Midterm 1

Write down your problem solving process and how you get to the solution. No points are given without explanation.

Name:

ID #:
1. Two dice are rolled, one blue and one red. (15 points)
   a) How many outcomes have at least one die showing 2?
   
   b) How many outcomes give the sum of 7 or the sum of 11?
   
   c) How many outcomes are doubles? (both dice show the same number)
2. There are 6 distinct boys and 4 distinct girls (15 points)
   a) In how many ways can they wait in a line?

   b) In how many ways can they wait in a line if no two girls stand together?

   c) In how many ways can they wait in a circle if no two girls stand together?
   (clockwise rotated arrangements in a circle are considered the same)
3. There’s a 5x3 grid as shown. (10 points)

   ![5x3 Grid Diagram]

   a) How many routes are there from the lower left corner to the upper right corner if restricted to traveling only to the right or upward?

   b) How many routes are there from the lower left corner to the upper right corner, restricted to traveling only to the right or upward, and allowed to touch but not above the dashed diagonal line?

4. How many ways are there to distribute 10 identical erasers and 8 identical pencils to five students such that each student has a pencil? (10 points)
5. Arrange the letters in word BOOKKEEPER: (10 points)
   a) How many distinguishable ways?

   b) Begin with B and end with E?

6. Find coefficients: (10 points)
   a) \(x^2 y^3\) in \((x+y)^7\)

   b) \(a^2 x^3\) in \((a+ax+x)(a+x)^4\)
7. 4-door Monty hall problem. If instead of 3 doors, there’re 4 doors with a car behind one of them, 3 goats behind the other 3 doors. You choose one door initially and Monty shows you another door with a goat. What is your probability of winning the car if switching to one of the remaining 2 doors? (10 points)

8. Suppose that you have a factory producing widgets and you know that of the forty widgets produced last hour, five of them are defective. What is the probability that if you test 6 of the widgets, exactly 2 of them will be defective? (10 points)