MATH 174, LECTURE 15

1. Go over homework questions.
2. Possibly discuss "review" web links.
3. Homework: pages 294–295, numbers 26, 29, 31
   pages 303–304, numbers 3(a), 4, 9, 11, 14(a,b), 18(a)
   Two Quizzes: One from Web Review, Thursday (10/25)

Old

4. **Definition:** A *permutation* of a set of objects is an ordering of the objects.
5. **Examples:** (1) The permutations of $\{\text{Jill}, \text{Rob}\}$ are "Jill Rob" and "Rob Jill".

   (2) The permutations of $\{a, b, c\}$ are abc, acb, bac, bca, cab, and cba.
6. **Theorem 6.2.2:** For every integer $n \geq 1$, the number of permutations of a set with n elments is
   $$\boxed{n \times (n-1) \times (n-2) \times \cdots \times 2 \times 1 = n!}.$$
7. **Further Examples:** (3) How many different ways can the letters in SIX be arranged in a row?

   (4) How many different ways can the letters in FOUR be arranged in a row?

   (5) What if we require the two vowels "O" and "U" be next to each other?

   (6) How many different ways can we arrange three letters in a row using the letters in FOUR? (Does this example belong here?)

   (7) How many different ways can we arrange two letters in a row using the letters in FOUR? (Does this example belong here?)

   (8) Jane has six different colored beads and wants to use them to make a necklace (with the beads equally spaced apart). How many different necklaces can she make?

NEW

   (9) How many different ways can we arrange two letters in a row using the letters in NINE? (How does the problem change if NINE is replaced by NIKE?)

   (10) How many different ways can we arrange two letters in a row using the letters in ELEVEN?

   (11) How many different ways can we arrange two letters in a row using the letters in THIRTEEN?
8. **Notation:** If S is a finite set, then $n(S)$ (or $|S|$) denotes the number of elements of S.
9. **Theorem 6.3.1 (The Addition Rule):** Suppose a finite set A is the union of k mutually disjoint sets $A_1, \ldots, A_k$. Then
   $$n(A) = n(A_1) + n(A_2) + \cdots + n(A_k).$$
10. **Examples:** (1) A password is to consist of 4 to 6 letters (repetitions allowed). How many different passwords are possible?

    (2) How many (positive) two digit integers are divisible by 5? (Do two ways.)

    (3) What is the largest power of 2 that divides 100!?
11. **Theorem 6.3.1 (The Difference Rule):** If A is a finite set and $B \subseteq A$, then
    $$n(A - B) = n(A) - n(B).$$
12. **Examples:** (1) A password is to consist of 4 to 6 digits (repetitions allowed). How many of these passwords contain at least one repeated digit?

    (2) How many positive integers ≤ 100 are even but not divisible by 3?