

Math 247: Test 2

Name: _____

In-class test _____/80 points

Take home test _____/20 points

On all problems involving probability, use the correct notation for full credit on the problem.

1. (2 pts) Which of the following numbers could NOT be probabilities? Circle your answer(s).
a) 2.724 b) 0.043 c) -0.125 d) 0 e) 1

2. (4 pts) Which is an Empirical Probability and which is a Theoretical Probability? Circle your answer.

a. You flip a fair coin 100 times and get heads 54 times. You calculate $P(\text{Heads}) = \frac{54}{100} = .54$
Empirical Theoretical

b. You calculate the probability of getting a heart in a deck of cards as $P(\text{Heart}) = \frac{13}{52} = .25$

Empirical Theoretical

3. (5 pts) Use your knowledge of the world to determine whether the following events are mutually exclusive:

A = A person currently lives full time in Mexico.
B = A person currently lives full time in Canada.
C = A person was born in the U.S.A.

A and B are mutually exclusive? YES NO

A and C are mutually exclusive? YES NO

B and C are mutually exclusive? YES NO

4. (4 pts) Use your knowledge of the world to label the pairs of these events as independent or associated.

(a) The outcome of each flip when you flip a coin a coin twice _____

(b) Height of a person and shoe size _____

5. (3 pts) If you flip a fair coin and roll a six-sided die, what is the probability you will get Tails on the coin and a 5 on the die?

6. (3 pts) The Humane Society of the United States reported that 39% of households own dogs and 33% own cats.

Would it be correct to say that 72% of households own a dog or a cat? YES, correct NO, not correct

Explain your answer.

7. (15 pts) A survey of randomly selected adults found that 64% of the men and 52% of the women believe there is intelligent life on other planets.

a. If M = the event that a man believes, what is $P(M^c)$?

b. If a man and a woman from this group meet, what is the probability that they both believe there is intelligent life on other planets? Use proper notation!

c. What is the probability that they both do NOT believe there is intelligent life on other planets? Use proper notation!

d. What is the probability that one of them believes and one does not believe? Use proper notation!

8. (20 pts) The Researchers asked students in grades 4 through 6 in three school districts in Michigan about what they thought was the most important thing in school: making good grades, being popular, or being good in sports. There were rural, suburban, and urban schools surveyed. The table shows the results

	Rural	Suburban	Urban	All
Grades	57	87	103	247
Popular	50	42	49	141
Sports	42	22	26	90
All	149	151	178	478

Express each of the following probabilities as a fraction, a decimal to three decimal places, and a percent.

- What percentage of all the students think sports are the most important thing in school?
- What percentage of the Rural students think that sports are the most important thing in school?
- Based on your answers to (a) and (b), is there an association between being from a rural school, and thinking sports are most important for this group of kids? Explain your answer.
(Note: Do NOT do a Chi-Square Test here. Just examine your answers from (a) and (b).)
- What is the probability a student chosen from the entire group is either from a Suburban school or thinks that Grades are most important?
- What is the probability a student is from an Urban school, given that he/she thinks being Popular is most important?

9. (24 points) The data table compares men who chose to regularly view television violence with those who did not, in order to study the difference in physical abuse of spouses. Using the data in the table, do a Chi-Square Hypothesis Test to see whether watching TV violence is associated with spousal abuse. Use a significance level of .05.

	High TV Violence	Low TV Violence	
Yes, Physical Abuse	13	27	
No, Physical Abuse	18	95	

(a) Write the Null and Alternative Hypotheses

(b) Find and fill in the expected counts. Show work!

(c) Find χ^2 and df by hand. Show work!

(d) The P-value for the Test is .025. Write the conclusion to the hypothesis test.

Conclusion:

9. (continued)

(e) Does this study show that watching TV violence causes men to abuse their spouses? Explain.

(f) What is a possible confounder for this study?

Math 247: Test 2 (Take Home)
(20 points)

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In-Class Test _____/80

Take-Home Test _____/20

- This exam is due at the beginning of class on Thursday, 10/5/2017 You may work with other people in the class but not with tutors, other instructors, etc. Be sure that all answers are written in your own words; i.e., do not write verbatim the same answer as another student.
- Your work can be typed or **NEATLY** handwritten.
- Your work should incorporate all of the Minitab work mentioned below; i.e., copy and paste the Minitab results into your write-up.

Scoring will be based on organization of your work, accuracy, and thoughtful, well-written answers.

Answer all of the following questions on another piece of paper and attach to this cover sheet. Use complete sentences in your answers!

Do certain car colors get more speeding tickets than others?

1. What is your initial impression? Are there certain colors of cars that you think would be more likely to get a speeding ticket? Briefly explain your answer (no math, here, folks, just your opinion and why you have it!).

Suppose the percentages of car colors for all cars registered in California are Red 14%; White/Silver 35%; Grey/Black 23%; Other 28%.

Next, the data shows the car color and number of speeding tickets for a random sample of 120 tickets.

Color	Red	White/Silver	Grey/Black	Other
Number of Tickets	16	33	39	32

2. Do these data show that there is a difference between the overall proportions of car colors and the proportion of tickets different colors receive? Perform a Chi-Square Goodness of Fit Test by hand to answer this question. Use .05 as the level of significance.
3. Next, use Minitab to confirm your results. Paste the Minitab display of the test results and also the graphs into a document, print it out, and include it with this packet.
4. Answer the follow-up questions:
 - Which car color got more tickets than “expected?”
 - Which color got fewer tickets than “expected?”
 - Did the data show that, for the cars in the sample, some colors were more likely to be ticketed? Explain.
 - Did this data provide enough evidence to show that, for all cars, not just this sample, some colors of cars are more likely to be ticketed? Explain your answer in terms of the results of the hypothesis test.