Ch 15 (15.1)
Counting and Probability

- quick look at day one problems
- License plate problem
- Lunch line problem
- Alabama problem
- Factorial numbers
- Triangular numbers
- Fundamental counting principle (rule of product)
- Rule of sum
- Sets and subsets
- Pascal's triangle.
- S-n-o-w problem

- Lunch line problem

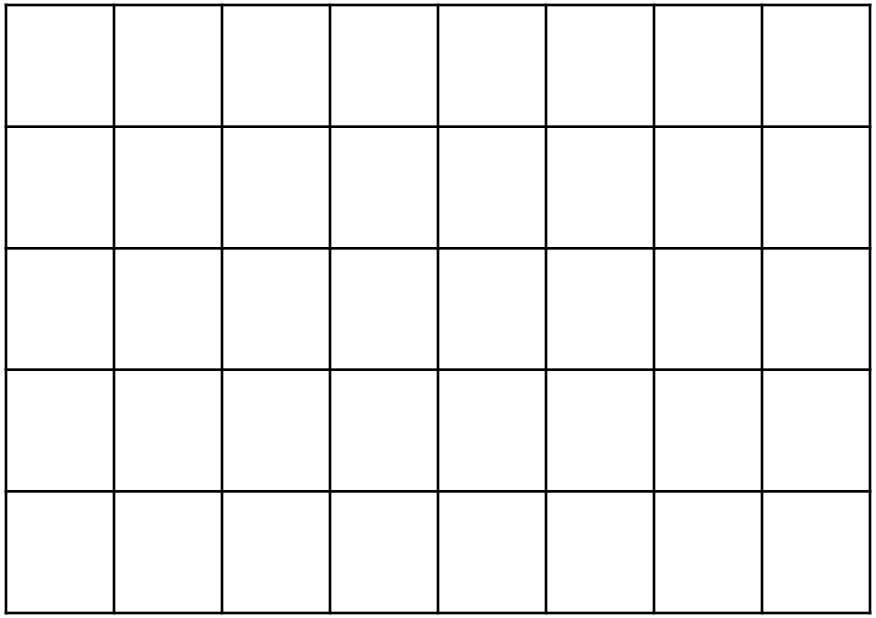
- Suppose a class of 14 students is to line up in single file to walk from the classroom to the cafeteria. In how many different ways can they line up?

- ALABAMA problem

Fundamental counting principle
(our text calls this the multiplication principle)

- When a task consists of k independent parts, if the first task can be performed in n_1 ways, the second in n_2 ways and so on through the kth part which can be done in n_k ways, then the total number of ways to complete the task is given by

$$n_1 \cdot n_2 \cdot n_3 \cdot \ldots \cdot n_k$$



- Path problem
- How many squares
- How many rectangles

Are you smarter than a 5th grader?

- Brooke's coffee creamer problem

Things to come:

- combinations
- permutations
- card and dice problems
- games of chance
- binomial theorem
- pascal’s triangle
- multinomial theorem

Patterns

- triangular numbers
- factorial numbers

- -- the digit circling thing (not sure what to call it!)

- License plate problem
- Suppose a certain state is designing license plates which are to have 2 letters (possibly repeating) followed by 3 nonrepeating digits. Using this scheme how many different license plates are possible?

- If Missouri has somewhere around 6 million citizens and if people have on average 2 cars person, how many additional digits would be needed to have enough plates to license all the cars?

Permutations and combinations

Permutation

An arrangement in which order IS important.

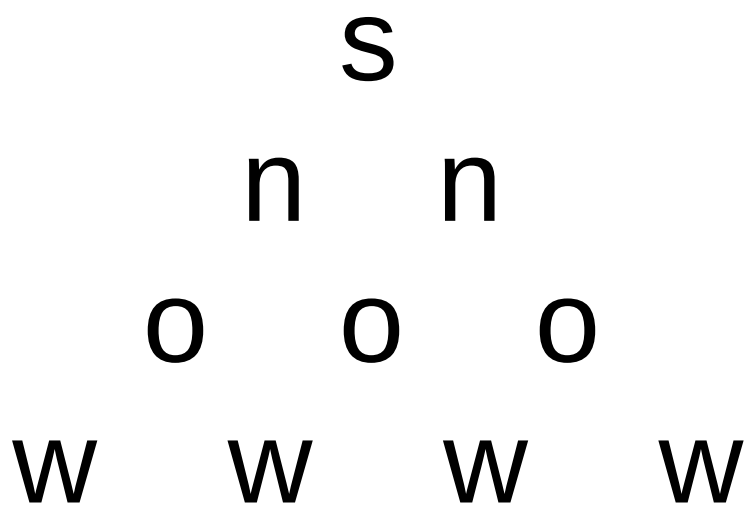
Combination

An arrangment in which order is NOT important.

Let’s select a word completely at random:

s n o w

Now, consider the following pattern (copy this onto paper)



In how many different ways Can we connect the letters s n o and w to form the word snow?

Pascal's triangle.

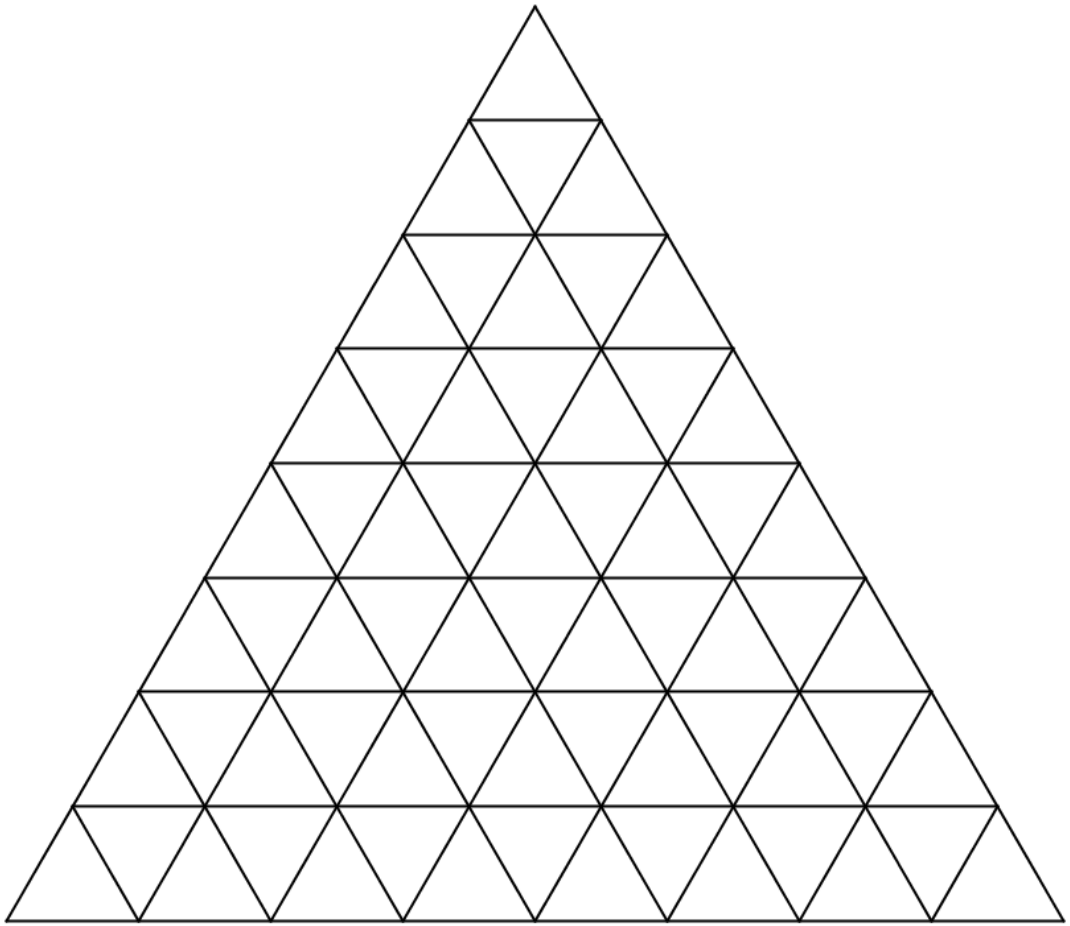
Let's look at pascal's triangle in the context of binomial expansion, and also subsets.

Some problems to think about:

1. Cookie problem
2. Handshake problem
3. Factorial number problem, in how many zeros does some large factorial number end. Like, in how many zeros does 287! End?

Cookie Problem

Suppose a tray comes around with an ample supply of three delicious types of cookies; chocolate chip, peanut butter, and oatmeal raisin. Suppose further that your pleasant task is to select 8 cookies for your group. You can select 8 all of one type, or any mix and match way you'd like. How many different selections of 8 cookies can be made?



Well, this is a little challenging, but not too bad. Can we count how many triangles are contained within the large triangle, and as usual we'll just trace along the existing lines.