

Permutations and combinations

Question Paper 7

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Permutations and combinations
Sub Topic	
Booklet	Question Paper 7

Time Allowed: 56 minutes

Score: /46

Percentage: /100

Grade Boundaries:

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- 1** Four families go to a theme park together. Mr and Mrs Lin take their 2 children. Mr O'Connor takes his 2 children. Mr and Mrs Ahmed take their 3 children. Mrs Burton takes her son. The 14 people all have to go through a turnstile one at a time to enter the theme park.

- (i) In how many different orders can the 14 people go through the turnstile if each family stays together? [3]
- (ii) In how many different orders can the 8 children and 6 adults go through the turnstile if no two adults go consecutively? [3]

Once inside the theme park, the children go on the roller-coaster. Each roller-coaster car holds 3 people.

- (iii) In how many different ways can the 8 children be divided into two groups of 3 and one group of 2 to go on the roller-coaster? [3]

- 2** A town council plans to plant 12 trees along the centre of a main road. The council buys the trees from a garden centre which has 4 different hibiscus trees, 9 different jacaranda trees and 2 different oleander trees for sale.

- (i) How many different selections of 12 trees can be made if there must be at least 2 of each type of tree? [4]

The council buys 4 hibiscus trees, 6 jacaranda trees and 2 oleander trees.

- (ii) How many different arrangements of these 12 trees can be made if the hibiscus trees have to be next to each other, the jacaranda trees have to be next to each other and the oleander trees have to be next to each other? [3]
- (iii) How many different arrangements of these 12 trees can be made if no hibiscus tree is next to another hibiscus tree? [3]

- 3** There are 10 spaniels, 14 retrievers and 6 poodles at a dog show. 7 dogs are selected to go through to the fin l.

- (i) How many selections of 7 different dogs can be made if there must be at least 1 spaniel, at least 2 retrievers and at least 3 poodles? [4]

2 spaniels, 2 retrievers and 3 poodles go through to the fin l. They are placed in a line.

- (ii) How many different arrangements of these 7 dogs are there if the spaniels stand together and the retrievers stand together? [3]
- (iii) How many different arrangements of these 7 dogs are there if no poodle is next to another poodle? [3]

- 4 (a) Seven friends together with their respective partners all meet up for a meal. To commemorate the occasion they arrange for a photograph to be taken of all 14 of them standing in a line.
- (i) How many different arrangements are there if each friend is standing next to his or her partner? [3]
 - (ii) How many different arrangements are there if the 7 friends all stand together and the 7 partners all stand together? [2]
- (b) A group of 9 people consists of 2 boys, 3 girls and 4 adults. In how many ways can a team of 4 be chosen if
- (i) both boys are in the team, [1]
 - (ii) the adults are either all in the team or all not in the team, [2]
 - (iii) at least 2 girls are in the team? [2]
- 5 An English examination consists of 8 questions in Part *A* and 3 questions in Part *B*. Candidates must choose 6 questions. The order in which questions are chosen does not matter. Find the number of ways in which the 6 questions can be chosen in each of the following cases.
- (i) There are no restrictions on which questions can be chosen. [1]
 - (ii) Candidates must choose at least 4 questions from Part *A*. [3]
 - (iii) Candidates must either choose both question 1 and question 2 in Part *A*, or choose neither of these questions. [3]