**MATH 106 QUIZ 5 Extended due date: Wednesday, July 13, 2016**

**NAME:** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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

**INSTRUCTIONS**

* There are **6 problems on 5 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 13, 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.** (15 pts) There are two envelopes. The first envelope contains a $5 bill and a $10 bill. The second envelope contains a $1 bill and a $50 bill.

From the first envelope a bill is randomly chosen, and from the second envelope, a bill is randomly chosen, and the outcome is recorded. [For instance, the outcome (5, 1) means $5 bill from the first envelope and $1 bill from the second envelope.] **Showing your work, answer the following questions:**

(a) List all of the outcomes in the sample space.

(b) Let A be the event "the sum of the bill values is an even number of dollars."

 What outcomes belong to event A? (Just list them).

 What is the probability of event A? \_\_\_\_\_\_

(c) Let B be the event "the sum of the bill values is greater than 50 dollars."

 What outcomes belong to event B? (Just list them).

 What is the probability of event B? \_\_\_\_\_\_

(d) Determine the probability P(A ∪ B), where A and B are the events described above. **Show work/explanation.**

**2.** (12) A telemarketing executive has determined that for a particular product, 25% of the people contacted will purchase the product. If 10 people are contacted, what is the probability that at most 2 will buy the product? **Show work/explanation.**

**NOTE:** The question is not the same as “what is the probability that 2 will buy the product”?

**3.** (15 pts) A collection of 11 greeting cards consists of 7 birthday cards and 4 thank-you cards. Seven of the cards are randomly selected for purchase.

What is the probability that the 7 purchased cards consist of 5 birthday cards and 2 thank-you cards? **Show work/explanation.**

**(The Answer can be stated as fraction, such as 35/46, or as decimal rounded to three decimal places)**

**4.** (13 pts) For a certain game of chance, a player loses $10 with a probability of 0.30, breaks even with probability 0.10, gains $3 with probability 0.20, gains $4 with probability 0.15, and gains $6 with probability 0.25. This information is summarized in the table below (extra space provided for computations.)

|  |  |
| --- | --- |
|  | **Payoff Table** |
| *xi* | –$10 | $0 | $3 | $4 | $6 |  |
| *pi* | 0.30 | 0.10 | 0.20 | 0.15 | 0.25 |  |
|  |  |  |  |  |  |  |

(a) A player plays this game of chance one time. What is the probability that the player will win some money? **Show work/explanation**.

(b) If the player plays the game many times, what is the player’s expectation? That is, what is the **expected value** of the probability distribution?

**Show work**. (You are welcome to use the extra row and/or column in the table to make it easier to carry out the computation.)

**5.** (24 pts) Medicines to relieve headache pain include Drug X and Drug Y. A study was carried out, tracking 100 patients suffering from a particular kind of headache, migraine headaches. Each patient was treated for two migraine headaches. For one migraine headache, Drug X was administered, and for the other, Drug Y was administered. Given a randomly selected patient, the study found that Drug X relieved a migraine headache for 57 of the patients, Drug Y relieved a migraine headache for 50 patients, and Drugs X and Y both relieved the migraine headaches for 24 patients.

(a) Let *X* = “Drug X relieved migraine” and *Y* = “Drug Y relieved migraine”. Complete the following Venn diagram, filling in the appropriate **number of patients** in each of the regions.

*U*

**\_\_\_\_**

**\_\_\_\_**

**\_\_\_\_**

**\_\_\_\_\_**

(b) Let event *X* = “Drug X relieved migraine” and event *Y* = “Drug Y relieved migraine”. Fill in the associated probability table with the appropriate **probabilities** (No work/explanation required)

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Y** | **Y′** | **Totals** |
| **X** |  |  |  |
| **X′** |  |  |  |
| **Totals** |  |  |  |

(d) Given a randomly selected patient, state the probability that Drug X or Drug Y relieved a migraine headache.

(c) Given a randomly selected patient, state the probability that Drug Y did not relieve the migraine headache.

(e) Given a randomly selected patient, state the probability that Drug Y relieved a migraine headache but Drug X did not.

(f) Given a randomly selected patient, state the probability that neither Drug X nor Drug Y relieved a migraine headache.

**6.** (21 pts) The table below gives the distribution of blood types by sex in a group of 1,200 individuals.

|  |  |  |  |
| --- | --- | --- | --- |
| **Blood Type** | **Male** | **Female** | **Total** |
| **O** | 200 | 416 | 616 |
| **A** | 68 | 284 | 352 |
| **B** | 40 | 144 | 184 |
| **AB** | 12 | 36 | 48 |
| **Total** | 320 | 880 | 1200 |

 **(Answers for parts a through f can be stated as fractions, such as 35/46, or as decimals rounded to three decimal places)**

A person is selected at random from the group.

**Showing your work**, what is the probability that the person:

 (a) is female?

 (b) has blood type A?

 (c) is a female having blood type A?

 (d) is a female or has blood type A?

 (e) is female, given that the person’s blood type is A?

 (f) has blood type A, given that the person is female?

Consider the events F = "person is female" and A = "person has blood type A".

 (g) Are the events F and A independent? **Show work**/**explain carefully.**