

Permutations and combinations

Question Paper 9

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Permutations and combinations
Sub Topic	
Booklet	Question Paper 9

Time Allowed: 74 minutes

Score: / 61

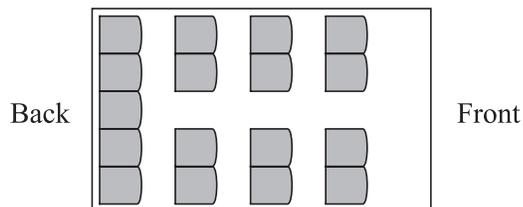
Percentage: /100

Grade Boundaries:

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

- 1** Three identical cans of cola, 2 identical cans of green tea and 2 identical cans of orange juice are arranged in a row. Calculate the number of arrangements if
- (i) the first and last cans in the row are the same type of drink, [3]
 - (ii) the 3 cans of cola are all next to each other and the 2 cans of green tea are not next to each other. [5]
- 2** A choir consists of 13 sopranos, 12 altos, 6 tenors and 7 basses. A group consisting of 10 sopranos, 9 altos, 4 tenors and 4 basses is to be chosen from the choir.
- (i) In how many different ways can the group be chosen? [2]
 - (ii) In how many ways can the 10 chosen sopranos be arranged in a line if the 6 tallest stand next to each other? [3]
 - (iii) The 4 tenors and 4 basses in the group stand in a single line with all the tenors next to each other and all the basses next to each other. How many possible arrangements are there if three of the tenors refuse to stand next to any of the basses? [3]
- 3** Issam has 11 different CDs, of which 6 are pop music, 3 are jazz and 2 are classical.
- (i) How many different arrangements of all 11 CDs on a shelf are there if the jazz CDs are all next to each other? [3]
 - (ii) Issam makes a selection of 2 pop music CDs, 2 jazz CDs and 1 classical CD. How many different possible selections can be made? [3]
- 4**
- (i) Find the number of ways in which all twelve letters of the word REFRIGERATOR can be arranged
 - (a) if there are no restrictions, [2]
 - (b) if the Rs must all be together. [2]
 - (ii) How many different selections of four letters from the twelve letters of the word REFRIGERATOR contain no Rs and two Es? [3]

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The diagram shows the seating plan for passengers in a minibus, which has 17 seats arranged in 4 rows. The back row has 5 seats and the other 3 rows have 2 seats on each side. 11 passengers get on the minibus.

- (i) How many possible seating arrangements are there for the 11 passengers? [2]
- (ii) How many possible seating arrangements are there if 5 particular people sit in the back row? [3]

Of the 11 passengers, 5 are unmarried and the other 6 consist of 3 married couples.

- (iii) In how many ways can 5 of the 11 passengers on the bus be chosen if there must be 2 married couples and 1 other person, who may or may not be married? [3]

- 6 (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 midfielder 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]

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

<p style="text-align: center;"><i>Starter Course</i></p> <p style="text-align: center;"><i>Melon</i> <i>or</i> <i>Soup</i> <i>or</i> <i>Smoked Salmon</i></p> <p style="text-align: center;"><i>Main Course</i></p> <p style="text-align: center;"><i>Chicken</i> <i>or</i> <i>Steak</i> <i>or</i> <i>Lamb Cutlets</i> <i>or</i> <i>Vegetable Curry</i> <i>or</i> <i>Fish</i></p> <p style="text-align: center;"><i>Dessert Course</i></p> <p style="text-align: center;"><i>Cheesecake</i> <i>or</i> <i>Ice Cream</i> <i>or</i> <i>Apple Pie</i></p> <p style="text-align: center;"><i>All the main courses are served with salad and either new potatoes or french fries.</i></p>
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- (i) How many different three-course meals are there? [2]
- (ii) How many different choices are there if customers may choose only two of the three courses? [3]
- (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? [3]

- 8** 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]