CS 230 : Discrete Computational Structures
Spring Semester, 2023
ASSIGNMENT #10
Due Date: Tuesday, Apr 25

Suggested Reading: Rosen Sections 6.1 - 6.4.

These are the problems that you need to turn in. Always explain your answers and show your reasoning. **You will be graded based on how well you explain your answers. Just correct answers will not be enough!**

1. [**3 Pts**] How many integers between 1 and 60000, inclusive, are divisible by 3 or 5 or 7?
2. [**2 Pts**] An ISU Computer Science shirt is sold in 9 colors, 5 sizes, striped or solid, and long sleeve or short sleeve. (a) How many different shirts are being sold? (b) What if the red and gold shirts only come in short-sleeve and solid?
3. [**8 Pts**] Let A and B be sets of 7 elements and 9 elements, respectively. (a) How many different functions possible from A to B? from B to A? (b) How many different relations possible from A to B? (c) How many of the functions from A to B are one-to-one? (d) How many of the functions from B to A are onto?
4. [**3 Pts**] The department is ordering new office chairs that will be placed in six labs. How many chairs should we buy to make sure that some lab gets at least five chairs? Use the Pigeonhole Principle to justify your answer.
5. [**4 Pts**] In how many ways can a photographer arrange 8 people in a row from a family of 10 people, if (a) Mom and Dad are in the photo, (b) Mom and Dad are next to each other in the center of the photo (three people on each side of them).
6. [**4 Pts**] A coin is flipped nine times where each flip comes up either head or tails. How many possible outcomes contain at least five heads?
7. [**6 Pts**] 12 women and 10 men are on the faculty. How many ways are there to pick a committee of 6 if (a) Ann and Beth will not serve together, (b) at least one woman must be chosen, (c) at least one man and one woman must be chosen.
8. [**4 Pts**] Prove, using a combinatorial argument, that $C(m+n,2) = C(m,2) + C(n,2) + mn$, where $m, n \geq 2$.
9. [**6 Pts**] Prove that $C(n,2k)C(2k,k) = C(n,k)C(n-k,k)$, where $n \geq 2k > 0$, by using (a) an algebraic proof, (b) a combinatorial proof.

For more practice, work on problems in Rosen Sections 6.1 - 6.4.