Counting - Permutations and Combinations

1 Permutations

1. How many different ways can 5 people line up for a photo?

2. How many different ways can 7 books be arranged on a bookshelf;

    i. Taking 7 at a time?

    ii. Taking 5 at a time?

    iii. Taking 3 at a time?

3. I have 3 hoodies, 5 t-shirts, 2 pairs of jeans and 4 pairs of runners. How many possible outfits can i make if each outfit includes one hoody, one t-shirt, one pair of jeans and one pair of runners?

4. There are 8 runners in a race. In how many ways can the podium (top three) be arranged?

5. How man arrangements are there of the word TABLE?

    i. If they must begin with T?

    ii. If they must end with B?

6. How many ways is there to arrange the letters of word HELLO?

7. How many ways are there to arrange the letters of the word CHEESE?

8. How many ways are there the letters of the word STATISTICS?

9. How many ways is there to arrange the letters of the word ORANGE if;

    i. If there are no restrictions?

    ii. If it must begin with the letter R?

    iii. If it must end with the letter G?

    iv. If it must begin with the letter P?

    v. If it must begin with a vowel?

    vi. If it must end with a consonant?

    vii. If the vowels must be together?

10. How many ways are there of arranging the letters of the word LINEAR:

    (a) If there are no restrictions

    (b) If they must begin with N

    (c) If they must begin with R and end with L

    (d) If they must begin with a vowel

    (e) If they must not begin with a vowel

11. How many four digit numbers can be made from the digits 2,3,5 and 8 (without repetition)?

    (a) How many of these are even?

    (b) How many are odd?

    (c) How many are over 5,000?

12. How many ways are there of arranging the letters of the word IRELAND:

    (a) If there are no restrictions

    (b) If they must begin with a vowel

    (c) If they must begin with a consonant

    (d) If the vowels must be together

    (e) if the three vowels cannot be appear together

13. How many natural numbers can be made using some or all of the digits 1, 2 and 3, with no repetitions?

14. A password for a safe consists of three different letters followed by two different digits.

    (a) How many different passwords are possible?

    (b) A person cannot remember his password. He remembers that the first letter is S and the second digit is 9. How many different passwords are possible now, given the above information.

15. Three men and four women line up for a photograph. How many different arrangements are possible:

    (a) If there are no restrictions

    (b) If no two women can stand beside each other.

16. A five digit number is to be formed from the digits 0, 1, 2, 3,....,9, where no digit is repeated in the number.

    How many of these numbers

    (a) are even?

    (b) are greater than 60,000?

    (c) are divisible by 5?

    (d) are greater than 60,000 and divisible by 5?

2   Combinations

1. How many ways can 3 people be selected from a group of 5?

2. How many ways can 6 books be selected from a collection of 10 books?

3. In how many ways can a team of 15 players be selected from a panel of 25?

4. There are 11 boys and 9 girls in a class. In how many ways can 8 people be selected if;

    i. There are no restrictions?

    ii. There will be 4 boys and 4 girls?

    iii. There will be 5 boys and 3 girls?

    iv. There will be 2 boys and 6 girls?

    v. There will be at least six girls?

5. There are 5 men and 4 women on a committee. In how many ways can a subcommittee of 4 members be selected if;

    i. There are no restrictions?

    ii. There will be the same amount of men as women?

    iii. There will be 3 men and 1 woman?

    iv. There will be more men than women?

6. John and Jack are in a class of 10 students. In how many ways can a group of 4 be selected from the class if;

    i. There are no restrictions?

    ii. John must be included?

    iii. Jake must be excluded?

    iv. John must be included and Jake must be excluded?

    v. Both John and Jake are included?

    vi. Both John and Jake are excluded?

    vii. Either John or Jake is included, but not both?

7. An exam consists of 5 questions.

    i. In how many ways can 3 questions be selected?

    ii. If question 1 is compulsory, in how many ways can 3 questions then be selected?

8. A bag contains 10 marbles, each of a different colour. Blue, green, red, black, white are some of the colours in the bag. In how many ways can 4 marbles be pick if:

    i. if there are no restrictions?

    ii. if black and white are always included?

    iii. if green is always included

    iv. if black and white are always included but red is excluded?

9. Two marbles are withdrawn from a bag of sixteen marbles. How many possible combinations are there?
   The bag contains five red, seven green and four white marbles. Two marbles are withdrawn, without replacement.
   How many possible combinations will have:

    i. Two red marbles?

    ii. Two red or two green marbles?

    iii. Two marble of the same colour.

    iv. Two marbles of different colour.

    v. One red marble and one marble that is not red.

10. John has to choose four subjects to study for his Leaving Cert, from a list of Business, Accounting, Construction Studies, Engineering, French, Spanish, German, Art, Geography, History, Physics, Biology or Chemistry.

    i. How many combinations are possible?

    ii. John has decided his four choices will include one Science subject and one Language. How many possible combinations fit this criteria?

11. A management team of 8 persons is to be chosen from 6 men and 7 women. In how many ways can this be done;

    i. when there are 5 men on each management team?

    ii. when there is a majority of men on each management team?

12. There are 15 students, including Jack and Jane, in a class. How many class committees of 5 students can be selected;

    i. if all students are eligible for the committee?

    ii. if Jack and Jane are to be included on the committee?

    iii. if Jack will be excluded from the committee?

    iv. if Jack and Jane will not work together on the same committee?

13. In how many ways can a management team of 8 be selected from 5 men and 6 women if each management team consists of;

    i. An equal number of men and women?

    ii. At least 4 men?

    iii. At least 4 women?

    iv. if there is more women than men on the committee?

14. A football squad has 3 goalkeepers, 7 defenders, 6 midfielders and 5 strikers. How many matchday selections are possible, if each team will be in a 4-4-2 format? (4-4-2 format means: 1 goalkeeper, 4 defenders, 4 midfielders and 2 strikers on each team.)