Name: _____

STATISTICS

PART 4 PRACTICE EXAM 2

Time – 1 hour and 30 minutes

Number of multiple choice questions – 20

Number of free response questions - 3

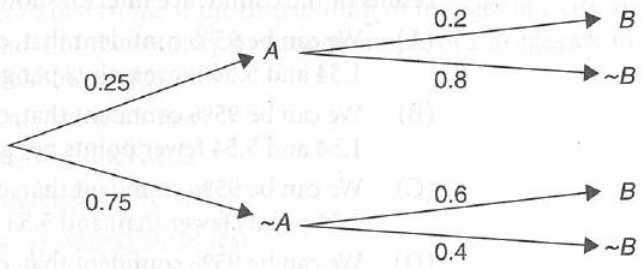
1.

What is the probability that on five rolls of a fair die you will roll three or more 1s?

(A) 99.7%
(B) 96.5%
(C) 40.2%
(D) 3.5%
(E) 0.3%

2.

Given the tree diagram shown, what is the probability that event B will happen given that event A has already occurred?



(A) 10%
(B) 20%
(C) 45%
(D) 50%
(E) 75%

3.

If $P(A) = 0.7$, $P(not\ B) = 0.4$, and $P(A \text{ and } B) = 0.5$, find $P(A \text{ or } B)$.

(A) 1.3
(B) 0.6
(C) 0.8
(D) 0.1
(E) 1.1

4.

There are 100 students enrolled in various AP* courses at Addison High School. There are 31 students enrolled in AP* Statistics, 52 students enrolled in AP* English, and 15 students enrolled in AP* French. Ten students study both AP* Statistics and AP* English, 5 students study both AP* Statistics and AP* French, 8 students study both AP* English and AP* French, and 3 students study all three AP* subjects. What is the probability that a student takes an AP* course other than these three?

(A) 9%
(B) 12%
(C) 22%
(D) 78%
(E) 93%

5.

Only 6 out of every 100 people have blood type O^+. What is the probability that in a random sample of individuals, the first person with type O^+ blood will be the eighth person tested?

(A) $C(8, 8)(0.06)^8(0.94)^0$
(B) $C(8, 1)(0.06)^1(0.94)^7$
(C) $C(1, 8)(0.06)^1(0.94)^7$
(D) $(0.06)^1(0.94)^7$
(E) $(0.06)^7(0.94)^1$

6.

Mr. DeVeaux teaches two sections of AP* Physics. He has 38 seniors in one section and 24 juniors in the other section. The overall mean for both sections on the midterm exam was 87. If the junior section had a mean of 92, what was the approximate mean for the senior section on the midterm exam?

(A) 82.6
(B) 83.8
(C) 89.5
(D) 87.0
(E) 90.4

7.

Statistics show that 7.3% of workers between the ages of 16 and 24 earn the minimum wage or less. What is the probability that if three young adults between the ages of 16 and 24 are polled, two or more will earn the minimum wage or less?

(A) 0.0004
(B) 0.0148
(C) 0.0152
(D) 0.0627
(E) 0.0677

8.

Of the registered voters in a community, 58% are female. A local politician running for office has the support of 48% of the registered women and 53% of the registered men. What percentage of the vote can the politician expect to get?

(A) 49.8%
(B) 50.1%
(C) 50.5%
(D) 58.58%
(E) Not enough information is given to determine the percentage of support for the politician.

9.

If $P(B) = 0.4$ and $P(A \cap B) = 0.21$, then find $P(A)$ if A and B are independent.

(A) 0.084
(B) 0.475
(C) 0.525
(D) 0.600
(E) Not possible

10.

Ruth plans to sell the jewelry she makes at an outdoor craft festival this coming Saturday. Based on her experience from past years, she can expect to make a profit of $400 if it is a sunny day, $275 if the weather is overcast, and $100 if it is raining. The weather forecaster (based on historical records) has estimated the chance of a sunny day for the day of the craft festival to be 0.65, the chance of an overcast day to be 0.15, and the chance of a rainy day to be 0.20. What is Ruth's expected profit from the sale of her jewelry?

(A) $400.00
(B) $321.25
(C) $275.00
(D) $258.33
(E) $100.00

11.

The probability that a car will skid on a bridge on a rainy day is 0.75. Today the weather station announced that there is a 20 percent chance of rain. What is the probability that it will rain today and that a car will skid on the bridge?

(A) 0.0300
(B) 0.0375
(C) 0.1500
(D) 0.3000
(E) 0.9500

12.

Suppose we have a random variable X with probability p. The probability of exactly 3 successes in 8 trials is given by

$$P(X = 3) = \binom{8}{3}(p)^3(0.45)^5.$$

What are the mean and standard deviation of X?

(A) mean = 4.4; standard deviation = 0.2475
(B) mean = 3.6; standard deviation = 0.2475
(C) mean = 4.4; standard deviation = 1.4071
(D) mean = 3.6; standard deviation = 1.4071
(E) There is not enough information to find the mean and standard deviation.

13.

For the given probability distribution, find the standard deviation of X.

X	1	3	5	7	9
$P(x)$	0.13	0.17	0.25	0.24	0.21

(A) 0.050
(B) 2.621
(C) 3.162
(D) 5.460
(E) 6.868

14.

A nursery guarantees that it will replace all the plants it sells that do not survive one year from the purchase date. From past experience the manager knows that 95 percent of plants sold survive more than a year. Suppose your school purchased 200 plants from this nursery to beautify the campus. How many plants do you expect will be replaced within a year?

(A) 5
(B) 10
(C) 20
(D) 95
(E) 190

15.

A publisher used standard boxes for shipping books. The mean weight of books packed per box is 25 pounds, with a standard deviation of 2 pounds. The mean weight of the boxes is 1 pound, with a standard deviation of 0.15 pounds. The mean weight of the packing material used per box is 2 pounds, with a standard deviation of 0.25 pounds. What is the standard deviation of the weights of the packed boxes?

(A) 28.000 pounds
(B) 5.290 pounds
(C) 4.085 pounds
(D) 2.400 pounds
(E) 2.021 pounds

16.

Which of the following is an outcome of a binomial experiment?

(A) Getting both spades on the first two draws from a standard deck of cards, when the first card is not replaced before the second card is drawn.
(B) Getting three spades out of the first seven draws from a standard deck of cards, when each card drawn is not replaced before the next card is drawn.
(C) Getting three spades out of the first seven draws from a standard deck of cards, when each card drawn is replaced before the next card is drawn.
(D) Getting three spades and four hearts out of the first seven draws from a standard deck of cards, when each card is not replaced before the next card is drawn.
(E) Getting three spades and four hearts out of the first seven draws from a standard deck of cards, when each card is replaced before the next card is drawn.

17.

A dentist has noticed that about 2 kids in every 7 that he sees professionally develop cavities before they turn 10 years old. Last week he examined the teeth of 5 unrelated children younger than 10. Let X be the number of children who develop cavities before turning 10. Which of the following gives the probability that at least one will develop a cavity before turning 10?

(A) $P(X = 2, 3, 4, 5, 6, 7)$
(B) $P(X = 2 \text{ out of } 7)$
(C) $P(X = 1)$
(D) $1 - P(X = 0)$
(E) $P(X = 0, 1)$

18.

Which of the following is true about any discrete probability distribution of a random variable X?

(A) The expected value of $X = np$.
(B) The sum of all possible values of X is equal to 1.
(C) The probabilities of all possible values of X must add up to 1.
(D) The probability distribution is bell-shaped and symmetric.
(E) Approximately 95 percent of the values of X fall within 2 standard deviations of the mean.

19.

The probability that Ted enrolls in an English class is $\frac{1}{3}$. If he does enroll in an English class, the probability that he enrolls in a mathematics class is $\frac{1}{5}$. What is the probability that he enrolls in both classes?

(A) $\frac{1}{15}$

(B) $\frac{2}{15}$

(C) $\frac{7}{15}$

(D) $\frac{3}{5}$

(E) $\frac{13}{15}$

20.

Two dice are rolled simultaneously. If both dice show 6, then the player wins \$20; otherwise the player loses the game. It costs \$2.00 to play the game. What is the expected gain or loss for the game?

(A) The player will gain about \$0.55.

(B) The player will gain about \$1.44.

(C) The player will lose about \$0.55.

(D) The player will lose about \$1.44.

(E) The player will lose about \$2.00.

FREE RESPONSE

Questions 1-3

Spend about 45 minutes on this part of the exam.

1.

The depth from the surface of Earth to a refracting layer beneath the surface can be estimated using methods developed by seismologists. One method is based on the time required for vibrations to travel from a distant explosion to a receiving point. The depth measurement (M) is the sum of the true depth (D) and the random measurement error (E). That is, $M = D + E$. The measurement error (E) is assumed to be normally distributed with mean 0 feet and standard deviation 1.5 feet.

(a) If the true depth at a certain point is 2 feet, what is the probability that the depth measurement will be negative?

(b) Suppose three independent depth measurements are taken at the point where the true depth is 2 feet. What is the probability that at least one of these measurements will be negative?

(c) What is the probability that the mean of the three independent depth measurements taken at the point where the true depth is 2 feet will be negative?

2.

For an upcoming concert, each customer may purchase up to 3 child tickets and 3 adult tickets. Let C be the number of child tickets purchased by a single customer. The probability distribution of the number of child tickets purchased by a single customer is given in the table below.

c	0	1	2	3
$p(c)$	0.4	0.3	0.2	0.1

(a) Compute the mean and the standard deviation of C.

(b) Suppose the mean and the standard deviation for the number of adult tickets purchased by a single customer are 2 and 1.2, respectively. Assume that the numbers of child tickets and adult tickets purchased are independent random variables. Compute the mean and the standard deviation of the total number of adult and child tickets purchased by a single customer.

(c) Suppose each child ticket costs \$15 and each adult ticket costs \$25. Compute the mean and the standard deviation of the total amount spent per purchase.

3.

Let the random variable X represent the number of telephone lines in use by the technical support center of a software manufacturer at noon each day. The probability distribution of X is shown in the table below.

x	0	1	2	3	4	5
$p(x)$	0.35	0.20	0.15	0.15	0.10	0.05

(a) Calculate the expected value (the mean) of X.

(b) Using past records, the staff at the technical support center randomly selected 20 days and found that an average of 1.25 telephone lines were in use at noon on those days. The staff proposes to select another random sample of 1,000 days and compute the average number of telephone lines that were in use at noon on those days. How do you expect the average from this new sample to compare to that of the first sample? Justify your response.

(c) The median of a random variable is defined as any value x such that $P(X \leq x) \geq 0.5$ and $P(X \geq x) \geq 0.5$. For the probability distribution shown in the table above, determine the median of X.

(d) In a sentence or two, comment on the relationship between the mean and the median relative to the shape of this distribution.