Department of Mathematics

Ma162 Chapter 6 Exam

July 27, 2010

DO NOT TURN THIS PAGE UNTIL INSTRUCTED TO DO SO.

Instructions: Be sure that your name, section number, and student ID are filled in below. Cell phones must be OFF and put away before you open this exam. You may use calculators (including graphing calculators, but no laptops or cellphone calculators) for checking numerical calculations, but you must show your work to receive credit. Put your answers in the answer boxes provided, and show your work. If your answer is not in the box or if you have no work to support your answer, you will receive no credit. The test has been carefully checked and its notation is consistent with the homework problems. No additional details will be provided during the exam.

Problem	Maximum	Actual
1	20	
2	20	
3	20	
4	20	
5	20	
Total	100	

Name: _____

Section: 020

Last four digits of Student ID: _____

Set counting: Two sets: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

Three sets: $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(B \cap C) - n(C \cap A) + n(A \cap B \cap C)$.

1. Suppose that X, Y and Z are sets with 35, 34, and 31 elements respectively. Calculate the indicated quantities. Display correct formulas or appropriate Venn diagrams.

(i) If $X \cap Y$ has 15 elements, then $X \cup Y$ has how many elements?

(ii) If it is further known that $X \cap Z$ has 13 elements, then $X \cup Z$ has how many elements?

(iii) If, in addition, $Z - Y$ has 17 elements, then $Z \cap Y$ has how many elements?

(iv) Finally, if we are given that the intersection of all three sets X, Y, and Z has 6 elements, then the union of all three sets has how many elements?

2. A survey of 100 waffle-fry house customers indicated the following (disturbing) trends:

- 46 customers drizzle their waffle fries with ketchup
- 27 customers smother their waffle fries with cheese
- 38 customers top their waffle fries with chili
- 3 customers have their fries drizzled and smothered with ketchup and cheese
- 4 customers have their fries drizzled and topped with ketchup and chili
- 15 customers have their fries smothered and topped with cheese and chili
- 1 customer has their fries "all the way" with ketchup, cheese, and chili

Based on the above information, answer the following questions. You must show your calculations to receive credit.

(a) How many customers surveyed get their waffle fries *au naturel*, that is, without ketchup, cheese, or chili?

(b) How many customers use at least two toppings on their waffle fries?

3. Lisa does not like to wear the same outfit twice, so she shops at *Swatches*, the hip new interchangeable fashion store for today's fashion elite. She has 9 different shirts, 4 different pairs of pants, and 5 different pairs of shoes.

(a) How many successive days can she wear an outfit without repetition?

(b) Lisa goes out and buys two new shirts but unfortunately one of her shoes breaks down. Now, how many days can she go without repeating an outfit?

4. There are 12 members in an executive committee. A subcommittee needs to be appointed for a special project. The subcommittee shall have a chairman, a public relations officer, a secretary, a catering coordinator, and an accountant. Answer the following questions. Be sure to show your reasoning. Just numerical answers shall earn no credit.

(a) How many different subcommittees can be formed from the executive committee?

(b) Suppose that the regular secretary of the executive committee has been assigned as the secretary of the subcommittee. How many different subcommittees can now be formed?

5. If you roll two (distinguishable, six-sided, fair) dice,

(a) How many possible outcomes are there?

(b) How many of those are "odd couples", that is, where both of the two dice show odd numbers?

(c) How many of those are "even stevens", that is, where both of the two dice show even numbers?

(d) How many of those are a "nine", that is, where the sum of the two dice is 9?