CMSC 57
Discrete Mathematical Structures in Computer Science II

Exercise 2. Sample Model of Counting

On your papers, write your name, student number, an emoticon of how you feel at the moment (you may add in some words), section, and the date today. Answer each item as neatly as possible. Minimize erasures. Review your solutions before submitting your papers. Do not discuss your work with any other group.

1. In how many ways can five non-distinguishable dryad and seven non-distinguishable naiad sit around a circular ancient oak stump if no two dryad sit beside each other?

2. In how many ways can five distinguishable Camp Half Blood demigods and five distinguishable maidens from the Hunters of Artemis sit around a circular chasm in the ground if no Artemis Hunter- maiden sit beside each other?

3. Referring to the group of demigods and Hunters in #2, demigods Percy Jackson (son of Poseidon), Annabeth Chase (daughter of Athena), and Clarisse La Rue (daughter of Ares) join in to encircle the chasm. In how many ways can they sit around the circular chasm if no two Artemis Hunter-maiden sit together and Percy, Annabeth, and Clarisse insist on sitting beside each other?

4. The new Oracle of Delphi, Rachel Elizabeth Dare, would like to send a letter through the US postal system to her friends in Camp Half Blood (because she don't want to bother the god of messengers, Hermes). In how many ways can she arrange three 5-cent stamps; four $1 stamps and; five 35-cent stamps in a line at the back of her envelope for his letter to the demigods? (All 5 cent stamps are identical, and so are the $1 stamps and the 35 cent stamps.)

5. Mythomagic added an expansion game of tower defense and has the following defense towers: Zeus lightning emitter; Poseidon trident thrower; Hades skeletal catapult; Demeter seed sower; Apollo laser gun; Ares warhammer pouncer; Artemis arrow launcher; Athena dagger hurler and; Hephaestus celestial bronze harpoon. How many ways are there to choose defense towers for the 40 tower limit game mode? (Given you max out the limit)

6. Referring to the towers in #5, how many ways are there to choose towers for the 25 tower limit game mode if there should be at least two towers for each kind? (Given you max out the limit)

7. Referring to the towers in #5, how many ways are there to choose towers for the 25 tower limit game mode if there should be at least seven trident thrower; four arrow launcher and; two celestial bronze harpoons? (Given you max out the limit)

8. Chiron, the centaur activities director of Camp Half Blood needs to send 14 demigods to a quest in the Sea of Monsters. How many ways can Chiron choose demigods if there are currently 65 of them in camp?

9. Referring to the item in #8, only 28 of the demigods are children of the great 12 Olympians while the rest are children of the lesser gods (like Hecate, Nemesis, and Prometheus). Aside from sending 14 of the campers, the mission requires that there should be at least 11 Olympian children in the quest. In how many ways can Chiron assemble a group of campers required in the quest?

10. An Underworld lock is 13 symbols long with three symbols to choose from: skulls and bones, scythe, and coffin. How many possible ways can Nico di Angelo (son of Hades) encode a lock if there should be 3 skulls and bones, 6 scythes, and 4 coffins in the lock?

11. In one complicated game of Capture the Flag, defenders for each side is limited to 9 archers, 5 sword fighters, 2 defenseless scouts, and 8 javelin throwers. How many ways can Percy Jackson pick demigods from his side if he put up a sign up sheet where demigods were restricted to pick only one role and in that list - 10 want to be archers, 5 want to be sword fighter (including himself), 11 want to be scouts, and 12 want to be javelin throwers?