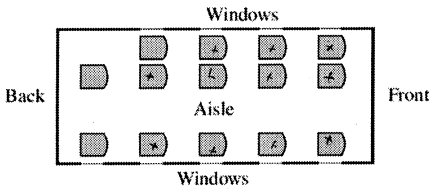
Question 8



A small aeroplane has 14 seats for passengers. The seats are arranged in 4 rows of 3 seats and a back row of 2 seats (see diagram). 12 passengers board the aeroplane.

(i) How many possible seating arrangements are there for the 12 passengers? Give your answer correct to 3 significant figures. $^{14}P_{12}$ [2]

These 12 passengers consist of 2 married couples (Mr and Mrs Lin and Mr and Mrs Brown), 5 students and 3 business people.

(ii) The 3 business people sit in the front row. The 5 students each sit at a window seat. Mr and Mrs Lin sit in the same row on the same side of the aisle. Mr and Mrs Brown sit in another row on the same side of the aisle. How many possible seating arrangements are there? [4] 17280

(iii) If, instead, the 12 passengers are seated randomly, find the probability that Mrs Lin sits directly behind a student and Mrs Brown sits in the front row. [4]

$$\frac{3\times10\times5\times{}^{11}P_9}{{}^{14}P_{12}} = 0.0687$$

Question 9

(a) Find the number of different ways in which the 12 letters of the word STRAWBERRIES can be arranged

(i) if there are no restrictions, [2]

(ii) if the 4 vowels A, E, E, I must all be together. [3]

(b) **(i)** 4 astronauts are chosen from a certain number of candidates. If order of choosing is not taken into account, the number of ways the astronauts can be chosen is 3876. How many ways are there if order of choosing is taken into account? [2]

(ii) 4 astronauts are chosen to go on a mission. Each of these astronauts can take 3 personal possessions with him. How many different ways can these 12 possessions be arranged in a row if each astronaut's possessions are kept together? [2]

Question 10

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. 462 [1]

(ii) Candidates must choose at least 4 questions from Part *A*. 406 [3]

(iii) Candidates must either choose both question 1 and question 2 in Part *A*, or choose neither of these questions. 210 [3]

Question 11

(a) In a sweet shop 5 identical packets of toffees, 4 identical packets of fruit gums and 9 identical packets of chocolates are arranged in a line on a shelf. Find the number of different arrangements of the packets that are possible if the packets of chocolates are kept together. 1260 [2]

(b) Jessica buys 8 different packets of biscuits. She then chooses 4 of these packets.

(i) How many different choices are possible if the order in which Jessica chooses the 4 packets is taken into account? 1680 [2]

The 8 packets include 1 packet of chocolate biscuits and 1 packet of custard creams.

(ii) How many different choices are possible if the order in which Jessica chooses the 4 packets is taken into account and the packet of chocolate biscuits and the packet of custard creams are both chosen? 360 [3]

(c) 9 different fruit pies are to be divided between 3 people so that each person gets an odd number of pies. Find the number of ways this can be done. [5]

4920

Question 12

(a) Find the number of different four digit numbers that can be formed from digits 2, 3, 5, 7, 8 and 9 without repetition if

(i) the numbers are less than 7000, 180 [2]

(ii) the numbers are odd. 240 [2]

(b) Find the number of different selections of three letters that can be made from the word MANGANASE. 31 [4]

Question 1

(a) A chess team of 2 girls and 2 boys is to be chosen from the 7 girls and 6 boys in the chess club. Find the number of ways this can be done if 2 of the girls are twins and are either both in the team or both not in the team. [3]

165

(b) (i) The digits of the number 1 244 687 can be rearranged to give many different 7-digit numbers. How many of these 7-digit numbers are even? [4]

1800

(ii) How many different numbers between 20 000 and 30 000 can be formed using 5 different digits from the digits 1, 2, 4, 6, 7, 8? [2]

120.

(c) Helen has some black tiles, some white tiles and some grey tiles. She places a single row of 8 tiles above her washbasin. Each tile she places is equally likely to be black, white or grey. Find the probability that there are no tiles of the same colour next to each other. [3]

0·0585

Question 2

A group of 6 boys and 5 girls are to be photographed together. The girls are to sit on 5 chairs placed in a row and the boys are to stand in a line behind them. Find the number of different possible arrangements.

86 400

For a second photograph, the boys and girls are to be arranged with 3 boys and 3 girls standing whilst 3 boys and 2 girls are seated on the chairs in front of them, and in each row the boys and girls are to occupy alternate places.

Find the number of different possible arrangements. (J.M.B.)

172 800

Question 3

A small holiday hotel advertises for a manager and 7 other members of staff. There are 4 applicants for the position of manager and 10 other people apply for the other jobs at the hotel. Find the number of different ways of selecting a group of people for the 8 jobs.

The hotel has 4 single rooms, 6 double rooms and 5 family rooms. For a particular week, 4 individuals book single rooms, 3 couples book double rooms and 3 families book family rooms. Given that all the rooms are available for that week, find the number of different possible arrangements of bookings amongst the rooms.

One afternoon, 12 guests organise a game requiring 2 teams of 6. Find the number of different ways of selecting the teams.

Given that the 12 guests consist of 6 adults and 6 children and that each team must contain at least 2 adults, find the number of different ways of selecting the teams. (J.M.B.)

480, 172 800, 462, 425

Question 4

(a) Find the number of ways of arranging the letters of the word PARABOLA. [2]

6720

In how many of these arrangements are

(i) all three As together, [2]

720

(ii) no two As together? [2]

2400

(b) In the state of Utopia, the alphabet contains 25 letters. A car registration number consists of 2 different letters of the alphabet followed by an integer n such that $100 \leq n \leq 999$. Find the number of possible car registration numbers. [3]

540 000

Question 5

A book club offers a choice of 20 books of which a member chooses six. Find the number of different ways in which a member may make his choice.

38 760

Given that 12 of the 20 books on offer are novels and that the other 8 are biographies, find the number of different ways in which a member chooses 6 so that

(i) he has 3 novels and 3 biographies,

12 320

(ii) he has at least 4 biographies.

5320

Question 6

Calculate the number of different 7-letter arrangements which can be made with the letters of the word MAXIMUM.

In how many of these do the 4 consonants all appear next to one another? (Cambridge)

840, 96

Question 7

(a) A team of rescue volunteers for flood victims to be set up. There are 7 doctors, 11 nurses and 10 workers volunteering their services. Find the number of ways the team can be formed if

(i) 5 doctors, 7 nurses and 9 workers are required, [2]

69 300

(ii) 3 doctors, 8 nurses and 7 workers are required such that Chan and Yoga from the group of workers and May and Hazreen from the group of doctors must be included in the team. [2]

46 200

(b) In how many ways can 7 teachers and 5 students stand in a straight line if

(i) there are no restrictions. [2]

12!

(ii) no two students stand next to each other. [3]

33 868 800