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Date: _____	**Course:** Elementary Statistics 60157	
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1. Suppose a baseball player had 235 hits in a season. In the given probability distribution, the random variable X represents the number of hits the player obtained in a game.

x	0	1	2	3	4	5
P(x)	0.1059	0.4629	0.2338	0.0594	0.1208	0.0172

(a) Compute and interpret the mean of the random variable X.

$\mu_x =$ ☐ (Round to one decimal place as needed.)

Which of the following interpretation of the mean is correct?

- ○A. The observed value of the random variable will almost always be equal to the mean of the random variable.
- ○B. As the number of trials n increases, the mean of the observations will approach the mean of the random variable.
- ○C. As the number of trials n decreases, the mean of the observations will approach the mean of the random variable.
- ○D. The observed value of the random variable will almost always be less than the mean of the random variable.

(b) Compute the standard deviation of the random variable X.

$\sigma_x =$ ☐ (Round to one decimal place as needed.)

2. Excel is used to find the mean and standard deviation of a discrete probability distribution and the results are as follows: $\mu = 2.0$ and $\sigma = -3.5$. Can these results be correct? Explain.

Choose the correct answer below.

- ○A. Yes. The results can be correct.
- ○B. No. The mean must be negative if the standard deviation is negative.
- ○C. No. The standard deviation is too large.
- ○D. No. The standard deviation cannot be negative.

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3. In a region, 20% of the population have brown eyes. If 12 people are randomly selected, find the probability that at least 10 of them have brown eyes. Is it unusual to randomly select 12 people and find that at least 10 of them have brown eyes? Why or why not?

The probability that at least 10 of the 12 people selected have brown eyes is ☐.
(Round to three decimal places as needed.)

Is it unusual to randomly select 12 people and find that at least 10 of them have brown eyes? Note that a small probability is one that is less than 0.05.

- ○A. No, because the probability of this occurring is very small.
- ○B. No, because the probability of this occurring is not small.
- ○C. Yes, because the probability of this occurring is not small.
- ○D. Yes, because the probability of this occurring is very small.

4. A candy company claims that 20% of its plain candies are orange, and a sample of 100 such candies is randomly selected.

a. Find the mean and standard deviation for the number of orange candies in such groups of 100.

$\mu =$ ☐

$\sigma =$ ☐ (Round to one decimal place as needed.)

b. A random sample of 100 candies contains 20 orange candies. Is this result unusual? Does it seem that the claimed rate of 20% is wrong?

- ○A. Yes, because 20 is within the range of usual values. Thus, the claimed rate of 20% is probably wrong.
- ○B. Yes, because 20 is below the minimum usual value. Thus, the claimed rate of 20% is probably wrong.
- ○C. Yes, because 20 is greater than the maximum usual value. Thus, the claimed rate of 20% is probably wrong.
- ○D. No, because 20 is within the range of usual values. Thus, the claimed rate of 20% is not necessarily wrong.

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5. Assume that 12 jurors are selected from a population in which 50% of the people are Mexican-Americans. The random variable x is the number of Mexican-Americans on the jury.

x	0	1	2	3	4	5	6	7	8	9	10	11	12
P(x)	0.000	0.003	0.016	0.054	0.121	0.193	0.226	0.193	0.121	0.054	0.016	0.003	0.000

a. Find the probability of exactly 8 Mexican-Americans among 12 jurors.

P(8) = ☐

b. Find the probability of 8 or fewer Mexican-Americans among 12 jurors.

The probability of 8 or fewer Mexican-Americans among 12 jurors is ☐.

c. Which probability is relevant for determining whether 8 jurors among 12 is unusually low: the result from part (a) or part (b)?

- ○A. The result from part (b), because it measures the probability of 8 or fewer successes.
- ○B. The result from part (a), because it measures the probability of exactly 8 successes.

d. Does 8 Mexican-Americans among 12 jurors suggest that the selection process discriminates against Mexican-Americans? Why or why not?

- ○A. Yes, because there is less than or equal to a 0.05 probability of it occurring.
- ○B. No, because there is greater than a 0.05 probability of it occurring.
- ○C. No, because there is less than or equal to a 0.05 probability of it occurring.
- ○D. Yes, because there is greater than a 0.05 probability of it occurring.

6. Refer to the Minitab display to the right. The probabilities were obtained by entering the values of n = 5 and p = 0.198. In a clinical test of a drug, 19.8% of the subjects treated with 10 mg of the drug experienced headaches. In each case, assume that 5 subjects are randomly selected and treated with 10 mg of the drug. Find the probability that more than one subject experiences headaches.

Binomial with n = 5 and p = 0.198

x	P(X = x)
0	0.3318
1	0.4096
2	0.2022
3	0.0499
4	0.0062
5	0.0003

The probability that more than one subject experiences headaches is ☐.
(Round to four decimal places as needed.)

7. An investor has $1,400 to invest, and his financial analyst recommends two types of junk bonds. The A bonds have a 8% annual yield with a default rate of 1%. The B bonds have a 10% annual yield with a default rate of 4%. (If the bond defaults, the $1,400 is lost.) Which of the two bonds is better? Why? Should he select either bond? Why or why not?

Which of the two bonds is better? Why?

- ○ A. The A bonds are better because its expected value is lower than the B bonds.
- ○ B. The A bonds are better because its expected value is greater than the B bonds.
- ○ C. The B bonds are better because its expected value is lower than the A bonds.
- ○ D. The B bonds are better because its expected value is greater than the A bonds.

Should the investor select either bond?

- ○ A. He should select neither because both the A and B bonds have negative expected values.
- ○ B. He should select the A bonds because the expected value is greater than the B bonds.
- ○ C. He should select the B bonds because the expected value is greater than the A bonds.

8. Assume that a procedure yields a binomial distribution with a trial repeated n times. Use the binomial probability formula to find the probability of x successes given the probability p of success on a single trial.

$n = 21, x = 18, p = 0.75$

$P(18) =$ ☐ (Round to three decimal places as needed.)

9. Assume that a procedure yields a binomial distribution with n trials and the probability of success for one trial is p. Use the given values of n and p to find the mean μ and standard deviation σ. Also, use the range rule of thumb to find the minimum usual value $\mu - 2\sigma$ and the maximum usual value $\mu + 2\sigma$.

$n = 1560, p = 4 / 5$

$\mu =$ ☐

$\sigma =$ ☐ (Round to one decimal place as needed.)

$\mu - 2\sigma =$ ☐ (Round to one decimal place as needed.)

$\mu + 2\sigma =$ ☐ (Round to one decimal place as needed.)

10. If we consider an experiment of generating 64 births and recording the genders of the babies, the mean number of girls is 32 and the standard deviation is 4 girls. Would it be unusual to get 50 girls in 64 births? Why or why not?

Choose the correct answer below.

- ○ A. Yes, because 50 is greater than the maximum usual value.
- ○ B. Yes, because 50 is within the range of usual values.
- ○ C. No, because 50 is below the minimum usual value.
- ○ D. No, because 50 is within the range of usual values.

11. Multiple-choice questions each have five possible answers (a, b, c, d, e), one of which is correct. Assume that you guess the answers to three such questions.

a. Use the multiplication rule to find P(WCW), where C denotes a correct answer and W denotes a wrong answer.

P(WCW) = ☐ (Type an exact answer.)

b. Beginning with WCW, make a complete list of the different possible arrangements of one correct answer and two wrong answers, then find the probability for each entry in the list.

P(WCW) – see above
P(CWW) = ☐
P(WWC) = ☐
(Type exact answers.)

c. Based on the preceding results, what is the probability of getting exactly one correct answer when three guesses are made?

☐ (Type an exact answer.)

12. Last year, a person wrote 136 checks. Let the random variable x represent the number of checks he wrote in one day, and assume that it has a Poisson distribution. What is the mean number of checks written per day? What is the standard deviation? What is the variance?

The mean number of checks written per day is ☐.
(Round to three decimal places as needed.)

The standard deviation is ☐.
(Round to three decimal places as needed.)

The variance is ☐.
(Round to three decimal places as needed.)

13. Determine whether the following probability experiment represents a binomial experiment and explain the reason for your answer.

An experimental drug is administered to 200 randomly selected individuals, with the number of individuals responding favorably recorded.

Does the probability experiment represent a biniomial experiment?

- ○ A. No, because the probability of success differs from trial to trial.
- ○ B. No, because there are more than two mutually exclusive outcomes for each trial.
- ○ C. Yes, because the experiment satisfies all the criteria for a binomial experiment.
- ○ D. No, because the trials of the experiment are not independent.

14. Dandelions are studied for their effects on crop production and lawn growth. In one region, the mean number of dandelions per square meter was found to be 7.0. Use the Poisson distribution to find the indicated probabilities.

a. Find the probability of 9 dandelions in an area of 1 m^2.
b. Find the probability of at least 9 dandelions in an area of 1 m^2.
c. Find the probability of at most 10 dandelions in an area of 1 m^2.

a. The probability of 9 dandelions is ☐.
(Round to four decimal places as needed.)

b. The probability of at least 9 dandelions is ☐.
(Round to four decimal places as needed.)

c. The probability of at most 10 dandelions is ☐.
(Round to four decimal places as needed.)

15. A pharmaceutical company receives large shipments of aspirin tablets. The acceptance sampling plan is to randomly select and test 22 tablets, then accept the whole batch if there is only one or none that doesn't meet the required specifications. If a particular shipment of thousands of aspirin tablets actually has a 2% rate of defects, what is the probability that this whole shipment will be accepted?

The probability that this whole shipment will be accepted is ☐.
(Round to three decimal places as needed.)

16. In a state's Pick 3 lottery game, you pay $1.29 to select a sequence of three digits, such as 255. If you select the same sequence of three digits that are drawn, you win and collect $301.83. Complete parts (a) through (e).

a. How many different selections are possible?

☐

b. What is the probability of winning?

☐ (Type an integer or a decimal.)

c. If you win, what is your net profit?

$☐ (Type an integer or a decimal.)

d. Find the expected value.

$☐ (Round to the nearest hundredth as needed.)

e. If you bet $1.29 in a certain state's Pick 4 game, the expected value is −$0.99. Which bet is better, a $1.29 bet in the Pick 3 game or a $1.29 bet in the Pick 4 game? Explain.

- ○ A. The Pick 3 game is a better bet because it has a larger expected value.
- ○ B. Neither bet is better because both games have the same expected value.
- ○ C. The Pick 4 game is a better bet because it has a larger expected value.

17. There is a 0.1475 probability that a best-of-seven contest will last four games, a 0.1501 probability that it will last five games, a 0.2286 probability that it will last six games, and a 0.4738 probability that it will last seven games. Verify that this is a probability distribution. Find its mean and standard deviation. Is it unusual for a team to "sweep" by winning in four games?

What is the mean of the probability distribution?

$\mu =$ ☐
(Round to two decimal places as needed.)

What is the standard deviation of the probability distribution?

$\sigma =$ ☐
(Round to two decimal places as needed.)

Is it unusual for a team to win in four games? Choose the correct answer below.

- ○A. No, because the probability that a team wins in four games is greater than 0.05.
- ○B. Yes, because the probability that a team wins in four games is greater than 0.05.
- ○C. No, because the probability that a team wins in four games is less than or equal to 0.05.
- ○D. Yes, because the probability that a team wins in four games is less than or equal to 0.05.

18. A researcher calculates the expected value for the number of girls in three births. He gets a result of 1.5. He then rounds the result to 2, saying that it is not possible to get 1.5 girls when three babies are born. Is this reasoning correct?

Choose the correct answer below.

- ○A. Yes. The correct expected value is 2.
- ○B. No. The correct expected value is 1.
- ○C. No. The correct expected value is 1.5.
- ○D. No. The correct expected value is 3.

19. Assume that a procedure yields a binomial distribution with a trial repeated n times. Use a binomial probabilities table to find the probability of x successes given the probability p of success on a given trial.

$n = 7, x = 1, p = 0.50$

$P(1) =$ ☐ (Round to three decimal places as needed.)

20. Researchers conducted a study to determine whether there were significant differences in graduation rates between medical students admitted through special programs and medical students admitted through the regular admissions criteria. It was found that the graduation rate was 92% for the medical students admitted through special programs. Complete parts (a) and (b) below.

a. If 12 of the students from the special programs are randomly selected, find the probability that at least 11 of them graduated.

The probability that at least 11 of the 12 students graduated is ☐.
(Round to three decimal places as needed.)

b. Would it be unusual to randomly select 12 students from the special programs and get only 9 or fewer that graduate? Why or why not? Note that a small probability is one that is less than 0.05.

- ○ A. No, because the probability of this occurring is very small.
- ○ B. No, because the probability of this occurring is not small.
- ○ C. Yes, because the probability of this occurring is not small.
- ○ D. Yes, because the probability of this occurring is very small.

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1. 1.7
   B
   1.2

2. D

3. 0.000
   D

4. 20
   4.0
   D

5. 0.121
   0.927
   A
   B

6. 0.2586

7. B
   B

8. 0.117

9. 1248
   15.8
   1216.4
   1279.6

10. A

11. 0.128
    0.128
    0.128
    0.384

12. 0.373
    0.610
    0.373

13. C

14. 0.1014
0.2710
0.9014

15. 0.929

16. 1,000
0.001
300.54
− 0.99
B

17. 6.03
1.10
A

18. C

19. 0.055

20. 0.752
B