

Problem 1 – Set Practice. Let $S = \{1, 2, 3\}$.

- (a) List the elements of the cartesian product $S \times S$.
- (b) List the elements of the power set $P(S)$.
- (c) We have that $S \in P(S)$. Is $S \subseteq P(S)$?

Problem 2 Use decision processes to compute the number of options for the following scenarios:

- (a) How many two-digit **numbers** are there whose digits are different? (ex: 09 is not counted as a two-digit number, but 10 is)
- (b) How many two-digit **strings** are there whose digits are different? (ex: "09" does count as a two-digit string)
- (c) How many ways are there to arrange 6 people in a line?

Problem 3 The student council has 6 first-year students, 4 second-year students, 3 third-year students, and 8 fourth-year students.

- (a) How many ways are there to form a committee consisting of one student from each year?

- (b) How many ways are there to form a committee consisting of two students from each year?

- (c) How many ways are there to form a committee with the same number of students from each year, regardless of how many there are?

- (d) How many ways are there to form a committee consisting of two underclass (1st/2nd year) and two upperclass (3rd/4th year) students?

- (e) Each member of the student council shakes the hand of each other member exactly once. How many handshakes occur?
- (f) Each grade must elect a President and a Vice President out of that grade's members on the student council. How many ways are there to assign these roles across the student council?
- (g) Each member of the student council is assigned to either the subcommittee for student life, academics, or clubs. How many possible assignments of members to subcommittees are there? (Subcommittees are allowed to be empty, but every member must be on a committee. No member can be in more than one subcommittee.)
- (h) A new rule stipulates that members do not need to serve on a subcommittee, but they may serve on one of the three committees. How many possible assignments of members to subcommittees are there?