Permutations and Combinations

Spec

3 Five friends, Ali, Bev, Carla, Don and Ed, stand in a line for a photograph.

(i) How many different possible arrangements are there if Ali, Bev and Carla stand next to each other? [2]

(ii) How many different possible arrangements are there if none of Ali, Bev and Carla stand next to each other? [3]

(iii) If all possible arrangements are equally likely, find the probability that two of Ali, Bev and Carla are next to each other, but the third is not next to either of the other two. [3]

Jan 02

5 Seven men and five women have been nominated to serve on a committee. The committee consists of four members who are to be chosen from the seven men and five women.

(i) In how many different ways can the committee be chosen? [2]

(ii) In how many of these ways will the committee consist of two men and two women? [4]

(iii) Assuming that each choice of four members is equally likely, find the probability that the committee will contain exactly two men. [2]

Jun 03

3 A standard pack of playing cards consists of 52 distinct cards. Five different cards are selected at random. The order in which the cards are selected does not matter.

(i) Find the number of different possible selections of 5 cards. [1]

(ii) There are 4 suits (clubs, diamonds, hearts and spades) and each suit consists of 13 cards. How many of the selections in part (i) consist of 3 spades and 2 clubs? [2]

(iii) How many of the selections in part (i) contain exactly 3 spades? [2]

(iv) Calculate the probability that 5 cards selected at random will consist of 3 spades and 2 clubs. [2]

Nov 03

6 Three families, Mr and Mrs Dale and their son, Mr and Mrs Mason and their daughter, and Mr and Mrs Baker and their three children, are going to the theatre together. They have booked seats in one row which contains exactly eleven seats.

(i) If there is no restriction on seating, state the number of different possible arrangements of the 11 people when they sit in the row. [1]

(ii) If each family has to sit together, how many arrangements are possible? [4]

(iii) If the seating arrangement is chosen at random, find the probability that each family is sitting together. [2]

Perms and Combs (cont 1)

3 Three married couples, Mr and Mrs Aziz, Mr and Mrs Baker and Mr and Mrs Campbell, are arranged in a line for a photograph.

May 02

(i) How many different arrangements of the six people are possible? [1]

(ii) In how many of these arrangements is Mr Aziz standing next to his wife? [4]

(iii) Given that every possible arrangement is equally likely, calculate the probability that Mr Aziz is standing next to his wife. [2]

5 Ten discs each have a letter written on them. Five have A, three have B and two have C written on them. The discs are placed in a bag and then selected one at a time, at random. They are then placed in a straight line in the order in which they were selected. The sequence of ten letters makes a code word. So, for example, one possible code word is $ABBAAACBCA$.

Nov 02

(i) How many different possible code words can be made? [2]

(ii) How many different possible code words start and end with the letter B? [3]

(iii) Find the probability that a code word starts and ends with the same letter. [4]

5 Each of 6 cards has a different single letter written on it. The letters on the cards are A, B, C, D, E and F. The cards are shuffled and then placed in a row.

Jan 04

(i) How many different possible arrangements of letters are there? [1]

(ii) In how many of these arrangements are the vowels (i.e. the letters A and E) next to each other? [4]

(iii) The cards are now shuffled and placed face down. Three of the cards are selected at random. Find the probability that at least one of the selected cards is a vowel. [4]

2 A hockey coach has to choose a team of 11 players from a group of 11 men and 11 women.

Jan 05

(i) If there is no restriction on the number of team members of each gender, find in how many different ways the coach can choose the team. [2]

(ii) If the team is chosen at random from the group, find the probability that it consists of 6 men and 5 women. [4]

2 The letters CCEGGGGEE give the first nine notes of a certain tune.

Jun 05

(i) Find how many different 'tunes' can be formed using all of the nine letters. [2]

(ii) Find how many of these tunes will have the four Gs in positions 2, 4, 6 and 8. [2]

(iii) Find the probability that a tune formed randomly using all of the nine letters will have the four Gs in positions 2, 4, 6 and 8. [1]

Perms and Combs (cont 2)

7 A standard pack of playing cards consists of 52 cards. The cards are all different. There are 13 cards in each of four 'suits': hearts, clubs, diamonds and spades. 5 cards are selected at random from the pack. The order in which the cards are selected does not matter.

Nov 04

(i) How many different possible selections of 5 cards are there? [1]

(ii) How many of these selections consist of 5 hearts? [2]

(iii) How many of these selections consist of 3 spades and 2 hearts? [2]

(iv) How many of these selections consist of 3 cards of one suit and 2 cards of another suit? [2]

(v) Find the probability that the selection consists of 3 cards of one suit and 2 cards of another suit. [2]

2 A child's game uses five bricks. One is blue, one is green, one is yellow and two are white. The five bricks are arranged in a line.

Jun 04

(i) How many different possible arrangements of the colours are there? [2]

(ii) Assuming that all the arrangements in part (i) are equally likely, find the probability that the two white bricks are at the ends of the line. [3]

3 A bag contains 30 plastic tiles which are used in a word game. Each tile has a single letter written on it. 12 of the tiles have vowels written on them and the remaining 18 tiles have consonants written on them. A contestant in the game picks 7 tiles at random, without replacement.

Jun 01

(i) Find the probability that, of the 7 tiles, 4 have vowels written on them and 3 have consonants written on them. [3]

(ii) Find the probability that, of the 7 tiles, at least 1 has a vowel written on it. [2]

(iii) The letters written on the tiles are A B A E S S U. Calculate the number of different possible arrangements of these letters if the tiles are placed in a straight line. [2]

3 The board of directors of a company consists of 4 men and 4 women. The 8 directors are told to stand in a line so that a photograph can be taken.

Jan 01

(i) Calculate the number of different ways in which the 8 directors can be arranged in a line. [1]

(ii) In how many ways can the 8 directors be arranged so that in the line men and women stand alternately? [3]

(iii) Five members of the board of directors are to be chosen to form a committee. There must be at least 2 women on the committee. Find the number of different possible committees which could be chosen. [4]