Math 465 ASSIGNMENT 1, WINTER 2017 **Name:** ______________________________

NOTE: For this assignment you will be doing a few things on an extra sheet of paper. Put all other answers on this sheet, in the blanks provided.

1. Many engineering students at OIT take both Math 321 and Math 341. Consider the experiment of randomly selecting an engineering student starting their third year at OIT. The probability that an engineering student starting their third year at OIT

   - has taken Math 321 is 0.56
   - has taken Math 321 but not Math 341 is 0.35
   - has taken neither Math 321 nor Math 341 is 0.17

   (a) Let the number 321 represent the event that the selected student has taken math 321, and let 341 represent the event that they have taken 341. **On another sheet of paper**, draw a Venn diagram for this experiment in the space above and to the right, labeling each region with its probability.

   (b) Give the probability that the randomly selected student

   - has taken both 321 and 341: __________
   - has not taken 341: __________
   - has taken 321, given that they have taken 341: __________
   - has taken 341, given that they have *NOT* taken 321: __________

   (c) Are the events of having taken 321 and having taken 341 independent? **On your extra paper**, justify your answer, based on the definition.

2. A bucket contains 4 red marbles and 6 green marbles. An experiment consists of drawing two marbles, *with replacement*.

   (a) **On your extra paper**, draw a tree diagram for this experiment, with each branch labeled with the probability of travelling that branch written in next to the branch, as we've been doing in class and as shown on page 23 of the book.

   (b) At the end of each final branch, put something like $P(RG) =$ at the end of each final branch, along with its value.

   (c) Give the probability of obtaining

   - exactly one green marble: __________
   - *at least* one red marble: __________
   - A red marble on the second draw, given that a green was obtained on the first draw: __________

3. A bucket contains 4 red marbles and 6 green marbles. An experiment consists of drawing two marbles, *without replacement*.

   (a) **On your extra paper**, draw a tree diagram for this experiment. Label as for the previous exercise.

   (b) Give the probability of obtaining

   - exactly one green marble: __________
   - *at least* one red marble: __________
   - A red marble on the second draw, given that a green was obtained on the first draw: __________

4. Now suppose that we have a bucket containing 8 red marbles and 12 green marbles.

   (a) For the experiment of drawing two marbles *with replacement*, would the probabilities of the events from Exercise 2(c) be the same as, or different from, what they were with 4 red marbles and 12 green marbles? Circle one: same different

   (b) For the experiment of drawing two marbles *without replacement*, would the probabilities of the events from Exercise 3(b) be the same as, or different from, what they were with 4 red marbles and 12 green marbles? Circle one: same different

5. Consider the experiment of drawing six marbles, *with replacement*, from a bucket containing 8 red marbles and 12 green marbles. Clearly drawing a tree is now out of the question! For each of the following, **show how each answer is obtained, along with the answer itself**.

   (a) How many red/green combinations are possible?

   (b) How many ways can *exactly* two red marbles be obtained?

   (c) What would be the probability of obtaining any *ONE* of the ways that exactly two red marbles can be obtained?

   (d) What is the probability of obtaining exactly two red marbles?

   (e) What is the probability of obtaining *at least* two red marbles? (**Hint:** Apply Theorem 1.3.)

   (f) What would be the probability of obtaining exactly two red marbles if we drew *without replacement*?