MA 162: Finite Mathematics - Section 6.4

Fall 2014

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Announcements:

- Homework 6.3 due Friday at 6pm.
- Homework 6.4 due next Tuesday at 6pm.
- Exam Grades are posted on Web Assign. The actual exams will be returned later this week.

6.4 - Permutations and Combinations

Today's counting techniques are called:

1. Permutations
   - Order matters.
2. Combinations
   - Order does not matter.

6.4 - Permutations

- A **permutation** of a set is an arrangement of these objects in a *definite order*.

- Consider the set $\{1, 2, 3\}$. What are the permutations of this set?

6.4 - Permutations

- (Example, Tan, Section 6.3 #30 (modified)) A rolling combination four-digit padlock is unlocked by moving each of four rollers so as to produce the correct sequence. Each roller has four digits.

6.4 - Permutations

- (Example, Tan, Section 6.3 #30) A rolling combination four-digit padlock is unlocked by moving each of four rollers so as to produce the correct sequence. Each roller has ten digits.

6.4 - Permutations

- **Permutations of n Distinct Objects**: The number of permutations of n distinct objects taken r at a time is

$$P(n, r) = \frac{n!}{(n-r)!}$$

- What if all the elements are not distinct?

6.4 - Permutations

- How many permutations can be formed from the letters in the word BANANA?

6.4 - Permutations

- **Permutations of n Objects, Not All Distinct**: Given a set of n objects in which n_1 are alike and of one kind, n_2 objects are alike and of another kind, . . . , and n_m objects are alike and of yet another kind, so that

$$n_1 + n_2 + \ldots + n_m = n$$

then the number of permutations of these n objects taken n at a time is given by

$$\frac{n!}{n_1!n_2! \cdots n_m!}$$

6.4 - Combinations

- Recall that in a combination, the order does not matter.
- (Example) A group of three students are going to be selected from a group of ten students to go on a field trip. How many different ways can this group of three be chosen?

6.4 - Combinations

- **Combinations of n Distinct Objects**: The number of combinations of n distinct objects taken r at a time is given by

$$\binom{n}{r} = C(n, r) = \frac{n!}{r!(n-r)!}$$

where $r \leq n$.

- One major difficulty in this chapter is determining whether to use a combination or permutation.

- Practice as many examples as possible to be able to determine which to use.

6.4 - Poker Hands

- A standard deck of playing cards has 52 cards.
- A standard hand of poker has 5 cards.
- How many distinct poker hands are possible?

6.4 - Poker Hands

- How many hands with one pair are possible? (Two cards with same numerical value and the other three cards all have different values.)

6.4 - Poker Hands

- How many straight flushes are possible? (A straight flush is 5 cards in numerical order; all the same suit.)

6.4 - Poker Hands

- How many straights (but not straight flushes) are possible? (A straight is 5 cards in numerical order, but not all the same suit.)

6.4 - Poker Hands

- How many flushes (but not straight flushes) are possible? (A flush is 5 cards of the same suit, but not in numerical order.)

6.4 - Poker Hands

- Is a flush or a straight more common?

6.4 - Poker Hands

- A different version of poker is called 7-card stud.
- A hand of 7-card stud consists of 4 cards dealt face-up and 3 cards dealt face-down.
- Note: The same 7 cards make up different hands if different cards are face-up.
- How many distinct 7-card stud hands are there?