

**Week in Review #3**

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**Section 2.1: The multiplication Principle.**

- factorial:  $n! = n * (n - 1) * (n - 2) * \dots * 1$ 
    - define  $0! = 1$
  - 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.
1. 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?
  2. An exam consists of 3 true false questions followed by 6 multiple choice questions each with 4 answers. Find the number of ways the exam can be answered assuming that
    - (a) no questions are left blank.
    - (b) questions may be left blank.
  3. 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?
  4. 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?
  5. 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.
  6. How many ways can a group of 10 people have at least two people with their birthdays on the same day of the year? Assume that there are only 365 days in a year.
  7. How many different four digit numbers are odd and greater than 6000?
  8. How many different four digit numbers are odd and greater than 6010?

9. How many four digit numbers can be formed if
- (a) There are no restrictions? (Zero is not the first digit.)
  - (b) Zero cannot be the first digit and no digit can be repeated?
  - (c) Zero cannot be the first digit, no digit can be repeated, and each number formed must be even?
10. Seven people, 4 guys and 3 women, are each asked to write down a integer between 1 and 15 (inclusive). In how many ways can they pick numbers if
- (a) Everybody picks a different number.
  - (b) The guys pick the same number and the women pick numbers different from the guys and different from each other.
  - (c) Exactly two of the people pick an even number.
11. In how many ways can you get a license plate consisting of three letters and two digits in any order with no digit or letter repeated?
12. A slot machine has 3 wheels. Each wheel has the same 5 symbols: tennis ball, baseball, soccer ball, football, and basketball. When playing the machine, your winnings are based on the number of tennis balls that are shown when the wheels stop spinning.
- (a) In how many ways can you not win at this game?
  - (b) In how many ways can you get at least one tennis ball?