### 6.1.1 The multiplication rule

| | |
|---|---|
| 1. There are 3 routes joining village A and village B and 4 routes joining village B and village C. Find the number of different ways of traveling from village A to village C via village B.<br><br>[12] | 2. There are 2 bus companies that provide transport from town E to town F and 3 bus companies that provide transport from town F to town G. Find the number of ways a person can travel from town E via to town G via town F by taking a bus.<br><br>[6] |
| 3. There are 3 boys and 2 girls in a group. Find the number of ways to pick a boy and a girl for a Mathematics quiz.<br><br>[6] | 4. Lim has to choose a shirt and a trouser from 6 shirts and 4 trousers in his cupboard. Find the possible number of ways he can do this.<br><br>[24] |
| 5. Team A which consists of 5 players wishes to have badminton matches with team B which consists of 6 players. Find the number of different single matches that can be held.<br><br>[30] | 6. <br><br>A  B  C  D    1  2  3<br><br>The diagram above shows cards of a game. If a player is going to select a letter card and a digit card, find the number of different ways can this be done.<br><br>[12] |
| 7. Hashim can choose to go to office by car or by bus. Find the number of different ways Hashim can go to school for three consecutive working days.<br><br>[8] | 8. A football team plays four friendly matches in a month. Find the number of possible outcomes from the four matches.<br><br>[16] |
| 9. There are 5 Malays, 3 Chinese and 2 Indians in a group. Find the number of ways can a Malay, a Chinese and an Indian be chosen from the group.<br><br>[30] | 10.There are 2 pieces of cakes on plate A, 3 pieces of cakes plate B and 4 pieces of cakes on plate C. If a boy is going to select a cake from each plate, find the number of different ways can this be done.<br><br>[24] |

## 6.1.2  Permutations of n different objects.

| | |
|---|---|
| 1. In how many different ways can 5 different books be arranged on a shelf ?<br><br>[120] | 2. In how many different ways can 4 different presents can be given to 4 children ?<br><br>[24] |
| 3. In how many ways can the letters of the word 'CLOSE' be arranged ?<br><br>[120] | 4. In how many ways can the letters of the word 'POCKET' be arranged ?<br><br>[720] |
| 5. In how many ways can the letters of the word 'SECTION' be arranged ?<br><br>[5040] | 6. In how many ways can the letters of the word 'GRADIENT' be arranged ?<br><br>[40320] |
| 7. How many four-digit numbers can be formed using the digits 2,3,7and 9 without repetition ?<br><br>[24] | 8. How many five-digit numbers can be formed using the digits 2,3,7, 8 and 9 without repetition ?<br><br>[120] |
| 9. How many different passwords can be formed using the letters A, B , C and digits 8 and 9 without repetition ?<br><br>[12] | 10. How many different passwords can be formed using the letters E, F, G, H  and symbols $\alpha$ , $\beta$ and $\lambda$ without repetition ?<br><br>[144] |

### 6.1.3 Permutations of n different objects taken r at a time.

| | |
|---|---|
| 1. In how many ways can 6 students be seated on 3 chairs arranged in a row ?<br><br><br><br><br><br><br>[120] | 2. There are 8 contestants in a drawing contest. How many possible ways for the first three places to be won by the contestants ?<br><br><br><br><br>[336] |
| 3. How many ordered arrangements are there if we want to arrange 5 out of 12 basket players ?<br><br><br><br><br>[95040] | 4. An examination paper has six questions. The students need only to answer four of them. In how many different ways can the students answer the 4 questions ?<br><br><br><br>[360] |
| 5. In how many different ways can 3 of the letters in the word ' PROGRAM ' be arranged without repetition ?<br><br><br><br><br>[210] | 6. In how many different ways can 4 of the letters in the word ' COMPUTER 'be arranged without repetition ?<br><br><br><br><br>[1680] |
| 7. In how many different ways can 2 of the letters in the word ' VISTA 'be arranged without repetition ?<br><br><br><br><br>[20] | 8. In how many different ways can half of the letters in the word ' MODULE' be arranged without repetition ?<br><br><br><br><br>[120] |
| 9. How many four-digit numbers can you form using the digits 2, 3, 5, 6 and 7 ?<br><br><br><br><br><br>[120] | 10.How many five-digit numbers can you form using the digits 2, 3, 4, 6 , 7, 8 and 9 ?<br><br><br><br><br><br>[2520] |

### 6.1.4 Permutations of n different objects under given conditions.

| | |
|---|---|
| 1. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the first letter is vowel ?<br><br><br><br><br>[2160] | 2. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the first letter is consonant ?<br><br><br><br><br>[2880] |
| 3. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the first and last letters are vowels ?<br><br><br><br><br>[720] | 4. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the three letters in the middle are vowels ?<br><br><br><br><br>[144] |
| 5. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the first letter is a vowel and last letter is a consonant ?<br><br><br><br><br>[1440] | 6. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the first letter is E and last letter is T ?<br><br><br><br><br>[120] |
| 7. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the vowels placed adjacent to each other ?<br><br><br><br><br>[720] | 8. In how many ways can all the letters in the word 'SECTION' be arranged without repetition such that the vowels separated from each other ?<br><br><br><br><br>[4320] |

| | |
|---|---|
| 9. How many five-digit even numbers that can be formed using the digits 2, 3, 4, 6 and 7 without repetition.<br><br><br><br><br><br>[72] | 10. How many five-digit odd numbers that can be formed using the digits 2, 3, 4, 6 and 7 without repetition.<br><br><br><br><br><br>[48] |
| 11. How many five-digit numbers that are greater than 40000 can be formed using the digits 2, 3, 4, 6 and 7 without repetition.<br><br><br><br><br><br>[72] | 12. How many five-digit numbers that are smaller than can be 40000 formed using the digits 2, 3, 4, 6 and 7 without repetition.<br><br><br><br><br><br>[48] |
| 13. In how many ways can 2 boys and 3 girls be arranged in a line if the two boys must be at the front and the back of the line respectively ?<br><br><br><br><br><br>[12] | 14. In how many ways can 2 boys and 3 girls be arranged in a line if the two boys must be at the first two position of the line respectively ?<br><br><br><br><br><br>[12] |
| 15. 8 different cards are to be arranged in a row. In how many ways can all the cards be arranged if 2 particular cards must be next to each other ?<br><br><br><br><br><br>[10080] | 16. 8 different cards are to be arranged in a row. In how many ways can all the cards be arranged if 3 particular cards must be next to each other ?<br><br><br><br><br><br>[4320] |

### 6.1.5 Permutations of n different objects taken r at a time under given conditions.

| | |
|---|---|
| 1. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter is vowel ?<br><br><br><br><br><br><br><br><div align="right">[240]</div> | 2. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter is consonant ?<br><br><br><br><br><br><br><br><div align="right">[600]</div> |
| 3. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter and the last letter are vowels ?<br><br><br><br><br><br><br><div align="right">[40]</div> | 4. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter and the last letter are consonants ?<br><br><br><br><br><br><div align="right">[400]</div> |
| 5. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter is a vowel and the last letter is a constant ?<br><br><br><br><br><br><br><div align="right">[200]</div> | 6. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the first letter is S and the last letter is D ?<br><br><br><br><br><br><br><div align="right">[20]</div> |
| 7. How many five-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the vowels placed adjacent to each other ?<br><br><br><br><br><br><br><div align="right">[720]</div> | 8. How many four-letter codes can be formed using the letters in the word 'WINSDOM' without repetition such that the vowels separated from each other?<br><br><br><br><br><br><br><div align="right">[4320]</div> |

9. How many four-digit even numbers that can be formed using the digits 2, 3, 4, 6 and 7 without repetition.

[72]

10. How many four-digit odd numbers that can be formed using the digits 2, 3, 4, 6 and 7 without repetition.

[48]

11. How many four-digit numbers that are greater than can be 3000 formed using the digits 2, 3, 4, 6 and 7 without repetition.

[96]

12. How many four-digit numbers that are smaller than can be 6000 formed using the digits 2, 3, 4, 6 and 7 without repetition.

[72]

13. 2 boys and 4 girls are to be seated in a row of 5 chairs. Find the number of ways they can be seated if the first and the last are boys.

[48]

14. 2 boys and 4 girls are to be seated in a row of 5 chairs. Find the number of ways they can be seated if the first and the last are girls.

[288]

15. Calculate the number of ways to arrange 3 different Mathematics books and 4 different Sciences books on a bookrack if the Mathematics books have to be placed together.

[720]

16. Calculate the number of ways to arrange 3 different Mathematics books and 4 different Sciences books on a bookrack if the Sciences books have to be placed together.

[576]

### 6.2.1 Combinations of r different objects chosen from n different objects.

| | |
|---|---|
| 1. In how many ways can 3 prefects be chosen from a group of 8 students?<br><br>[56] | 2. In how many ways can 4 teachers be chosen from a group of 10 teachers for an expedition ?<br><br>[210] |
| 3. A committee of 5 members are to be chosen from 12 candidates. In how many ways can the committee be formed ?<br><br>[792] | 4. A team of 5 players are to be chosen from 12 players. In how many ways can the team be formed ?<br><br>[792] |
| 5. Lim is given a chance to choose 4 subjects from the 8 subjects offered in a course. Find the number of combinations she can make?<br><br>[70] | 6. Wahid is given a chance to choose 3 courses from the 8 courses offered in a college. Find the number of combinations he can make?<br><br>[56] |
| 7. A school has a committee of 3 male teachers and 2 female teachers. Find the number of different such committees that can be formed from 8 male teachers and 11 female teachers ?<br><br>[3080] | 8. The Parents-Teachers Association of a school has a committee of 3 teachers and 5 parents. Find the number of different such committees that can be formed from 10 teachers and 15 parents ?<br><br>[360360] |
| 9. <br>| A | B | C | D |   | 5 | 6 | 7 |<br><br>The diagram shows 4 letters and 3 digits. A code is made up of 3 letters and 2 digits. Find the number of ways it can be.<br><br>[12] | 10. <br>| A | B | C | D |   | 5 | 6 | 7 |<br><br>The diagram shows 4 letters and 3 digits. A code is made up of 2 letters and 1 digits. Find the number of ways it can be.<br><br>[18] |

### 6.2.2 Combinations of r different objects chosen from n different objects under given conditions.

| | |
|---|---|
| 1. They are a couple in a group of 10 people. In how many ways can a team of 5 people be formed from the group if the couple must be included ?<br><br><br>[56] | 2. They are monitor and assistant monitor in a group of 20 students. In how many ways can a committee of 8 people be formed from the group if the monitor and assistant monitor must be included ?<br><br><br>[18564] |
| 3. Find the number of ways of choosing 4 letters including the letter O from the word 'OBJECT'.<br><br><br>[10] | 4. Find the number of ways of choosing 4 letters including the letter A from the word 'IMAGE'.<br><br><br>[4] |
| 5. Find the number of ways of choosing at least 3 students from 5 students to represent their class in a Mathematics Quiz.<br><br><br>[6554] | 6. Find the number of ways of choosing at least 1 colour from 3 colours to paint the poster.<br><br><br>[7] |
| 7. In a class of 8 boys and 6 girls, 4 boys and 3 girls or 3 boys and 4 girls are to be chosen to form a committee. In how many ways can the committee be formed ?<br><br><br>[2240] | 8. In a group of 10 men and 8 women, 5 men and 4 women or 4 men and 5 women are to be chosen to form a committee. In how many ways can the committee be formed ?<br><br><br>[29400] |
| 9. 10 students are divided into three groups that consists of 5, 3 and 2 students respectively. Find the number of ways of forming the three groups.<br><br><br>[8820] | 10. 12 students are divided into three groups that consists of 5, 4 and 3 students respectively. Find the number of ways of forming the three groups.<br><br><br>[27720] |

| | |
|---|---|
| 11. A committee that consists of 6 members is to be selected from 7 teachers and 5 parents. Find the members of different committees that can be formed if the number of teachers must same as the number of parents.<br><br>[350] | 12. A committee that consists of 8 members is to be selected from 9 men and 7 women. Find the members of different committees that can be formed if the number of men must same as the number of women.<br><br>[4410] |
| 13. A committee that consists of 6 members is to be selected from 7 teachers and 5 parents. Find the members of different committees that can be formed if it consists of not more than 2 teachers.<br><br>[112] | 14. A committee that consists of 8 members is to be selected from 9 men and 7 women. Find the members of different committees that can be formed if it consists of not more than 2 men.<br><br>[261] |
| 15. A committee that consists of 6 members is to be selected from 7 teachers and 5 parents. Find the members of different committees that can be formed if it consists of at least 4 teachers.<br><br>[462] | 16. A committee that consists of 8 members is to be selected from 9 men and 7 women. Find the members of different committees that can be formed if it consists of at least 6 men.<br><br>[2025] |
| 17. A committee that consists of 6 members is to be selected from 7 teachers and 5 parents. Find the members of different committees that can be formed if it consists of at most 2 teachers.<br><br>[112] | 18. A committee that consists of 8 members is to be selected from 9 men and 7 women. Find the members of different committees that can be formed if it consists of at most 2 men.<br><br>[261] |