Week in Review #4

Section 2.2: Combination

- permutation of distinct objects: $P(n,r) = \frac{n!}{(n-r)!}$ where $r \leq n$
    arrangement of r objects from a set of n objects
    with order being important.
- permutation of not all distinct objects: $\frac{n!}{n_1!n_2!n_3!...n_r!}$
    $n_1 + n_2 + n_3 + ... + n_r = n$ where n_1 objects are alike and one of a kind,
    n_2 objects are alike and one of a kind,... for a total of n objects.
- combination: $C(n,r) = \frac{n!}{(n-r)!r!}$ where $r \leq n$
    a group of r objects from a set of n objects
    with order not being important.

1. A box has 4 red, 7 green, and 8 yellow balls. How many ways can a sample of 6 balls be selected from the box that contains

   (a) exactly 2 red and exactly 4 green balls.
   (b) exactly 2 red balls.
   (c) at least 2 green balls.
   (d) exactly 2 red balls or exactly 4 yellow balls.
   (e) exactly 2 red balls or exactly 3 green balls.

2. A meal at a local restaurant consists of a main dish, two vegetable dishes, and a desert. If there are 10 main dishes, 13 vegetable dishes, and 8 deserts, how many different meals are possible?

3. A basketball program has 20 kids signed up to play in a summer league. How many ways can these kids be divided into teams of 5 to be coached by 4 different coaches.

4. How many different arrangements are there of the letters of these words?

   (a) **representation**
   (b) **Endangered**

5. The Student Senate is creating a committee to study the issue of professors parking in the student lots. This committee will consists of 5 senators with one designated the chairperson and another designated the assistant chairperson. Currently 9 senators want to be on the committee. How many committees are possible?

6. A group has 8 guys and 10 girls as its members. In how many ways can 3 of the guys and 5 for the girls stand in a row for a picture?

7. How many ways can you get these poker hands? (note: this is a 5 card hand)

   (a) full house (ex JJJ33)
   (b) two pairs (ex JJKK2)

Section 2.3: Probability applications of Counting Principles

- If S is an uniform sample space
    - $P(E) = \frac{n(E)}{n(S)}$
    - $n(E)$ is the number of ways to get what we want.
    - $n(S)$ is the number of possible outcomes in S.

8. Fifteen cards are numbered 1 through 15. The cards are shuffled, and three cards are drawn and arranged in a row.

   (a) Find the probability that the first is odd and the second is even.

   (b) Find the probability that the first two are odd, and the third is an even number greater than 9.

9. David is selecting 10 kids from a group of 30 kids to form a summer basketball team. The group of 30 kids is made up of 9 thirteen-year-olds, 13 fourteen-year-olds, and 8 fifteen-year-olds. What is the probability that exactly 3 kids that are fifteen-years-old were selected on the team.

10. Three couples are going to an Aggie football game. They have tickets next to each other all in the same row. If the tickets are randomly given to the 6 people, what is the probability of each couple standing together?

11. Jim is taking an exam where he has to answer 10 of the 15 question on the exam. What is the probability that Jim answers at most 4 of the first 7 questions?

12. A committee of 6 students are to be chosen from a group of 9 freshmen, 10 sophomores, and 7 juniors. Find the probability that

   (a) The committee has all sophomores.

   (b) The committee has a majority of freshmen.

   (c) Bill, Sue, Sara and Jim are on the committee.

   (d) Only two of Bill, Sue, Sara and Jim are on the committee.

13. Your 4 year old nephew is playing with some blocks. The blocks are identical except for the letter on the block: one block has an M, four blocks have an I, 4 blocks have an S, and 2 blocks have a P. If your nephew places all of the blocks in a row, what is the probability that he spells the word MISSISSIPPI?

14. Fifteen people are all applying for three different scholarships. What is the probability that John, who is one of the 15 people, get at least 2 scholarships?