A LEVEL (P6) PERMUTATIONS AND COMBINATION

QUESTION'S

1 (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? [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]

2 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 (a) A football team consists of 3 players who play in a defence position, 3 players who play in a midfi ld 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 midfi ld 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]

4 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, f nd the probability that there will **not** be 4 empty spaces next to each other. [2]

5 A box contains 300 discs of different colours. There are 100 pink discs, 100 blue discs and 100 orange discs. The discs of each colour are numbered from 0 to 99. Five discs are selected at random, one at a time, with replacement. Find

(i) the probability that no orange discs are selected, [1]

(ii) the probability that exactly 2 discs with numbers ending in a 6 are selected, [3]

(iii) the probability that exactly 2 orange discs with numbers ending in a 6 are selected, [2]

(iv) the mean and variance of the number of pink discs selected. [2]

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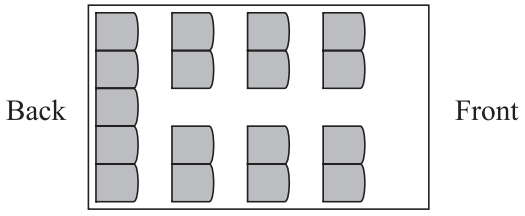


The diagram shows the seating plan for passengers in a minibus, which has 17 seats arranged in 4 rows. The back row has 5 seats and the other 3 rows have 2 seats on each side. 11 passengers get on the minibus.

(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]

7 Six men and three women are standing in a supermarket queue.

(i) How many possible arrangements are there if there are no restrictions on order? [2]

(ii) How many possible arrangements are there if no two of the women are standing next to each other? [4]

(iii) Three of the people in the queue are chosen to take part in a customer survey. How many different choices are possible if at least one woman must be included? [3]

8 **(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]

9 The six digits 4, 5, 6, 7, 7, 7 can be arranged to give many different 6-digit numbers.

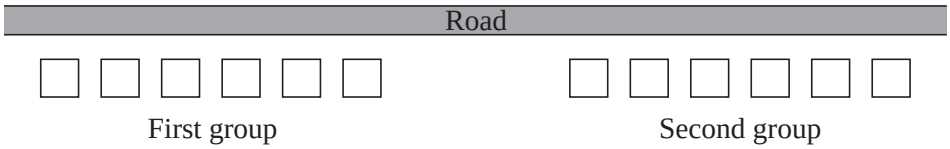
(i) How many different 6-digit numbers can be made? [2]

(ii) How many of these 6-digit numbers start with an odd digit and end with an odd digit? [4]

10 A builder is planning to build 12 houses along one side of a road. He will build 2 houses in style *A*, 2 houses in style *B*, 3 houses in style *C*, 4 houses in style *D* and 1 house in style *E*.

(i) Find the number of possible arrangements of these 12 houses. [2]

(ii)



The 12 houses will be in two groups of 6 (see diagram). Find the number of possible arrangements if all the houses in styles *A* and *D* are in the firs group and all the houses in styles *B*, *C* and *E* are in the second group. [3]

(iii) Four of the 12 houses will be selected for a survey. Exactly one house must be in style *B* and exactly one house in style *C*. Find the number of ways in which these four houses can be selected. [2]

11 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]

12 **(a)** Find how many numbers between 5000 and 6000 can be formed from the digits 1, 2, 3, 4, 5 and 6

(i) if no digits are repeated, [2]

(ii) if repeated digits are allowed. [2]

(b) Find the number of ways of choosing a school team of 5 pupils from 6 boys and 8 girls

(i) if there are more girls than boys in the team, [4]

(ii) if three of the boys are cousins and are either all in the team or all not in the team. [3]

13 **(a)** **(i)** Find how many different four-digit numbers can be made using only the digits 1, 3, 5 and 6 with no digit being repeated. [1]

(ii) Find how many different odd numbers greater than 500 can be made using some or all of the digits 1, 3, 5 and 6 with no digit being repeated. [4]

(b) Six cards numbered 1, 2, 3, 4, 5, 6 are arranged randomly in a line. Find the probability that the cards numbered 4 and 5 are **not** next to each other. [3]

14 **(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]

15 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]

16 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]

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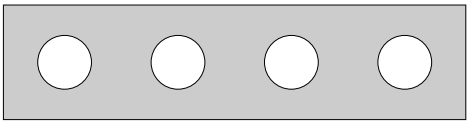

Pegs are to be placed in the four holes shown, one in each hole. The pegs come in different colours and pegs of the same colour are identical. Calculate how many different arrangements of coloured pegs in the four holes can be made using

(i) 6 pegs, all of different colours, [1]

(ii) 4 pegs consisting of 2 blue pegs, 1 orange peg and 1 yellow peg. [1]

Beryl has 12 pegs consisting of 2 red, 2 blue, 2 green, 2 orange, 2 yellow and 2 black pegs. Calculate how many different arrangements of coloured pegs in the 4 holes Beryl can make using

(iii) 4 different colours, [1]

(iv) 3 different colours, [3]

(v) any of her 12 pegs. [3]

18 A committee of 6 people, which must contain at least 4 men and at least 1 woman, is to be chosen from 10 men and 9 women.

(i) Find the number of possible committees that can be chosen. [3]

(ii) Find the probability that one particular man, Albert, and one particular woman, Tracey, are both on the committee. [2]

(iii) Find the number of possible committees that include either Albert or Tracey but not both. [3]

(iv) The committee that is chosen consists of 4 men and 2 women. They queue up randomly in a line for refreshments. Find the probability that the women are not next to each other in the queue. [3]

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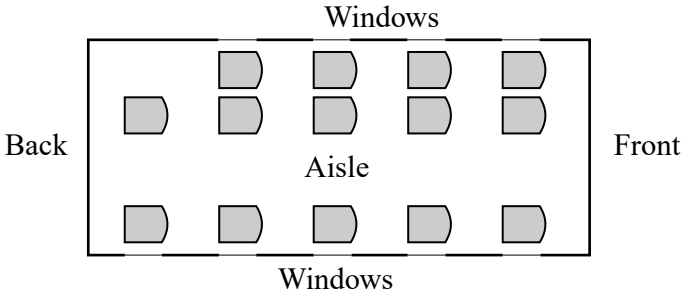


A small aeroplane has 14 seats for passengers. The seats are arranged in 4 rows of 3 seats and a back row of 2 seats (see diagram). 12 passengers board the aeroplane.

(i) How many possible seating arrangements are there for the 12 passengers? Give your answer correct to 3 signif cant f gures. [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]

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

20 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]

21 **(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]

22 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]

23 **(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]

24 Twelve coins are tossed and placed in a line. Each coin can show either a head or a tail.

(i) Find the number of different arrangements of heads and tails which can be obtained. [2]

(ii) Find the number of different arrangements which contain 7 heads and 5 tails. [1]

25 **(a)** Geoff wishes to plant 25 f owers in a f ower-bed. He can choose from 15 different geraniums, 10 different roses and 8 different lilies. He wants to have at least 11 geraniums and also to have the same number of roses and lilies. Find the number of different selections of f owers he can make. [4]

(b) Find the number of different ways in which the 9 letters of the word GREENGAGE can be arranged if exactly two of the Gs are next to each other. [3]

26 Mary saves her digital images on her computer in three separate folders named 'Family', 'Holiday' and 'Friends'. Her family folder contains 3 images, her holiday folder contains 4 images and her friends folder contains 8 images. All the images are different.

(i) Find in how many ways she can arrange these 15 images in a row across her computer screen if she keeps the images from each folder together. [3]

(ii) Find the number of different ways in which Mary can choose 6 of these images if there are 2 from each folder. [2]

(iii) Find the number of different ways in which Mary can choose 6 of these images if there are at least 3 images from the friends folder and at least 1 image from each of the other two folders. [4]

27 **(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]

28 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]

29 **(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]

30 **(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. [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? [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? [3]

31 **(a)** A team of 3 boys and 3 girls is to be chosen from a group of 12 boys and 9 girls to enter a competition. Tom and Henry are two of the boys in the group. Find the number of ways in which the team can be chosen if Tom and Henry are either both in the team or both not in the team. [3]

(b) The back row of a cinema has 12 seats, all of which are empty. A group of 8 people, including Mary and Frances, sit in this row. Find the number of different ways they can sit in these 12 seats if

(i) there are no restrictions, [1]

(ii) Mary and Frances do not sit in seats which are next to each other, [3]

(iii) all 8 people sit together with no empty seats between them. [3]

32 **(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]

(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]

(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]

(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]

33 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]

34 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]

35 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]

36 A shop has 7 different mountain bicycles, 5 different racing bicycles and 8 different ordinary bicycles on display. A cycling club selects 6 of these 20 bicycles to buy.

(i) How many different selections can be made if there must be no more than 3 mountain bicycles and no more than 2 of each of the other types of bicycle? [4]

The cycling club buys 3 mountain bicycles, 1 racing bicycle and 2 ordinary bicycles and parks them in a cycle rack, which has a row of 10 empty spaces.

(ii) How many different arrangements are there in the cycle rack if the mountain bicycles are all together with no spaces between them, the ordinary bicycles are both together with no spaces between them and the spaces are all together? [3]

(iii) How many different arrangements are there in the cycle rack if the ordinary bicycles are at each end of the bicycles and there are no spaces between any of the bicycles? [3]

37 The 11 letters of the word REMEMBRANCE are arranged in a line.

(i) Find the number of different arrangements if there are no restrictions. [1]

(ii) Find the number of different arrangements which start and f nish with the letter M. [2]

(iii) Find the number of different arrangements which do not have all 4 vowels (E, E, A, E) next to each other. [3]

4 letters from the letters of the word REMEMBRANCE are chosen.

(iv) Find the number of different selections which contain no Ms and no Rs and at least 2 Es. [3]

38 **(i)** Find the number of different ways that the 9 letters of the word AGGREGATE can be arranged in a line if the first letter is R. [2]

(ii) Find the number of different ways that the 9 letters of the word AGGREGATE can be arranged in a line if the 3 letters G are together, both letters A are together and both letters E are together. [2]

(iii) The letters G, R and T are consonants and the letters A and E are vowels. Find the number of different ways that the 9 letters of the word AGGREGATE can be arranged in a line if consonants and vowels occur alternately. [3]

(iv) Find the number of different selections of 4 letters of the word AGGREGATE which contain exactly 2 Gs or exactly 3 Gs. [3]

39 Find the number of different ways in which all 8 letters of the word TANZANIA can be arranged so that

(i) all the letters A are together, [2]

(ii) the first letter is a consonant (T, N, Z), the second letter is a vowel (A, I), the third letter is a consonant, the fourth letter is a vowel, and so on alternately. [3]

4 of the 8 letters of the word TANZANIA are selected. How many possible selections contain

(iii) exactly 1 N and 1 A, [2]

(iv) exactly 1 N? [3]

40 Find how many different numbers can be made from some or all of the digits of the number 1 345 789 if

(i) all seven digits are used, the odd digits are all together and no digits are repeated, [2]

(ii) the numbers made are even numbers between 3000 and 5000, and no digits are repeated, [3]

(iii) the numbers made are multiples of 5 which are less than 1000, and digits can be repeated. [3]

41 Nine cards are numbered 1, 2, 2, 3, 3, 4, 6, 6, 6.

(i) All nine cards are placed in a line, making a 9-digit number. Find how many different 9-digit numbers can be made in this way

(a) if the even digits are all together, [4]

(b) if the first and last digits are both odd. [3]

(ii) Three of the nine cards are chosen and placed in a line, making a 3-digit number. Find how many different numbers can be made in this way

(a) if there are no repeated digits, [2]

(b) if the number is between 200 and 300. [2]

42 A committee of 6 people is to be chosen from 5 men and 8 women. In how many ways can this be done

(i) if there are more women than men on the committee, [4]

(ii) if the committee consists of 3 men and 3 women but two particular men refuse to be on the committee together? [3]

One particular committee consists of 5 women and 1 man.

(iii) In how many different ways can the committee members be arranged in a line if the man is not at either end? [3]

43 The 50 members of a club include both the club president and the club treasurer. All 50 members want to go on a coach tour, but the coach only has room for 45 people. In how many ways can 45 members be chosen if both the club president and the club treasurer must be included? [3]

44 Find the number of different ways that 6 boys and 4 girls can stand in a line if

(i) all 6 boys stand next to each other, [3]

(ii) no girl stands next to another girl. [3]

45 **(a)** Seven fair dice each with faces marked 1, 2, 3, 4, 5, 6 are thrown and placed in a line. Find the number of possible arrangements where the sum of the numbers at each end of the line add up to 4. [3]

(b) Find the number of ways in which 9 different computer games can be shared out between Wainah, Jingyi and Hebe so that each person receives an odd number of computer games. [6]

46 **(a)** Find how many different numbers can be made by arranging all nine digits of the number 223 677 888 if

(i) there are no restrictions, [2]

(ii) the number made is an even number. [4]

(b) Sandra wishes to buy some applications (apps) for her smartphone but she only has enough money for 5 apps in total. There are 3 train apps, 6 social network apps and 14 games apps available. Sandra wants to have at least 1 of each type of app. Find the number of different possible selections of 5 apps that Sandra can choose. [5]

47 **(a)** Find the number of different ways the 7 letters of the word BANANAS can be arranged

(i) if the f rst letter is N and the last letter is B, [3]

(ii) if all the letters A are next to each other. [3]

(b) Find the number of ways of selecting a group of 9 people from 14 if two particular people cannot both be in the group together. [3]

48 Rachel has 3 types of ornament. She has 6 different wooden animals, 4 different sea-shells and 3 different pottery ducks.

(i) She lets her daughter Cherry choose 5 ornaments to play with. Cherry chooses at least 1 of each type of ornament. How many different selections can Cherry make? [5]

Rachel displays 10 of the 13 ornaments in a row on her window-sill. Find the number of different arrangements that are possible if

(ii) she has a duck at each end of the row and no ducks anywhere else, [3]

(iii) she has a duck at each end of the row and wooden animals and sea-shells are placed alternately in the positions in between. [3]

49 **(a)** Find the number of ways in which all nine letters of the word TENNESSEE can be arranged

(i) if all the letters E are together, [3]

(ii) if the T is at one end and there is an S at the other end. [3]

(b) Four letters are selected from the nine letters of the word VENEZUELA. Find the number of possible selections which contain exactly one E. [3]

50 A committee of 6 people is to be chosen at random from 7 men and 9 women. Find the probability that there are no men on the committee. [3]

51 One plastic robot is given away free inside each packet of a certain brand of biscuits. There are four colours of plastic robot (red, yellow, blue and green) and each colour is equally likely to occur. Nick buys some packets of these biscuits. Find the probability that

(i) he gets a green robot on opening his first packet, [1]

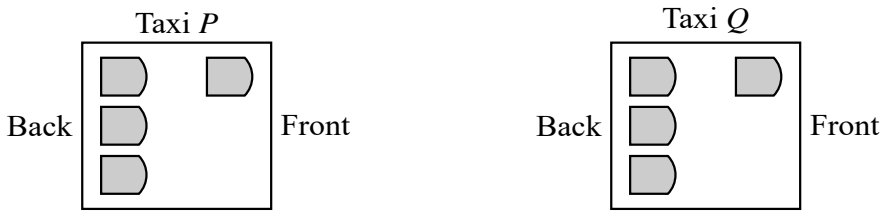
(ii) he gets his first green robot on opening his fifth packet. [2]

Nick's friend Amos is also collecting robots.

(iii) Find the probability that the first four packets Amos opens all contain different coloured robots.

52 A group of 8 friends travels to the airport in two taxis, P and Q. Each taxi can take 4 passengers.

(i) The 8 friends divide themselves into two groups of 4, one group for taxi P and one group for taxi Q, with Jon and Sarah travelling in the same taxi. Find the number of different ways in which this can be done. [3]



Each taxi can take 1 passenger in the front and 3 passengers in the back (see diagram). Mark sits in the front of taxi *P* and Jon and Sarah sit in the back of taxi *P* next to each other.

(ii) Find the number of different seating arrangements that are now possible for the 8 friends. [4]

53 **(a)** Find the number of different ways that the 13 letters of the word ACCOMMODATION can be arranged in a line if all the vowels (A, I, O) are next to each other. [3]

(b) There are 7 Chinese, 6 European and 4 American students at an international conference. Four of the students are to be chosen to take part in a television broadcast. Find the number of different ways the students can be chosen if at least one Chinese and at least one European student are included. [5]