Stats for Business HOMEWORK 4 (16 Topic 3 problems)

DIRECTIONS:

- Important! Do you . . .
  - Write homework problems in a separate (blank) notebook?
  - Use the recommended (markup) ACCOUNTING SYSTEM?

  See STATS HOMEWORK (STATS GUIDE), Notebook page 1, for these tips that provide a performance **competitive advantage!**

- Your decision to exploit those tips (or not!) can impact your semester's performance and course grade.

- Refer to **Topic 3 Notes and Worksheet** for similar problems and other tips.

- Work textbook exercises in the order listed. (Prof. Whitten chose this order to provide maximum benefit.) Some exercises have additional parts or modified instructions.

Textbook Exercises

Chapter 5 (begins on page 293)

- Exercise 5.12

- Exercise 5.13

- Exercise 5.28 (Round answers to 4 decimal places.)

- Exercise 5.49

  Special directions for part (a): Refer to Topic 3 Example 3 in the Notebook. Write out each of the Three Steps, including English definitions!

- Exercise 5.50

- Exercise 5.51

- Exercise 5.52 (Use either a Venn Diagram or a table, as you prefer.)

- Exercise 5.53

  Special directions: Write out each of the Three Steps.

  Also add part (b):

  (b) What percentage of products are completely inspected?

(Additional Problems next page)

Additional Problems

1. In a random survey involving 100 cars, each vehicle is classified according to whether or not it has side airbags and whether or not it has been involved in an accident in the past year. Based on this survey, answer the following questions.

	Side Airbags	No Side Airbags
Accident	0.03	0.12
No Accident	0.40	0.45

   (a) What's the probability that a car has been involved in an accident in the past year?

   (b) What's the probability that a car has not been involved in an accident in the past year and has side airbags?

   (c) Does a car having an accident in the past year depend on whether or not the car has side airbags? Prove your answer mathematically.

   (d) If safety is a car consumer's primary concern, would you recommend side airbags? Explain.

2. An article in *Consumers' Research* states that 43% of all 2013 model cars came equipped with side airbags. Suppose three 2013 model cars are randomly selected.

   (a) Given that the first car has side airbags, what's the probability that the second car has side airbags?

   (b) Are the two events described in part (a) independent? Prove your answer.

   (c) What's the probability that all three cars have side airbags?

   (d) What's the probability that only one of the three cars has side airbags?

3. Three machines produce items, some of which are defective. Production records show the following probabilities:

	Machine		
Items Produced	1	2	3
Good	0.3800	0.2375	0.3325
Defective	0.0200	0.0125	0.0175

   (a) Does whether an item is good depend on whether it is produced from Machine 1? Does it depend on Machine 2? On Machine 3? Explain and justify your answers.

   (b) Compare the three machines for relative performance. What's your overall conclusion?

(continued)

4. GEICO insurance company has offices in 13 locations across the United States, including an office in Coralville, Iowa.

   As a promotional campaign to keep employees happy and productive, GEICO management has announced that the entire administrative staff at any office will win a one-week, expenses-paid trip to Disney World in Florida if any two staff members in that particular office have the same birthday.

   (a) The Coralville office has 5 administrative staff members. What's the percentage chance that they all win a trip to Disney World?

   Tips:

   - Assume that there are 365 days in a year. (Ignore leap years.)
   - For 3 staff members we can use the Multiplication Rule repeatedly:

     P(A and B) = P(A)×P(B|A) (A happens *first*, B happens *second* after A happens)

   (1) P(first two persons have different B-Days)
   = P(first person has a B-Day)
   × P(second person has different B-Day than first | first person has B-Day)

   (2) P(all three persons have different B-Days)
   = P(first two persons have different B-Days)
   × P(third person has different B-Day than first two | first two persons have different B-Days)

   (3) So ... P(all three persons have different B-Days)

   = (Prob 1) × (Prob 2) × (Prob 3)

   = _____ × _____ × _____

   Can you fill in the three blanks?

   - Though not absolutely required, this is a great time to become friends with your calculator's exponent (y^x) button and the memory button!

     You'll need to Google directions for your calculator model's memory button to discover how to use it. Once you know, it's simple! And will likely save you *time* and *trouble* on quizzes and exams in both Stats for Business and Business Analytics since your calculations will be quicker and more accurate!

   - You may need help, either with your calculator or finding the answers. Stop by any (shared) TA/professor office hour in Schaeffer Hall or to either of the Tutor Labs (TA/grad student tutor lab and Tippie undergrad tutor lab.)

(Problem 4 continued next page)

(b) Suppose that the office in Tucson, Arizona has 10 administrative staff members. Does the percentage chance of a trip to Disney World double for the Tucson office compared to the Coralville office since there are twice as many staff members? What's the percentage chance for Tucson?

Parts (c) and (d) below are optional challenge questions for students who have studied *permutations* in an earlier math course. We won't cover permutations in Stats for Business so these questions will not appear on any quiz or exam.

(c) Honolulu, Hawaii is a popular place to live so the GEICO office in Honolulu employs 20 administrative staff members. Does the percentage chance of a trip to Disney in Honolulu double compared to Tucson since there are twice as many staff? What's the percentage chance for Honolulu?

(d) Find the minimum number of staff members so that the chances of a trip to Disneyworld exceed 50%.

5. A particular type of light bulb lasts more than 60 hours with probability 0.84. The same type lasts more than 100 hours with probability 0.52.

(a) Find the probability that a light bulb lasts more than 100 hours given that it lasts more than 60 hours.

(b) Your goal is for a light bulb to last more than 100 hours. You are offered two bulbs: one that has lasted 72 hours (so that only 28 more hours are needed) and a bulb that has never been used (so that 100 more hours are needed.)

Which bulb should you choose, the used one or the new one? Explain why!

6. One of the boxes shown below is chosen at random (each box is equally-likely to be chosen) and a marble drawn from it.

Box A	**Box B**	**Box C**
3 red	5 red	8 red
7 blue	5 blue	2 blue

(a) Find the probability that the chosen marble is red.

(b) Find the probability that Box A was chosen, given that the chosen marble is red.

(c) Find the probability that Box B was chosen, given that the chosen marble is red.

(d) Find the probability that Box C was chosen, given that the chosen marble is red.

(e) To what percentage must the three previous answers to (b), (c), and (d) add up to?

(continued)

7. Coperto Insurers of Davenport, Iowa offers four different insurance plans, all of which are equally popular with customers. If each of three different customers chooses a plan, what's the probability that at least two customers choose the same plan?

8. All human blood can be "ABO-typed" as one of O, A, B, or AB, but the distribution of the types varies a bit across different countries. Here is the approximate distribution for the United States:

Blood Type	O	A	B	AB
Probability	0.45	0.40	0.11	0.04

   (a) Someone with type B blood can receive transfusions safely only from persons with type B or type O blood. What's the probability that the husband of a woman with type B blood is an acceptable blood donor for her?

   (b) What's the probability that the husband and wife of a married couple share the same blood type?

   (c) What's the probability that one person in a husband-wife couple has type A blood and the other has type B blood?

(end of assignment)