

PERMUTATIONS & COMBINATIONS

1. s-02

The digits of the number 1223678 can be rearranged to give many different 7-digit numbers. Find how many different 7-digit numbers can be made if

- (i) there are no restrictions on the order of the digits, [2]
- (ii) the digits 1, 3, 7 (in any order) are next to each other, [3]
- (iii) these 7-digit numbers are even. [3]

2. w-01

- (a) A competition involves listing *in order* the best 6 features of a certain car. There are 10 features to choose from (e.g. power steering, air bags, air conditioning etc.). Peter makes a list of 6 features. How many different lists could Peter make? [2]
- (b) The word MOBILE consists of the three consonants M, B, L and the three vowels O, I, E. How many different arrangements of all the letters of the word MOBILE are possible if the vowels must be next to each other? [3]

3. w-02

In a certain hotel, the lock on the door to each room can be opened by inserting a key card. The key card can be inserted only one way round. The card has a pattern of holes punched in it. The card has 4 columns, and each column can have either 1 hole, 2 holes, 3 holes or 4 holes punched in it. Each column has 8 different positions for the holes. The diagram illustrates one particular key card with 3 holes punched in the first column, 3 in the second, 1 in the third and 2 in the fourth.



- (i) Show that the number of different ways in which a column could have exactly 2 holes is 28. [1]
- (ii) Find how many different patterns of holes can be punched in a column. [4]
- (iii) How many different possible key cards are there? [2]

4. S-03

A committee of 5 people is to be chosen from 6 men and 4 women. In how many ways can this be done

- (i) if there must be 3 men and 2 women on the committee. [2]
- (ii) if there must be more men than women on the committee. [3]
- (iii) if there must be 3 men and 2 women, and one particular woman refuses to be on the committee with one particular man? [3]

5. W-03

- (a) A collection of 18 books contains one Harry Potter book. Linda is going to choose 6 of these books to take on holiday.
- (i) In how many ways can she choose 6 books? [1]
- (ii) How many of these choices will include the Harry Potter book? [2]
- (b) In how many ways can 5 boys and 3 girls stand in a straight line
- (i) if there are no restrictions. [1]
- (ii) if the boys stand next to each other? [4]

PERMUTATIONS & COMBINATIONS(2)

1. s-04

(a) The menu for a meal in a restaurant is as follows.

Starter Course

Melon

or

Soup

or

Smoked Salmon

Main Course

Chicken

or

Steak

or

Lamb Cutlets

or

Vegetable Curry

or

Fish

Dessert Course

Cheesecake

or

Ice Cream

or

Apple Pie

*All the main courses are served with salad and either
new potatoes or french fries.*

(i) How many different three-course meals are there?

(ii) How many different choices are there if customers may choose only two of the three courses?

(b) In how many ways can a group of 14 people eating at the restaurant be divided between three tables seating 5, 5 and 4?

2. w-04

The word ARGENTINA includes the four consonants R, G, N, T and the three vowels A, E, I.

(i) Find the number of different arrangements using all nine letters. [2]

(ii) How many of these arrangements have a consonant at the beginning, then a vowel, then another consonant, and so on alternately? [3]

3. s-05

(a) A football team consists of 3 players who play in a defence position, 3 players who play in a midfield position and 5 players who play in a forward position. Three players are chosen to collect a gold medal for the team. Find in how many ways this can be done

(i) if the captain, who is a midfield player, must be included, together with one defence and one forward player. [2]

(ii) if exactly one forward player must be included, together with any two others. [2]

(b) Find how many different arrangements there are of the nine letters in the words GOLD MEDAL.

(i) if there are no restrictions on the order of the letters. [2]

(ii) if the two letters D come first and the two letters L come last. [2]

4. w-05

A staff car park at a school has 13 parking spaces in a row. There are 9 cars to be parked.

(i) How many different arrangements are there for parking the 9 cars and leaving 4 empty spaces? [2]

(ii) How many different arrangements are there if the 4 empty spaces are next to each other? [3]

(iii) If the parking is random, find the probability that there will not be 4 empty spaces next to each other. [2]