Permutations and combinations
Question Paper 8

Level	International A Level
Subject	Maths
Exam Board	CIE
Topic	Permutations and combinations
Sub Topic	
Booklet	Question Paper 8

Time Allowed: 60 minutes

Score: / 50

Percentage: /100

Grade Boundaries:

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

1   **(i)** In how many ways can all 9 letters of the word TELEPHONE be arranged in a line if the letters P and L must be at the ends?   [2]

How many different selections of 4 letters can be made from the 9 letters of the word TELEPHONE if

 (ii) there are no Es,   [1]

(iii) there is exactly 1 E,   [2]

(iv) there are no restrictions?   [4]

2   A cricket team of 11 players is to be chosen from 21 players consisting of 10 batsmen, 9 bowlers

and 2 wicketkeepers. The team must include at least 5 batsmen, at least 4 bowlers and at least 1 wicketkeeper.

 (i) Find the number of different ways in which the team can be chosen.   [4]

Each player in the team is given a present. The presents consist of 5 identical pens, 4 identical diaries and 2 identical notebooks.

(ii) Find the number of different arrangements of the presents if they are all displayed in a row.   [1]

(iii) 10 of these 11 presents are chosen and arranged in a row. Find the number of different arrangements that are possible.   [3]

3   **(i)** Find the number of different ways that the 9 letters of the word HAPPINESS can be arranged in a line.   [1]

 (ii) The 9 letters of the word HAPPINESS are arranged in random order in a line. Find the probability that the 3 vowels (A, E, I) are not all next to each other.   [4]

(iii) Find the number of different selections of 4 letters from the 9 letters of the word HAPPINESS which contain no Ps and either one or two Ss.   [3]

4   Fahad has 4 different coloured pairs of shoes (white, red, blue and black), 3 different coloured pairs of jeans (blue, black and brown) and 7 different coloured tee shirts (red, orange, yellow, blue, green, white and purple).

   (i) Fahad chooses an outf t consisting of one pair of shoes, one pair of jeans and one tee shirt. How many different outf ts can he choose?   [1]

   (ii) How many different ways can Fahad arrange his 3 jeans and 7 tee shirts in a row if the two blue items are not next to each other?   [2]

Fahad also has 9 different books about sport. When he goes on holiday he chooses at least one of these books to take with him.

   (iii) How many different selections are there if he can take any number of books ranging from just one of them to all of them?   [3]

5   **(i)** Find the number of different ways that a set of 10 different mugs can be shared between Lucy and Monica if each receives an odd number of mugs.   [3]

   (ii) Another set consists of 6 plastic mugs each of a different design and 3 china mugs each of a different design. Find in how many ways these 9 mugs can be arranged in a row if the china mugs are all separated from each other.   [3]

   (iii) Another set consists of 3 identical red mugs, 4 identical blue mugs and 7 identical yellow mugs. These 14 mugs are placed in a row. Find how many different arrangements of the colours are possible if the red mugs are kept together.   [3]

6   Nine cards, each of a different colour, are to be arranged in a line.

   (i) How many different arrangements of the 9 cards are possible?   [1]

The 9 cards include a pink card and a green card.

  (ii) How many different arrangements do not have the pink card next to the green card?   [3]

Consider all possible choices of 3 cards from the 9 cards with the 3 cards being arranged in a line.

(iii) How many different arrangements in total of 3 cards are possible?   [2]

(iv) How many of the arrangements of 3 cards in part **(iii)** contain the pink card?   [2]

 (v) How many of the arrangements of 3 cards in part **(iii)** do not have the pink card next to the green card?   [2]