MATH 141

Exam II Review Activity for Sections 3.1-3.3, 6.1-6.4, and 7.1

1. SET UP but DO NOT SOLVE the following linear programming problem, as discussed in class. You must clearly define any variables used.

A jean manufacturer makes three types of jeans, each which goes through two manufacturing phases: sewing and finishing. The amount of time each pair of jeans requires in each of the two phases, as well as the profit made on each pair of jeans, is given below. There are 100 hours of sewing time and 2200 minutes of finishing time available each day. Previous demand now stipulates that no more than 30% of the total number of pairs of jeans made each day should be Type III Jeans. Determine the number of pairs of jeans in each category that should be made each day to maximize profits.

<table>
<thead>
<tr>
<th>Type</th>
<th>Minutes of Sewing</th>
<th>Minutes of Finishing</th>
<th>Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>I Jeans</td>
<td>12</td>
<td>4</td>
<td>$3</td>
</tr>
<tr>
<td>II Jeans</td>
<td>18</td>
<td>9</td>
<td>$4.50</td>
</tr>
<tr>
<td>III Jeans</td>
<td>24</td>
<td>10</td>
<td>$6</td>
</tr>
</tbody>
</table>

2. Given $U = \{x | x$ is a lowercase letter of the alphabet$\}$,
   $A = \{x | x$ is a lowercase vowel (not including $y$)$\}$,
   $B = \{x | x$ is a letter in the word $math$\}$ and
   $C = \{r, s, t, l, n, e\}$,
circle whether the following statements are true or false.

(a) True False $n(A \cup B \cup C) = 12$
(b) True False $A \cap B \cap C = \{a, e\}$
(c) True False $C^C \subset A$
(d) True False $\emptyset \subseteq U$
(e) True False $\{x | x$ is a letter in the word $near$\} $\in (B \cup C)$
(f) True False $A$ and $B$ are disjoint sets
(g) True False $\emptyset$ is a proper subset of every set except itself

3. You draw a card at random from a standard 52-card deck, noting the suit drawn. You then roll a fair six-sided die, noting whether the number rolled is odd or even. Write an appropriate sample space for this experiment.

4. An exam has 6 true/false questions and 4 multiple choice (MC) questions. Each MC question has answer choices (a) through (e). How many different ways can the test be completed if

(a) Every question is answered?
(b) Every T/F question is answered, but not necessarily all MC questions are answered?
5. Shade the portion of the Venn diagram that represents the set: \((A \cap B)^C \cup (B \cap C^C)\)

![Venn diagram]

6. An experiment where one letter is drawn from a bag has a sample space of 
\(S = \{h, o, w, d, y, t, e, x, a, s\}\).

(a) How many total events are associated with the experiment?

(b) Write the events \(R = \text{“a vowel is drawn”}\) and \(B = \text{“a letter in the word bad is drawn”}\). Are \(R\) and \(B\) mutually exclusive events? Why or why not?

7. Among 200 students surveyed, 125 like chocolate ice cream, 70 like vanilla ice cream and 50 like both chocolate and vanilla ice cream. How many students from this group like

(a) Neither type of ice cream?

(b) Exactly one of these types of ice cream?

8. Given the following system,
\[
\begin{align*}
x - y & \geq 0 \\
4 & \leq x \leq 10 \\
x + 5y & \geq 10
\end{align*}
\]

(a) Find the solution set and determine whether or not it is bounded.

(b) Find all corner points of the solution set.

(c) Maximize and minimize the objective function, \(P = 3x + 15y\), on the solution set you found in (a), if possible. If not possible, explain why not.

9. Two fair five-sided dice are cast and the numbers rolled are noted.

(a) Write the sample space associated with this experiment.

(b) Write the event, \(E\), that at least one 4 is rolled.
10. A survey of 150 John Travolta fans was conducted.
   \( P \) is the set of people surveyed who own the movie \textit{Phenomenon}.
   \( M \) is the set of people surveyed who own the movie \textit{Michael}.
   \( S \) is the set of people surveyed who own the movie \textit{Saturday Night Fever}.

Use the information given to \textbf{FILL IN} the provided Venn diagram.

- 51 own \textit{Phenomenon}
- 4 own only \textit{Michael}
- 35 own exactly two of these movies
- 69 own \textit{Saturday Night Fever}
- 50 own \textit{Michael} or \textit{Saturday Night Fever}, but not \textit{Phenomenon}
- 47 own at least two of these movies
- 28 own only \textit{Saturday Night Fever}

11. A class has 5 seniors, 4 juniors, 3 sophomores, and 8 freshmen.

   (a) In how many ways can all the students be arranged in one row of seats if all students with the same classification must side beside each other?

   (b) A group of 6 students is selected for a presentation. How many groups are possible with

      (i) At least 5 freshmen?
      (ii) Exactly 2 seniors and exactly 1 junior?