Exam 2
7 May 2012
50 points total

Show all work for full or partial credit.

Name:_____

Problem Scores

1	/10		4	/ 5
2	/10		5	/10
3	/15			

Total Score: /50

Exam Grade:

Projected Course Grade:

Do not spend too much time on any one problem.

1. (10 pts) Suppose that you play a betting game with your friend Iris. You roll a six-sided blue die and she rolls a six-sided red die. You win \$1 every time the blue die is **greater than** the red die. You lose \$1 every time the red die is **greater than or equal to** the blue die.

   (a) (6 pts) What is the expected value of how much money you will win when you play this game?

   (b) (4 pts) In a sentence or two, explain in words what your answer means.

****** Question # 1 is on the other side. ******

2. (10 pts) Write a paragraph or two discussing linear programs and integer programs. You should give at least one way in which they are similar and give at least one way in which they are different. You should also address the reasons why you would use one instead of the other.

3. (15 pts) This is a question involving sensitivity analysis.

   You are baking chocolate-chip peanut-butter cookies for the school bake fair and have two recipes. Recipe x needs two ounces of chocolate chips and one ounce of peanut butter and makes you a profit of \$15 per batch. Recipe y needs one ounce of chocolate chips and one ounce of peanut butter and makes you a profit of \$10 per batch. You have available 8 ounces of chocolate chips and 5 ounces of peanut butter.

   Here is the linear program that corresponds to this problem:

   On the provided handout is the corresponding feasible region.

$$\begin{array}{rr} \text{Maximize } 15x + 10y & \\ \text{subject to} & 2x + y \leq 8 \\ \text{the constraints} & x + y \leq 5 \\ & x, y \geq 0 \end{array}$$

   (a) (4 pts) How many batches of Recipes x and y gives you the maximum profit? Explain your answer.

   (b) (6 pts) Suppose that you buy one more ounce of peanut butter at the store. How does the linear program change? How does the feasible region change?
   [*Feel free to draw on the provided handout.*]

   (c) (5 pts) What is the solution to the new linear program? What does this mean in terms of the equilibrium cost for an ounce of peanut butter?

4. (5 pts) Write one or more lines of *Mathematica* code that simulates flipping a biased coin that lands heads up 40% of the time and lands tails up 60% of the time.

5. (10 pts) Suppose that in our waiting room simulation, there are only five seats in the waiting room. If a patient arrives when the waiting room is full, he leaves right away without being seen by the doctor.

   (a) (3 pts) First, describe in words (one or two sentences) how this would affect the waiting room experience. You should describe what changes in the way the doctor sees her patients.

   (b) (7 pts) Now, explain how you would modify the provided code to take this into account. To receive partial credit, make sure to **explain in words** what you are trying to do in each line you write.

```
nwait = 0; busy = 0; endTime = 0;
For[i = 0, i < 180, i++,
   If[endTime == i, busy = 0];
   newPatient = If[RandomReal[] <= 0.075, 1, 0];
   If[newPatient == 1, nwait++];
   If[busy == 0 && nwait > 0, nwait--; busy = 1; endTime = i + 15];]
```