 0.594

b. The probability that the selected adult says Democrats have better domestic economic policies is: (round your answer to three decimal places)

P(Democrats) = (350 + 190 + 31) / 1000 = 0.571

c. The probability that the selected adult is a female given that she thinks that Republicans have better domestic economic policies is approximately (round your answer to three decimal places):

P(female | Republicans) = P(Republicans | female) * P(female) / P(Republicans)

P(Republicans | female) = 185 / (185 + 190 + 31) = 0.450

P(female) = (185 + 190 + 31) / 1000 = 0.406

P(Republicans) = (205 + 185) / 1000 = 0.390 +

So,

P(female | Republicans) = 0.450 * 0.406 / 0.390 = 0.468

d. The probability that the selected adult has no opinion given that he is a male is approximately (round your answer to three decimal places):

P(no opinion | male) = P(male | no opinion) * P(no opinion) / P(male)

P(male | no opinion) = 39 / (205 + 350 + 39) = 0.036

P(no opinion) = (39 + 31) / 1000 = 0.070

P(male) = (205 + 350 + 39) / 1000 = 0.594

So,

P(no opinion | male) = 0.036 * 0.070 / 0.594 = 0.004

e. The joint probability (rounded to three decimal places) of events "Republicans" and "Male" is:

P(Republicans and Male) = 205 / 1000 = 0.205

37. A survey group of 10 basketball players are chosen at random from thirty college athletes and fifteen professionals. Determine the probability that at least 5 of the athletes chosen are college athletes.

To solve this problem, we can use the binomial distribution formula, which gives us the probability of obtaining a certain number of successes in a fixed number of independent trials. In this case, the trials are the selection of 10 basketball players, and a success is defined as selecting a college athlete.

The probability of selecting a college athlete is given by:

P(college athlete) = 30/45 = 2/3

The probability of selecting a professional athlete is:

P(professional athlete) = 15/45 = 1/3

The probability of selecting at least 5 college athletes can be calculated as follows:

P(X ≥ 5) = P(X = 5) + P(X = 6) + P(X = 7) + P(X = 8) + P(X = 9) + P(X = 10)

where X is the number of college athletes selected.

Using the binomial distribution formula, we can calculate the probability of selecting exactly k college athletes out of n total players as:

P(X = k) = (n choose k) * p^k * (1 - p)^(n-k)

where (n choose k) represents the number of ways of selecting k college athletes out of n total players, and p is the probability of selecting a college athlete.

Using this formula, we can calculate the probability of selecting at least 5 college athletes as:

P(X ≥ 5) = (10 choose 5) * (2/3)^5 * (1/3)^5 + (10 choose 6) * (2/3)^6 * (1/3)^4 + (10 choose 7) * (2/3)^7 * (1/3)^3 + (10 choose 8) * (2/3)^8 * (1/3)^2 + (10 choose 9) * (2/3)^9 * (1/3)^1 + (10 choose 10) * (2/3)^10 * (1/3)^0

Using a calculator or a computer, we can find that:

P(X ≥ 5) ≈ 0.984