

# Praktis 4

## Permutation and Combination

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## Praktis Formatif

### 4.1 Permutation

- There are 3 types of fruits and 5 types of cupcakes in the kitchen. Determine the number of selections made by Aiman if
  - he can only choose one of the item,
  - he can choose one type of fruits and one type of cupcakes.
- During the school mid-year holidays, Zoe wants to do revision for her 4 Science subjects, 2 Mathematics subjects, 4 language subjects and 2 other subjects. Find the number of ways the revision can be done if
  - Zoe revises one subject only,
  - Zoe wants to revise one science subject, one mathematics subject and one core subject in a day.
- Ali plans to visit Zaleha who stays in Sarawak. Ali can choose to ride in either 4 of his friends's car or purchase a ticket from any of the 3 bus companies to Kuala Lumpur International Airport. From there, Ali can choose from any 3 flight companies to Sarawak. In how many ways can Ali go to Sarawak?
- During School's Entrepreneurship Carnival, Sandy is interested to participate in the Treasure Hunt game. The participants need to get two clues from Station A and Station B. There are 4 paths to Station B. All paths are of different distances. After obtaining two clues, every participant needs to return to the starting point to get his last clue. Determine the number of ways to travel to and from if Sandy
  - choose the same path,
  - does not use the same path.
- Chong wants to set a passcode to her safe deposit box. The passcode consists of a 4-digit number. Find the number of passcodes that can be formed by Chong.
- Solve each of the following situations.
  - Find the number of ways to rearrange all the letters in the word CUTE.
  - How many 4-digit numbers that are different that can be formed by using the digits 1, 2, 3, and 4 without repetition?
- Find the number of arrangements in each of the following situations.
  - Determine the number of ways to arrange 10 VIP guests to sit at a round table.
  - Find the number of ways for 8 scouts to stand around a campfire.
  - Find the number of ways to distribute 10 types of fruits to 10 students sitting at a round table.
- Determine the number of arrangements for each of the following situations.
  - How many ways to form a bracelet with 12 different pearls?
  - Find the number of ways to arrange 10 types of flowers to form a floral hoop.
- Find the value of  $n$  for each of the following.
  - ${}_nP_2 = 6$
  - ${}_{n+2}P_3 = 42n$
  - $7({}_{n+1}P_2) = 5({}_{n+2}P_2)$
  - ${}_{2n}P_2 = 3({}_{n+1}P_2)$
- Determine the number of arrangements of the following situations.
  - How many 4-digit numbers that are different that can be formed from digits 1, 2, 3, 4, and 5 without repetition?
  - Find the number of ways to arrange 7 students in 4 chairs.
  - How many ways can 4 cars park in 8 empty parking lots along the street as shown in the following diagram?
  - There are 12 participants in a 100-m run. Find the number of possible results obtained if presents are only given to the champion, 1<sup>st</sup> runner-up and 2<sup>nd</sup> runner-up only.
- Determine the number of arrangements of  $r$  out of  $n$  different objects in a circle.
  - Find the number of ways to arrange 10 students to sit in 6 chairs at a round table.
  - If each of the children is given only a new school bag, find the number of ways to distribute 9 school bags to 5 children sitting in a circle.
  - Determine the number of ways 5 people can sit in 7 empty chairs at a round table.
- Solve each of the following questions.
  - The following diagram shows a hula hoop that can be dismantled into 6 parts. The user can fix the hoop again by choosing the combination of colours desired.  
How many ways can the hula hoop be fixed if Siti has 8 parts of different colours?
  - Find the number of ways to make a bracelet which contains a bracelet which contains 8 pearls chosen from 16 different pearls.
- Solve the following permutation questions involving identical objects.
  - Find the number of ways to rearrange the letters from the word
    - LOOKOUT
    - MATHEMATICS

iii. MISSISSIPPI

- (b) Find the number of ways to form a 5-digit number from cards that are labelled with 1, 2, 2, 2, 3, 4, 5, 6, 7, 8, and 8 if all the digit 2 must be used.
14. Find the number of ways to rearrange all the letters in the word ENGLISH if
- (a) vowels must be placed at both ends,
  - (b) it must start with a consonant,
  - (c) vowels must be side by side,
  - (d) only 5 letters are arranged with the vowels placed side by side.
15. Find the number of ways to arrange 7 family members at a round table if
- (a) there are 5 vacant chairs and both parents must sit next to each other,
  - (b) there are 7 vacant chairs and both parents must sit next to each other,
  - (c) there are 10 vacant chairs and both parents must sit next to each other.
16. How many ways can 4 male students and 3 female students be seated in a row if
- (a) they can sit anywhere,
  - (b) 2 female students must sit together,
  - (c) 2 female students must be separated.
17. Find the number of ways to arrange 7 different story books and 3 different magazines on a bookshelf if
- (a) no condition is imposed,
  - (b) the magazines must be put together,
  - (c) the magazines cannot be put together.
18. Given cards that are labelled with the digits 0, 3, 4, 5, 6, and 7. Find the number of arrangements of those digits without repetition to form
- (a) 4-digit odd numbers,
  - (b) 4-digit numbers that begin with an even digit,
  - (c) 4-digit numbers with all the odd digits together,
  - (d) 4-digit numbers with odd digits together,
  - (e) 4-digit numbers with odd and even digits at the alternate positions,
  - (f) even numbers that are greater than 50 000.
19. IN every football match, the result may be win, lose or draw. Determine the number of possible outcomes obtained in a round of match that involves 12 teams (6 matches).
20. The following diagram shows the seating arrangement in the meeting room of company X.  
Determine the number of ways 9 workers can be seated during the meeting if

- (a) no condition is imposed,
- (b) 3 particular workers must sit in the same row.

21. 8 teachers travel in 2 cars to attend a course. Only 5 teachers have driving licenses. Calculate the number of seating arrangements of the teachers in the 3 cars if each car can accommodate only 4 people.
22. Find the numbers of different arrangements using all the letters in the word COMMITMENT. Hence, determine the number of arrangements which
- (a) begin and end with the letter T,
  - (b) contain MMM,
  - (c) do not contain TT.
23. Determine the number of ways 4 doctors and 4 nurses can be seated at a round table if
- (a) no condition is imposed,
  - (b) 2 nurses should not sit side by side,
  - (c) the doctors and nurses sit in alternate positions.

## 4.2 Combination

24. (a) Find the number of ways to choose 2 out of 5 story books on the bookshelf.  
(b) Determine the number of ways to select 4 representatives from 10 students to participate in the national debate competition.
25. Calculate the number of ways to form groups in which 9 students are divided into
- (a) 2 groups of 4 and 5 students respectively,
  - (b) 3 groups of 2, 3, and 4 students respectively,
  - (c) 2 groups in which the difference between the group members must be at least 3 people.
26. Four letters are selected from the word HITUNG. How many different selections that are possible? From the selections, determine the number of selections that
- (a) do not contain the vowel U,
  - (b) contains the vowel U.
27. The following diagram shows 8 cards of 1-digit number.  
Find the number of selections of one card if
- (a) the chosen number is a multiple of 2,
  - (b) a prime number is chosen,
  - (c) the number that is less than 6 is chosen.
28. A team of 4 members is selected from 4 men and 6 women. Find the number of ways the team can be formed if
- (a) no condition is imposed,
  - (b) the team consists of 1 man and 3 women,

- (c) the number of men in the team is at least 2 people.
29. The following diagram shows points that can be connected to form a geometrical shape.  
Find the possible number of ways to form
- (a) a triangle,
  - (b) a quadrilateral,
  - (c) a triangle in which point A or point C but not both and point F must be used.
30. A tennis team of 4 men and 4 women is to be selected from 6 men and 7 women.
- (a) Find the number of selections to form the team.
  - (b) Determine the number of formations of the team if 2 out of 7 women must be selected together or not selected at all.
31. During a meeting, 3 executive officers, 3 managers and 5 workers are seated at a round table. Determine the number of ways they are seated if
- (a) no condition is imposed,
  - (b) a particular executive officer must sit between a manager and a worker,
  - (c) 3 executive officers sit separately.
32. A quiz team of 10 players is to be chosen from a class of 8 boys and 12 girls. Find
- (a) the number of different teams that can be formed if the number of boys is equal to the number of girls,
  - (b) the number of different teams that can be formed if the number of girls is more than the number of boys,
  - (c) the number of different teams that can be formed if Kamal and Ali as well as Fatimah and Mei Mei must be chosen.
33. During the National Mathematics Olympiad Competition 2021, all the 100 participants gather in a hall for a briefing. After the briefing all participants are divided equally into 5 groups. All the participants in each group are instructed to take their seats in their respective classrooms. Before the competition begins, the participants in Group A shake hands with each other. Find
- (a) the number of handshakes made between the participants in Group A,
  - (b) the number of handshakes made if Afiq, Ben and Cathy do not shake hands.

# Praktis Summatif

## 4.1 Kertas 1

1. (a) State the values of  $r$  if  ${}_7C_r = 1$ .  
(b) Express  $s$  in terms of  $t$  and  $u$  if  ${}_sC_t = {}_sC_u$
2. (a) Show that  ${}_nC_r = {}_nC_{n-r}$  where  $n$  and  $r$  are positive integers and  $n > r$ .  
(b) Find the value of  $r$  if  $\frac{{}_nP_r}{{}_nC_r} = 120$ .
3. A committee of 7 students is selected from 7 male students and 10 female students find the number of ways the committee can be formed if
  - (a) no condition is imposed,
  - (b) there are 3 male students and 4 female students.
  - (c) The number of female students must be more than the number of male students.
4. During the school year end dinner, every round table must be seated with 10 people. The VIP table has only 6 seats. 6 teachers are selected from 5 mathematics teachers and five science teachers to fill in the vacant seats at the VIP table. Find a number of ways to seat the teachers if
  - (a) no condition is imposed,
  - (b) the mathematics teachers cannot sit next to each other.
5. Diagram below shows 8 cards that are labelled with letters.
  - (a) Find the number of arrangements if
    - i. all the letters are used without repetition,
    - ii. all the letters are used and the vowels must be side by side.
  - (b) Find the number of different ways to select 5 cards in which S and T needs to be chosen.
  - (c) Find the number of different 5-letter codes that begin with a vowel and end with a consonant could be formed.
6. Agnes decorates her hat with 18 artificial flowers. She uses the same number and the same type of artificial flowers, but of a smaller size to form a bracelet as shown in the diagram below.

Given that the ratio of the number of roses to the number of morning glories to the number of sunflowers on the hat is 3 : 2 : 1.

- (a) Find the number of roses used.
- (b) If the morning glories have to be side by side on both the hat and bracelet find the total number of ways to arrange the artificial flowers.

7. Diagram below shows 8 cards where 3 cards are labelled with letters and 4 cards are labelled with digits. Find the number of different arrangements that can be done if

- (a) no condition is imposed,
- (b) the arrangements begin with R and ends with an even digit.

8. 10 participants successfully enter the final round of a competition. The score is used to determine the champion, 1<sup>st</sup> runner up, 2<sup>nd</sup> runner up, and 3<sup>rd</sup> runner up.

- (a) Find the number of different results that are possible to be obtained.
- (b) If Ben Hong and Haikal are two of the 10 participants, find the number of different results obtained if
  - i. neither Ben Hong nor Haikal wins the competition,
  - ii. Ben Hong and Haikal win the competition.

9. Diagram below shows cards that are labelled with digits.

Find the number of 4-digit numbers that can be formed if the digit are used without repetition. From the numbers formed, find the number of 4-digit numbers that are

- (a) greater than 6 000,
- (b) odd numbers and greater than 6 000.

10. Diagram below shows the arrangement of tables in an exhibition room. A few panels of partition board are arranged in the middle of the room to create a one-way path.

After the visiting hour to the exhibition, the worker uses pieces of cloth to cover the exhibition objects on each table. It is given that the worker brings three pieces of red cloth, three pieces of green cloth, two pieces of blue cloth and a piece of yellow cloth. Find the number of ways to cover the tables with cloth if

- (a) the worker chooses the cloth at random,
- (b) the pieces of green cloth are used side by side,
- (c) the yellow cloth must be used to cover table A and the blue cloth cannot be used to cover its adjacent table.