

11th November 2007

Probability, Permutations, Combinations

Objectives

- recognize and distinguish between a permutation case and a combination case;
- know and use the notation n and the expressions for permutations and combinations of n items taken r at times;
- answer simple problems on arrangement and selection (cases with repetition of objects, or with objects arranged in a circle or involving both permutations and combinations, are excluded);
- use the sum and product laws of probability, expectation, including treatment of mutually exclusive and independent events;
- use addition and multiplication of probabilities, as appropriate, in simple cases;
- understand the representation of events by means of tree diagrams and Venn diagrams, and use them in calculating probabilities;
- understand and use the notations $P(A)$.

Sample problems

1. How many license plates can be made by using two English letters in uppercase followed by a three digit number? The first digit of a license plate should not be a zero. How many of those license plates have two vowels followed by three identical digits?
2. Ten persons, A, B, C, \dots, J sit round a circular table. The chairs are all numbered. What is the probability that A and B sit next to each other?
3. Out of a group of 10 men and 8 women, two persons are chosen at random. What is approximately the probability that they are both men, correct to three decimal places?
4. A committee of five is chosen from six men and four women. In how many ways can this be done so that the committee contains
 - (a) at least one man

- (b) at least one man and one woman?
5. A box contains 5 red and 4 white marbles. Two marbles are drawn successively from the box without replacement and it is noted that the second one is white. What is the probability that the first is also white?
 6. A box contains 8 balls, of which 3 are identical (and so are indistinguishable from one another) and the other 5 are different from each other. 3 balls are to be picked out of the box; the order in which they are picked out does not matter. Find the number of different possible selections of 3 balls.
 7. A board of directors consists of 9 men and 4 women, one of whom is Mrs Lee. A committee consisting of 4 people is to be formed from this board of directors and it has been decided that it must contain at least a woman.
 - (a) How many different committees can be formed?
 - (b) How many different committees can be formed that have Mrs Lee as a member?
 8. A girl wishes to phone a friend but cannot remember the exact number. She knows that it is a five digit number, that is even, and that it consists of the digits 2,3,4,5 and 6 in some order. Using this information, find the largest number of different wrong telephone numbers she could try.
 9. In how many ways can a committee of 3 men and 3 women be chosen from a group of 7 men and 6 women? The oldest of the 7 men is A and the oldest of the 6 women is B . It is decided that the committee can include at most one of A and B . In how many ways can the committee now be chosen?
 10. In this question, a *word* is defined to be any set of letters in a row, whether or not it makes sense. Find how many different words can be made using all 8 letters of the word SYLLABUS.