MA 110 SECTION 7.3 BASIC COUNTING PRINCIPLES
HOMEWORK: 1 – 31 ODD, 35, 37, 49, 51, 53, 57, 61

1. **THE NUMBER OF ELEMENTS IN A SET A IS DENOTED**: n(A)

2. **ADDITION PRINCIPLE: THE INCLUSION-EXCLUSION PRINCIPLE**

   For any two sets A and B: $n(A \cup B) = n(A) + n(B) - n(A \cap B)$

   NOTE: If A and B are disjoint, then $n(A \cap B) = 0$ and $n(A \cup B) = n(A) + N(B)$.

3. EXAMPLE: Use the table to answer the following:

ELEMENTARY SCHOOL	RIDE A SCHOOL BUS TO SCHOOL	RIDE A BIKE TO SCHOOL	RIDE IN PARENT'S CAR TO SCHOOL	WALK TO SCHOOL
BOYS	40	5	10	12
GIRLS	50	2	15	14

Let B = Boys, G = girls, S = rides school bus, R = rides a bike, C = rides in car, W = walks

A. $n(B)$

B. $n(B \cap W)$

C. $n(G \cup S)$

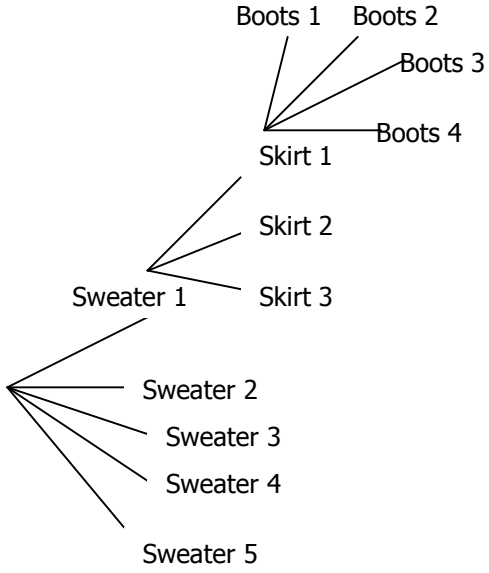
D. $n(R \cup C)$

4. **MULTIPLICATION PRINCIPLE**

   The multiplication principle is used when you have a finite number of operations to perform in order, with each operation having a finite number of ways it can be done.

   EXAMPLE:
   Dressing a store mannequin: Suppose a window dresser has 5 sweaters, 3 skirts, and 4 pairs of boots available to dress a mannequin. If she wants to change the window each day – how many different outfits can she create using the articles of clothing she has?

5. A Tree diagram is a helpful visual for solving this type of problem. The following is a partial tree diagram.



6. Suppose now that the window dresser has 10 sweaters, 7 skirts, and 5 pairs of boots. How many outfits are possible now?

7. Multiplication Principle Formula: p. 369

   For problems that have a set number of operations to be performed, with N_1 ways to do the first operation, N_2 ways to do the second operation, etc. The formula for computing the total number of possible outcomes is

   $$N_1 \bullet N_2 \bullet \cdots \bullet N_n .$$

8. Examples using the multiplication principle formula:

   A. At a restaurant, you can have you choice of 3 appetizers, 5 main-courses, and 4 desserts. How many different meal combinations are possible?

   B. At your office, you make up your own security code. The code must consist of one letter, one digit, one of 5 special symbols and another letter (that can be the same as the previous letter). How many security codes are possible?

C. How many security codes are possible, if the letter at the end of the code can not match the letter chosen at the beginning of the code?

D. An internet company assigns all of its customers a password. The password consists of four letters (repeats allowed) followed by two digits (no repeats allowed). How many different passwords can this company create?

E. If a 10 question multiple choice test in which each question has three choices for a response is given, how many different ways could the test be answered?

F. Your family of five is lining up in a row for a photo. How many different ways can you arrange your family members for the photo?