NCERT Solutions Class 11 Maths
Chapter 6: Permutations and Combinations
EXERCISE 6.1

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Quick Summary: In NCERT Solutions Class 11 Maths Chapter 6 Exercise 6.1, students learn the Fundamental Principle of Counting through practical problems involving digit arrangements, telephone numbers, and coin tosses. This exercise covers essential counting techniques, permutation formula ^nP_r = (n!)/((n-r)!), and combination formula ^nC_r = (n!)/(r!(n-r)!) which are fundamental for CBSE Class 11 exams and competitive tests.

Key Takeaways:

- Master the Fundamental Principle of Counting: if one event occurs in m ways and another in n ways, both together occur in m × n ways
- Apply permutation formula ^nP_r = (n!)/((n-r)!) for arranging objects where order matters
- Solve real-world problems like forming digit numbers with and without repetition conditions
- Distinguish between permutations (order matters) and combinations (order doesn't matter) for exam success

Complete Solutions

Question 1

QUESTION

How many 3-digit numbers can be formed from the digits 1, 2, 3, 4 and 5 assuming that repetition of the digits is allowed and also when repetition is not allowed?

SOLUTION

This question asks us to find the number of 3-digit numbers that can be formed using the digits 1, 2, 3, 4, and 5, considering both cases: with and without repetition.

(i) Repetition is allowed

Step 1: Understand the problem

We need to form a 3-digit number, and we have 5 choices (1, 2, 3, 4, 5) for each digit. Since repetition is allowed, the choice for each digit is independent of the others.

Step 2: Calculate the possibilities for each digit

For the hundreds place, we have 5 choices (1, 2, 3, 4, or 5).

For the tens place, we also have 5 choices (1, 2, 3, 4, or 5) because repetition is allowed.

For the units place, we again have 5 choices (1, 2, 3, 4, or 5).

Step 3: Apply the multiplication principle

The total number of 3-digit numbers is the product of the number of choices for each digit:

Final Answer (i): 125

(ii) Repetition is not allowed

Step 1: Understand the problem

We need to form a 3-digit number using the digits 1, 2, 3, 4, and 5, but once a digit is used, it cannot be used again.

Step 2: Calculate the possibilities for each digit

For the hundreds place, we have 5 choices (1, 2, 3, 4, or 5).

For the tens place, we have only 4 choices left because we cannot repeat the digit used in the hundreds place.

For the units place, we have only 3 choices left because we cannot repeat the digits used in the hundreds and tens places.

Step 3: Apply the multiplication principle

The total number of 3-digit numbers is the product of the number of choices for each digit:

Final Answer (ii): 60

ANSWER

(i) 125

(ii) 60

Question 2

QUESTION

How many 3-digit even numbers can be formed from the digits 1, 2, 3, 4, 5, 6 if the digits can be repeated?

SOLUTION

We need to find the number of 3-digit even numbers that can be formed using the digits 1, 2, 3, 4, 5, and 6, with repetition allowed.

Step 1: Analyze the conditions

For a number to be even, its last digit must be even. In our set of digits {1, 2, 3, 4, 5, 6}, the even digits are {2, 4, 6}.

Step 2: Determine the possibilities for each digit place

Since we are forming a 3-digit number, we have three places to fill: hundreds, tens, and units.

- **Units place:** Since the number must be even, the units place can only be filled by an even digit. We have 3 choices (2, 4, or 6).
- **Tens place:** Repetition is allowed, so the tens place can be filled by any of the 6 digits (1, 2, 3, 4, 5, or 6). We have 6 choices.
- **Hundreds place:** Similarly, the hundreds place can be filled by any of the 6 digits (1, 2, 3, 4, 5, or 6). We have 6 choices.

Step 3: Apply the multiplication principle

The total number of 3-digit even numbers is the product of the number of choices for each place.

Total numbers = (Choices for hundreds place) (Choices for tens place) (Choices for units place)

Total numbers =

Step 4: Calculate the result

Total numbers =

Final Answer: There are 108 such 3-digit even numbers.

ANSWER

108

Question 3

QUESTION

How many 4-letter codes can be formed using the first 10 letters of the English alphabet if no letter can be repeated?

SOLUTION

This question asks us to find the number of 4-letter codes that can be formed from the first 10 letters of the English alphabet, with no repetition allowed. This is a permutation problem since the order of the letters matters.

Step 1: Identify the values of n and r

We have a total of 10 letters to choose from, so . We want to form a 4-letter code, so .

Step 2: Apply the permutation formula

The number of permutations of objects taken at a time is given by the formula:

In our case, we want to find , which is the number of ways to arrange 4 letters out of 10 without repetition.

Step 3: Substitute the values into the formula

Step 4: Simplify the factorial expression

Recall that . Therefore:

We can cancel out the from both the numerator and the denominator:

Step 5: Calculate the result

Final Answer: There are 5040 possible 4-letter codes that can be formed using the first 10 letters of the English alphabet without repetition.

ANSWER

5040

Question 4

QUESTION

How many 5-digit telephone numbers can be constructed using the digits 0 to 9 if each number starts with 67 and no digit appears more than once?

SOLUTION

We need to find the number of 5-digit telephone numbers that can be formed using digits 0 to 9, with the conditions that each number starts with 67 and no digit is repeated.

Step 1: Understand the constraints

The first two digits are fixed as 6 and 7. So, we have the form 67 _ _ _ where the blanks need to be filled with distinct digits from 0 to 9, excluding 6 and 7.

Step 2: Determine the available digits

Since the digits 6 and 7 are already used, we have 10 - 2 = 8 digits remaining to choose from. These are: 0, 1, 2, 3, 4, 5, 8, and 9.

Step 3: Determine the number of ways to fill the remaining digits

We need to fill three places with 8 available digits, and the order matters (since different orders create different telephone numbers). This is a permutation problem.

Step 4: Calculate the number of permutations

We need to find the number of permutations of 8 digits taken 3 at a time, which is denoted as or . The formula for permutations is:

In our case, and , so:

Step 5: Calculate the final result

Therefore, there are 336 possible 5-digit telephone numbers that meet the given conditions.

Final Answer: 336

ANSWER

336

Question 5

QUESTION

A coin is tossed 3 times and the outcomes are recorded. How many possible outcomes are there?

SOLUTION

This question asks us to find the total number of possible outcomes when a coin is tossed 3 times. This involves understanding basic counting principles.

Step 1: Identify the possible outcomes for a single coin toss

When a coin is tossed once, there are two possible outcomes: Heads (H) or Tails (T). So, there are 2 possibilities for each toss.

Step 2: Determine the number of tosses

The coin is tossed 3 times. Each toss is an independent event.

Step 3: Apply the multiplication principle

The multiplication principle states that if there are ways to do one thing and ways to do another, then there are ways to do both. In this case, each coin toss has 2 possible outcomes, and we have 3 tosses. Therefore, we multiply the number of outcomes for each toss together.

Step 4: Calculate the total number of outcomes

Total outcomes = (Outcomes for 1st toss) (Outcomes for 2nd toss) (Outcomes for 3rd toss)

Total outcomes =

Step 5: List the possible outcomes (optional, for verification)

The possible outcomes are: HHH, HHT, HTH, HTT, THH, THT, TTH, TTT. As we can see, there are 8 possible outcomes.

Final Answer: There are 8 possible outcomes.

ANSWER

8

Question 6

QUESTION

Given 5 flags of different colours, how many different signals can be generated if each signal requires the use of 2 flags, one below the other?

SOLUTION

This question tests our understanding of permutations, specifically how to arrange items when order matters. We need to find the number of different signals that can be generated using 2 flags out of 5, where the order of the flags (one below the other) is important.

Step 1: Identify the type of problem

Since the order of the flags matters (a red flag above a blue flag is different from a blue flag above a red flag), this is a permutation problem.

Step 2: Determine the values of n and r

We have a total of flags of different colors.

We need to choose and arrange flags for each signal.

Step 3: Apply the permutation formula

The number of permutations of items taken at a time is given by the formula:

Step 4: Substitute the values of n and r into the formula

In our case, and , so we have:

Step 5: Calculate the factorial values

Step 6: Simplify the expression

Final Answer: There are 20 different signals that can be generated.

Conclusion: The permutation formula helps us calculate the number of arrangements when the order of selection is important. In this case, we found that there are 20 different ways to arrange 2 flags out of 5, considering the order of the flags.

ANSWER

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📌 Key Formulas

Important Formulas for Exercise 6.1

Formula / Concept	Description
Fundamental Principle of Counting (Multiplication Rule)	If an event can occur in m different ways, and another independent event can occur in n different ways, then the total number of ways that both events can occur in succession is m × n.
Fundamental Principle of Counting (Addition Rule)	If an event can occur in m ways and a second event can occur in n ways, and the two events cannot occur at the same time (mutually exclusive), then either of the two events can occur in m + n ways.
Factorial Notation	The continued product of first n natural numbers is called the "n factorial" and is denoted by n!. n! = n × (n-1) × (n-2) × \dots × 1 By definition, 0! = 1.
Permutations (nPr Formula)	The number of arrangements of n distinct objects taken r at a time, where order is important. ^nP_r = P(n, r) = (n!)/((n-r)!)
Combinations (nCr Formula)	The number of ways to choose r objects from a set of n distinct objects, where the order of selection does not matter. ^nC_r = C(n, r) = (n!)/(r!(n-r)!)

❓ Top FAQs

Q1. How many questions are included in NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations Exercise 6.1?

Exercise 6.1 of NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations contains exactly 6 questions. These questions are based on the Fundamental Principle of Counting and help students build a strong foundation for understanding nPr and nCr formulas relevant for CBSE board exam 2025-26.

Q2. Where can I download free PDF of NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations Exercise 6.1 with step by step solutions?

You can download the free PDF of NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations Exercise 6.1 from the official NCERT website or trusted educational portals. These PDFs include detailed step by step solutions for all 6 questions, updated as per the CBSE syllabus 2025-26, helping students prepare effectively for their board exams.

Q3. How many marks does Chapter 6 Permutations and Combinations carry in CBSE Class 11 Maths board exam 2025-26?

Chapter 6 Permutations and Combinations carries approximately 5 marks in the CBSE Class 11 Maths board exam 2025-26 as part of Unit II - Algebra. Exercise 6.1 focuses on the Fundamental Principle of Counting, which forms the basis for more complex problems involving nPr and nCr formulas in subsequent exercises.

Q4. Which is the most difficult question in NCERT Solutions Class 11 Maths Chapter 6 Permutations and Combinations Exercise 6.1?

Question 6 is generally considered the most challenging in Exercise 6.1 of NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations as it requires application of the Fundamental Principle of Counting in multiple steps. Students preparing for CBSE board exam 2025-26 should practice this question with step by step solutions to master the concept thoroughly.

Q5. What is the nPr formula explained in NCERT Solutions for Class 11 Maths Chapter 6 Permutations and Combinations?

The nPr formula in NCERT Class 11 Maths Chapter 6 is nPr = n!/(n-r)!, where n represents the total number of objects and r represents the number of objects to be arranged. This permutation formula is introduced after Exercise 6.1 and is crucial for solving problems related to arrangements and CBSE Class 11 board exam 2025-26 questions.

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