

MATH 106 QUIZ

Extended due date: Wednesday, July 6, 2016

NAME: _____

I have completed this assignment myself, working independently and not consulting anyone except the instructor.

INSTRUCTIONS

- There are **11 problems on 6 pages**. This quiz is *open book* and *open notes*. This means that you may refer to your textbook, notes, and online classroom materials, but ***you must work independently and may not consult anyone*** (and confirm this with your submission). You may take as much time as you wish, provided you turn in your quiz no later than **11:59 PM (US Eastern Time Zone) Wednesday, July 6, 2016**.
- **Show work/explanation. Answers without any work may earn little, if any, credit.** You may type or write your work in your copy of the quiz, or if you prefer, create a document containing your work. Scanned work is acceptable also; **a single file in pdf format is preferred. In your document, be sure to include your name and the assertion of independence of work (see top of the page).**
- If you have any question, please post it in “Ask the Professor” discussion on LEO if the answer to your question would also benefit others in class; otherwise, please contact me privately via e-mail.

1. (5 pts) Determine how many five-character codes can be formed if the first, second, and third characters are letters, the fourth character is a nonzero digit, the fifth character is an odd digit, and repetition of letters and digits are allowed. (A digit is 0, 1, 2, ..., or 9.) **Show your work.** 1. _____

- A. 92
- B. 3,510
- C. 312,000
- D. 790,920

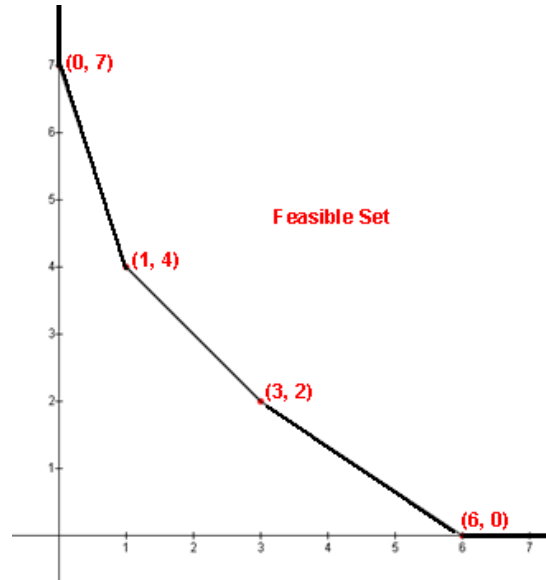
2. (5 pts) Suppose that a multiple choice exam has seven questions and each question has five choices. In how many ways can the exam be completed? **Show your work.** 2. _____

- A. 35
- B. 4,096
- C. 16,807
- D. 78,125

3. (5 pts) 3. _____

Given the feasible region shown to the right, find the values of x and y that **minimize** the objective function $7x + 8y$. **Show your work.**

- A. There is no minimum.
- B. $(x, y) = (6, 0)$
- C. $(x, y) = (3, 2)$
- D. $(x, y) = (1, 4)$
- E. $(x, y) = (0, 7)$



4. (5 pts) Five customers in a grocery store are lining up at the check-out. In how many different orders can the customers line up? **Show your work.** 4. _____

- A. 5
- B. 25
- C. 120
- D. 3,125

5. (5 pts) A restaurant's menu has six appetizers, five entrees, and four beverages. To order dinner, a customer must choose one entrée and one beverage, and may choose one appetizer. (That is, a dinner must include one entrée and one beverage, but not necessarily an appetizer. An appetizer is optional.) How many different dinners can be ordered? **Show your work.**

5. _____

- A. 140
- B. 120
- C. 24
- D. 15

HINT: There are several ways to solve the problem. Here is something to think about, in general: Declining an item actually is a choice. For example, suppose that a person has an option of choosing a sweetener for a coffee drink. The person might use sugar or a particular sugar-free substitute, or decline a sweetener. Declining a sweetener means choosing no sweetener. (Choices are sugar, sugar-free, or none.)

6. (10 pts) A stamp collector has a set of five different stamps of different values and wants to take a picture of each possible subset of his collection (including the "empty set," depicting just

the picture frame!), i.e., pictures showing no stamps, one stamp, two stamps, three stamps, four stamps, or five stamps. In each picture showing two or more stamps, the stamps are in a row. **Showing your work**, determine the maximum number of different pictures possible, when the difference between two pictures would be either in the number of stamps or in the horizontal order of the stamps. For example, if the stamp collector had just two different stamps (say A and B) of different values, he would have five pictures showing: A, B, AB, BA, and the empty frame.

7. (12 pts) Let $U = \{10, 20, 30, 40, 50, 60, 70, 80, 90\}$, $A = \{30, 50, 60, 90\}$ and $B = \{10, 20, 50, 80, 90\}$.

List the elements of the indicated sets. (No work/explanation required).

(a) $A \cap B$

(b) $A' \cap B$

(Be sure to notice the complement symbol applied to A)

(c) $A \cup B'$

(Be sure to notice the complement symbol applied to B)

8. (9 pts) Use the given information to complete the following table.

$n(U) = 80$, $n(A) = 22$, $n(B') = 35$, $n(A \cap B) = 15$. (No work/explanation required; note that U represents the universal set and each “primed” set is the complement of that set; the four central cells of the matrix represent the intersections.)

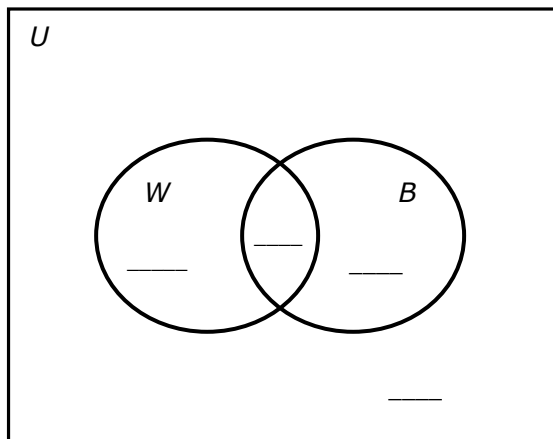
	A	A'	Totals
B			
B'			
Totals			

9. (12 pts) 200 baseball fans in a Maryland county have been surveyed about the baseball teams they watch on TV. 103 fans watch the Washington Nationals. 90 fans watch the Baltimore Orioles. 170 watch the Washington Nationals or the Baltimore Orioles (or both).

(a) How many of the fans watch both the Washington Nationals and the Baltimore Orioles? **Show work.**

(b) How many of the fans watch the Baltimore Orioles but not the Washington Nationals? **Show work.**

(c) Complete the following Venn diagram, filling in the number of fans belonging in each of the four regions. Circle $W = \{\text{fans who watch the Washington Nationals}\}$ and Circle $B = \{\text{fans who watch the Baltimore Orioles}\}$. (no explanation required)



10. (12 pts) A panel of 7 politicians is to be chosen from a group of 15 politicians.

(a) In how many ways can the panel be chosen? **Show work/explanation.**

(b) Now suppose that the group of politicians consists of 5 Democrats, 7 Republicans, and 3 Independents. In how many ways can the 7-person panel be chosen if it must consist of 3 Democrats, 3 Republicans, and 1 Independent? **Show some work/explanation.**

11. (20 pts) Two kinds of cargo, A and B, are to be shipped by a truck. Each crate of cargo A is 25 cubic feet in volume and weighs 100 pounds, whereas each crate of cargo B is 40 cubic feet in volume and weighs 120 pounds. The shipping company collects \$180 per crate for cargo A and \$220 per crate for cargo B. The truck has a maximum load limit of 1,200 cubic feet and 4,200 pounds. The shipping company would like to earn the highest revenue possible.

(a) Fill in the chart below as appropriate.

	Cargo A (per crate)	Cargo B (per crate)	Truck Load Limit
Volume			
Weight			
Revenue			

Let x be the number of crates of cargo A and y the number of crates of cargo B shipped by one truck.

(b) State an expression for the total revenue R earned from shipping x crates of cargo A and y crates of cargo B.

(c) Using the chart in (a), state two inequalities that x and y must satisfy because of the truck's load limits.

(d) State two inequalities that x and y must satisfy because they cannot be negative.

(e) State the linear programming problem which corresponds to the situation described. Be sure to indicate whether you have a **maximization** problem or a **minimization** problem, and state the objective function and all the inequalities. (This part is mostly a summary of the previous parts)

(Parts (f) and (g) on the next page)

(f) Solve the linear programming problem. You will need to find the feasible region and determine the corner points. You do *not* have to submit your graph, and you do *not* have to show algebraic work in finding the corner points, but you must list the corner points of the feasible region and the corresponding values of the objective function.

Corner Point (x, y)	Value of Objective Function

(g) Write your conclusion with regard to the word problem. State **how many crates of cargo A and how many crates of cargo B** should be shipped in the truck, in order to earn the highest total revenue possible. State the value of that **maximum revenue**.