

**Week in Review #5**

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**Section 6.2: The number of elements in a Finite Set.**

- $n(A)$  denotes the number of things in set  $A$ .
  - $n(\phi) = 0$
- Set  $A$  and  $B$  are **disjoint** provided that  $A \cap B = \phi$
- $A$  and  $B$  are any two sets.
  - $n(A \cup B) = n(A) + n(B) - n(A \cap B)$
- $A$ ,  $B$ , and  $C$  are any three sets.
  - $n(A \cup B \cup C) = n(A) + n(B) + n(C) - n(A \cap B) - n(A \cap C) - n(B \cap C) + n(A \cap B \cap C)$

1. A group of 160 students were asked which of these sports they participated in high school.

- 15 students participated in all of these sports
- 25 students participated in basketball and track.
- 25 students participated in basketball and Tennis but not track.
- 15 students participated in track but not tennis.
- 70 students participated in basketball.
- 100 students did not participate in tennis.
- 37 students participated in exactly one sport.

(a) Fill in the Venn diagram.

(b) How many students participated in track?

(c) How many students participated in at least two sports?

(d) How many students participated in basketball or tennis but did not participate in track?

2. A group of students were asked which of these types of pets: dogs, cats, or fish, they had when they were kids.
- 28 said they only had a dog.
  - 6 said they had all three of these pets.
  - 16 said they had a dog and a fish.
  - 15 said they had a fish but did not have a cat.
  - 48 said they only had one of these types of pets when they were a kid.
  - 57 said they had fish or a cat as a pet when they were a kid.
  - 87 said they did not have a fish as a pet when they were a kid.
  - 57 said they did not have a dog as a pet when they were a kid.

(a) Fill in the Venn diagram.

(b) How many students were in the survey?

### Section 6.3: The multiplication Principle.

3. Four processes are involved in assembling a product and can be performed in any order. The management wants to test each order to determine which is the least time consuming. How many different orders will have to be tested?
4. An exam consists of 3 true false questions followed by 5 multiple choice questions each with 4 answers. How many ways can the exam be answered assuming that no questions are left blank

5. John, Sue, Beth and 3 other friends are lining up for a picture. How many ways can all of them line up to take the picture if Sue has to be directly between John and Beth?
6. Bob has designed a five-symbol license plate for the vehicles at a local theme park that use either all letters or two letters followed by three digits.
- (a) How many license plates are possible if the first letter must be a M, E, or W?
- (b) How many license plates are possible if the first letter must be a M, E, or W and no letter or digit can be repeated?

#### Section 6.4: Permutations and Combinations

- 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:  $\frac{n!}{n_1!n_2!n_3!\dots n_r!}$ 
  - $n_1 + n_2 + n_3 + \dots + n_r = n$  where  $n_1$  objects are alike and one of a kind,  $n_2$  objects are alike and one of a kind, ...
- combination:  $C(n, r) = \frac{n!}{(n-r)!r!}$  where  $r \leq n$ 
  - a group of  $r$  objects from a set of  $n$  objects without regard to order.

7. A box has 4 red, 7 green, and 8 yellow balls. A sample of 6 objects will be selected from the box. 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.

8. 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?
9. How many ways can a group of 10 people have their birthdays on different days of the year? Assume that there are only 365 days in a year.
10. 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.
11. How many different arrangements are there of the letters of the word **representation**?