CLARK UNIVERSITY 1887

First assignment
Math 217 Probability and Statistics
Prof. D. Joyce, Fall 2014

Assignment on combinatorics. Corresponds to chapter 1 exercises.

Guidelines. When you do these homework assignments, don't just write down the final answer. You may see the answer in the back of the book which is a final answer, but that's just there so you can check to see if you did it right. You won't get *any* credit on homework, a quiz, or a test if you just write a final answer. Show your work.

But your work isn't enough either. Sure, you have to do the computations, write a bunch of equations, and other hen scratchings to do the assignments, but marks like that without explanation aren't good enough. I'm not an archeologist who has to interpret a bunch of marks on stones to see what primitive man knew. I expect you to explain what you're doing.

Your work should be a collection of English sentences with equations and computations interspersed. Each time you introduce a new variable, you have to explain what it is. Each time you write an equation, it should have a context, although that context might be nothing more than "since" or "therefore".

What you write should be clear, understandable, and complete.

Remember to explain why as well as how. *Why* is more important than *how* or *what* in mathematics.

1. Consider two different dice in this exercise. One is a long die with 6 sides, the other a decahedron.

a. First consider the long die shown below with 6 sides. Two of the sides are squares with 1 or 2 dots, the other 4 are rectangles with 3, 4, 5, or 6 dots. Determine whether you should assign equal probabilities to all 6 outcomes when this die is tossed. Explain why.

b. Next consider this die with 10 sides numbered 1 through 10. Determine whether you should assign equal probabilities to all 10 outcomes when this die is tossed. Explain why.

2. Four people are to be arranged in a row to have their picture taken. In how many ways can this be done?

3. An automobile manufacturer has four colors available for automobile exteriors and three for interiors. How many different combinations can he produce?

4. In a digital computer, a *bit* is one of the integers $\{0, 1\}$. Bits are grouped together by 8 to make a *byte*. That is, a byte is a bitstring of length

8. One standard for storing characters (digits, letters, special symbols), the ASCII standard, uses one byte to store a character. That wasn't enough to store all the characters people use, so the UCS-2 Unicode was introduced. It uses 2 bytes to store a character,so each code is a bitstring of length 16. It was standardized in 1991. It's already obsolete. Now UTF-8 and UTF-16 are standard, and they can use up to 4 bytes.

How many different bitstrings of length 8 are there? How many of length 16? How many of length 32?

5. There are three different routes connecting city A to city B. How many ways can a round trip be made from A to B and back? How many ways if it is desired to take a different route on the way back?

6. In arranging people around a circular table, we take into account their seats relative to each other, not the actual position of any one person. Show that n people can be arranged around a circular table in $(n-1)!$ ways.

7. A symphony orchestra has in its repertoire 30 Haydn symphonies, 15 modern works, and 9 Beethoven symphonies. Its program always consists of a Haydn symphony followed by a modern work, and then a Beethoven symphony.

(a). How may different programs can it play?

(b). How many different programs are there if the three pieces can be played in any order?

(c). How many different three-piece programs are there if more than one piece from the same category can be played and they can be played in any order?

8. A certain state has license plates showing three numbers and three letters. How many different license plates are possible

(a). if the numbers must come before the letters?

(b). if there is no restriction on where the letters and numbers appear but there have to be 3 of each.

9. Suppose that 10 fish are caught at a lake that contains 5 distinct types of fish.

(a). How many different outcomes are possible, where an outcome specifies the numbers of caught fish of each of the five types.

(b). How many outcomes are possible when 3 of the 10 fish caught are trout?

(c). How many when at least 2 of the 10 are trout?

Math 217 Home Page at
`http://math.clarku.edu/~djoyce/ma217/`