

Test \_\_\_\_\_ /70 points

Take Home \_\_\_\_\_ 30 points

Show work where necessary in a clear, organized fashion. probabilities and express each as a fraction, a decimal, and a percent Round all answers to three decimal places.

1. (2 pts) Which of the following numbers could be probabilities? Circle all correct answers.
  - a) 2.051
  - b) 0
  - c) 0.325
  - d) -0.732
  - e) 1
  
2. (2 pts) If 28 of 40 people in our class have brown eyes, what is the probability a randomly selected student in the class will not have brown eyes?
  
3. (4 pts) (a) Assuming it is equally likely for a woman to have a boy or a girl baby, what is the probability of her having a boy?

What type of probability is this? (circle one)      Empirical      Theoretical

(b) The births in a large city in one year revealed that out of 100 births, 46 of them were boys. **According to this result**, what is the probability that a woman had a boy in that city?

What type of probability is this? (circle one)      Empirical      Theoretical

4. (2 pts) Use your knowledge of the world to determine whether the following events are independent or associated:
  - (a) Being a basketball player in the NBA; being taller than average.      INDEPENDENT      ASSOCIATED
  - (b) The outcomes (heads or tails) on the flip of two separate coins:      INDEPENDENT      ASSOCIATED
  
5. (3 pts) Suppose Event A is that a person is taking a statistics exam. Give an example of another event, Event B, that is **mutually exclusive** to Event A.

Event B = \_\_\_\_\_

6. (4 pts) The probability that a fair coin lands heads is 0.5. Therefore, we can be sure that if we toss a coin a large number of times (say, 10,000 times), the proportion of times it lands heads will (circle your answer)
- (a) be close to 0.5      (b) be equal to 0.5      (c) be greater than 0.5      (d) can't tell

What is the name of the Law that supports your answer above?

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7. (12 pts) This year, (2019), Pew Research found that 90% of all U.S. adults use the internet.
- (a) If two unrelated U.S. adults are randomly selected, what is the probability that both of them use the internet?

(b) What is the probability that neither of them use the internet?

(c) What is the probability that exactly one of them use the internet?

(d) In the same study, Pew Research found that only 75% of adults in rural areas use the internet. This tells us that internet use and the area a US adult lives are most likely (circle one)    INDEPENDENT    ASSOCIATED

8. (6 pts) Let's define "I" to be the event that a person uses Instagram.

(a) What does  $P(I)$  mean?

(b) What is the complement for event I?

$I^c =$  \_\_\_\_\_

(c) If  $P(I) = .78$  for college students, what is  $P(I^c)$  and what does it mean?

9. (3 pts) A Gallup Poll from 2009 estimated that 83% of all US adults thought that nurses had high or very high ethical standards. If this rate is still correct and there was a new poll of 5000 people, how many would you expect to say nurses have high or very high ethical standards?
10. (7 pts) A deck of cards has 52 cards, 4 suits (heart, diamonds, spades, and clubs) and 13 kinds (2 – 10, jack, queen, king, ace). If you pick one card at random from the deck, find the following:
- (a) The probability the card is a queen.
  - (b) The probability the card is a heart.
  - (c) The probability the card is a queen or a heart.
10. (10 pts) Suppose you have a bag with 5 yellow marbles, 11 red marbles, and 4 blue marbles. Find the following.
- (a) If you choose one marble,
    - i. what is the probability it will be blue?
    - ii. What is the probability it will be blue or red?
  - (b) If you choose two marbles **with replacement**, what is the probability both will be yellow?
  - (c) If you choose two marbles **without replacement**, what is the probability both will be yellow?

11. (15 pts) A 2019 study investigating vaping and sleep disturbance (not sleeping well) used a sample of 274 women who responded to the questions of “Do you vape (yes/no)”, and “Do you have sleep disturbances (yes/no)”. A summary of their answers is given in the table below:

Vape?	Sleep Disturbance?	
	No	Yes
No	104	60
Yes	32	78

- (a) What type of study is this (circle one)?      OBSERVATIONAL      CONTROLLED EXPERIMENT
- (b) What is the research question for this study?
- (c) What is the probability a randomly chosen person from the study has sleep disturbances?
- (d) What is the probability a person has sleep disturbances, given that she vapes?
- (e) What is the probability a person has sleep disturbances, given that she doesn't vape?
- (f) Are vaping and sleep disturbances associated or independent in this group? Explain, and include the percentages you found in the answers above in your explanation.

**Math 247: Test 2 Take Home**

**Name:** \_\_\_\_\_

\_\_\_\_\_/30 points

**Class day and time:** \_\_\_\_\_

*Due at the beginning of class on Thursday, 10/10/19.*

I encourage you to work with other students in the class but the final work you hand in must be your own. You may consult with tutors for general guidance but please do not ask them to solve the problems for you!

*For full credit, your work must be clear, legible and well organized.*

**Vitamin C** A study (double-blind) was done investigating the therapeutic value of vitamin C (ascorbic acid) for treating common colds. The study (done in 1971 by Linus Pauling) was conducted during a 2-week period on a sample of 279 school children in a skiing camp in the Swiss Alps. The participants were split into two groups (assume random assignment), one taking 1 gram of vitamin C per day and the other taking a placebo. At the end of two weeks the researchers assessed who had gotten a cold and who hadn't.

What is the research question?

What is the Independent Variable? \_\_\_\_\_

What is the Dependent Variable? \_\_\_\_\_

Will this study be able to establish cause and effect? Explain how you can tell.

*Results from the study:*

	<b>Cold</b>	<b>No Cold</b>	
<b>Placebo</b>	31	109	
<b>Vitamin C</b>	17	122	

Does this data suggest that there may be a link between taking Vitamin C is linked to fewer colds? Explain your thinking, using the numbers in the table and relevant percentages.

Conduct a Chi-Square Hypothesis Test (all 4 steps) to see whether there is an association between taking Vitamin C and getting colds. You may write or type your work on the 4 steps. (Space is provided on the next page if you choose to write your work by hand.

For the “Compute” step, do the work for finding the Chi Square value and the degrees of freedom by hand, then use StatCrunch to confirm your results and to find the P-value.

Include the StatCrunch results with your exam. Be sure to include the “Expected Counts” and the “Contribution to Chi square” values in the StatCrunch work.

Step 1: \_\_\_\_\_

Step 2: \_\_\_\_\_

Step 3: \_\_\_\_\_

	<b>Cold</b>	<b>No Cold</b>	
<b>Placebo</b>	31	109	
<b>Vitamin C</b>	17	122	

Step 4: \_\_\_\_\_