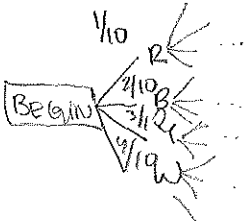


1. A bag contains 1 red marble, 2 blue marbles, 3 yellow marbles, and 4 white marbles. Ten marbles are drawn with replacement from the bag. Write down an expression (you need not evaluate it) for the probability that exactly 2 blue and 3 yellow marbles appear in the 10 trials.  $n=10$



$$P(2 \text{ blue and } 3 \text{ yellow in one trial}) = \frac{2! 3! 4! 1!}{10^{10}}$$

this uses multinomial distribution

2. A five card hand is dealt (without replacement) from a standard deck of cards. Write an expression for the probability that the hand contains exactly 3 hearts.

$$P(\text{hand contains exactly 3 hearts}) = \frac{\binom{13}{3} \cdot \binom{39}{2}}{\binom{52}{5}}$$

$\frac{13}{52}$   
 $\frac{39}{52}$   
 $\frac{39}{52}$

3. The chairman of the math department dictates 7 letters to his overworked secretary. Delirious from nicotine withdrawal, she completely mixes up the letters and addresses, and the letters end up addressed completely at random. Find the expected number of correctly addressed letters under the following assumptions:

- (a) that seven addresses are assigned to the letters without replacement, i.e. each address is used on only one letter.  
 (b) that the addresses are assigned to the letters with replacement, i.e. one address might be on more than one letter.

EX;  $X = \#$  of correctly addressed letter.  $X \in \{0, 1, \dots, 7\}$   $L_1, L_2, \dots, L_7$   
 $A_1, A_2, \dots, A_7$

(a)  $P(X=x)$ .  $P(X=0) = P(\text{all wrongly assigned}) = 1 - P(\text{all correctly assigned}) = 1 - \frac{1}{7!}$

$P(X=1) = \frac{6!}{7!}$ ;  $P(X=2) = \frac{5!}{7!}$ ;  $P(X=3) = \frac{4!}{7!}$ ;  $P(X=4) = \frac{3!}{7!}$ ;  $P(X=5) = \frac{2!}{7!}$ ;  $P(X=6) = \frac{1!}{7!}$ ;  $P(X=7) = \frac{0!}{7!}$

$EX = \sum_{x=0}^7 P(X=x) \cdot x =$

4. A poll is planned to estimate the percentage of people who would vote for Bush and Gore (given just those two choices) if the election were held tomorrow. How large must the sample be in order for it to be accurate to within 1 percentage point with a confidence level of at least .95? (Hint: You will need the inequality  $p(1-p) \leq \frac{1}{4}$ .)