

## Unit 4

### Elementary Combinatorics

#### Choose the Correct Answer

1. What is the value of  $5!$ ?

- A) 20
- B) 60
- C) 120
- D) 240

**Answer: C) 120**

2. The number of ways to arrange 4 distinct objects is:

- A) 4
- B) 8
- C) 16
- D) 24

**Answer: D) 24**

3. Which formula represents a permutation?

- A)  $\frac{n!}{r!(n-r)!}$
- B)  $\frac{n!}{(n-r)!}$
- C)  $n + r$
- D)  $n - r$

**Answer: B)  $\frac{n!}{(n-r)!}$**

4. Which formula represents a combination?

- A)  $\frac{n!}{(n-r)!}$
- B)  $n!$
- C)  $\frac{n!}{r!(n-r)!}$
- D)  $r!$

**Answer: C)  $\frac{n!}{r!(n-r)!}$**

5. In which case does order matter?

- A) Combination
- B) Permutation

- C) Selection
- D) Subset

**Answer: B) Permutation**

**6. The value of  $5C_2$  is:**

- A) 5
- B) 10
- C) 15
- D) 20

**Answer: B) 10**

**7. The value of  $5P_2$  is:**

- A) 5
- B) 10
- D) 25

**Answer: C) 20**

**8. Which identity is correct?**

- A)  $nC_r = nC_{n-r}$
- B)  $nC_r = nP_r$
- C)  $nC_r = n + r$
- D)  $nC_r = n - r$

**Answer: A)  $nC_r = nC_{n-r}$**

**9. The number of terms in the expansion of  $(a + b)^n$  is:**

- A)  $n$
- B)  $n + 1$
- C)  $2n$
- D)  $n - 1$

**Answer: B)  $n + 1$**

**10. The binomial theorem is used to expand:**

- A)  $(a + b)^n$
- B)  $a + b + n$
- C)  $a^n + b^n$  only
- D)  $a - b$

**Answer: A)  $(a + b)^n$**

**11. The coefficient of  $x^2$  in  $(1 + x)^4$  is:**

- A) 4
- B) 6
- C) 8
- D) 12

**Answer: B) 6**

**12. The multinomial theorem deals with:**

- A) Two variables only
- B) Three or more terms in an expansion
- C) Only permutations
- D) Only combinations

**Answer: B) Three or more terms in an expansion**

**13. Which principle is used when overlapping groups must be counted without double-counting?**

- A) Pigeonhole principle
- B) Principle of inclusion and exclusion
- C) Multiplication principle
- D) Division principle

**Answer: B) Principle of inclusion and exclusion**

**14. The number of ways of arranging  $n$  distinct objects around a circle is:**

- A)  $n!$
- B)  $n^2$
- C)  $(n - 1)!$
- D)  $n + 1$

**Answer: C)  $(n - 1)!$**

**15. If objects are repeated, the number of distinct permutations is found by:**

- A) Adding the repeated objects
- B) Multiplying by repeated factorials
- C) Dividing by the factorials of the repetitions
- D) Ignoring repetitions

**Answer: C) Dividing by the factorials of the repetitions**

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### Fill in the Blanks

1. The number of ways of arranging  $n$  distinct objects is \_\_\_\_\_.

2. The number of ways of selecting  $r$  objects from  $n$  distinct objects is denoted by \_\_\_\_\_.
3. The value of  $0!$  is \_\_\_\_\_.
4. The formula for permutation of  $n$  objects taken  $r$  at a time is \_\_\_\_\_.
5. The formula for combination of  $n$  objects taken  $r$  at a time is \_\_\_\_\_.
6. In a permutation, the \_\_\_\_\_ of selecting objects is important.
7. In a combination, the order of selection is \_\_\_\_\_.
8. The expression  $\binom{n}{r}$  is called a \_\_\_\_\_ coefficient.
9. The binomial expansion of  $(a + b)^n$  is given by the \_\_\_\_\_ theorem.
10. The sum of all binomial coefficients in  $(a + b)^n$  is \_\_\_\_\_.
11. The number of permutations of  $n$  objects when  $r$  objects are repeated is calculated by dividing by the \_\_\_\_\_ of the factorials of repeated objects.
12. The multinomial theorem is a generalization of the \_\_\_\_\_ theorem.
13. The principle of inclusion and exclusion is used to avoid \_\_\_\_\_ elements when counting.
14. The number of ways to arrange  $n$  objects in a circle is \_\_\_\_\_.
15. The coefficient of  $x^r$  in  $(1 + x)^n$  is \_\_\_\_\_.

### Answers

1.  $n!$
2.  $nC_r$  or  $\binom{n}{r}$
3. 1
4.  $nP_r = \frac{n!}{(n-r)!}$
5.  $nC_r = \frac{n!}{r!(n-r)!}$
6. Order
7. Irrelevant
8. Binomial
9. Binomial
10.  $2^n$

- 11. Product
- 12. Binomial
- 13. Repeated
- 14.  $(n - 1)!$
- 15.  $\binom{n}{r}$

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**B. Choose the Correct Answer**

**1. What is the value of** *Type equation here.*