Some Problems about Basic Probability and Counting

IE231 - Lecture Notes 2

Feb 21, 2017

These problems are to enhance the theoretical learning. Solutions are provided under the questions. There might be R codes to replicate what is done in paper.

1. Suppose I toss a coin, roll a die and draw a card from the deck. How many different number of outcomes are there for this experiment?

   Solution: Multiplication rule. $n_1 n_2 n_3 = 2.6.52 = 624$.

2. In how many ways I can order the Teletubbies? (Tinky-Winky, Dipsy, Laa Laa and Po) For instance, (TW - Dipsy - Po - Laa Laa) is an ordering and (Dipsy - Po - TW - Laa LAa) is another.

   Solution: Permutation rule. $n! = 4! = 24$

3. I want to reorder the letters of the phrase "GOOD GRADES". In how many ways can I do it? (space character is not included).

   Solution: Remember the permutation rule with identical items. There are two "G"s, two "D"s and two "O"s. Remember the formula $\frac{n!}{n_1!n_2!\dots n_k!}$. So the result should be $\frac{10!}{2!2!2!1!1!1!1!} = 453600$.

4. I want to make two letter words from "GRADES" such as "GA", "ED" or "DE" (it doesn't have to make sense). Find the number of permutations.

   Solution: Permutation of r items from n items is $\frac{n!}{(n-r)!}$. So the result is $\frac{6!}{4!} = 30$.

5. Suppose I am drawing a hand of 5 cards from a playing deck. How many different hands there can be? (Each card should be considered as different in this question.)

   Solution: Since in a hand you do not care for the order, it is the combination $\binom{52}{5} = \frac{52!}{(52-5)!5! = 2598960}$.

Coins, Dice and Cards

When questions mention about coins, dice and cards they are commonly referred items. Nevertheless, you can refer to .

- Coin tosses: Two possible outcomes. Heads or Tails.
- Dice rolling: Six possible outcomes. 1-2-3-4-5-6.
- Card drawing: 52 possible outcomes. There are 4 types (clubs, diamonds, spades and hearts) and 13 ranks for each type. (A)ce - 2 - 3 - 4 - 5 - 6 - 7 - 8 - 9 - 10 - (J)ack - (Q)ueen - (K)ing.