



Attempt all questions before checking the answer key.
Unless stated, selections are unordered and arrangements are ordered; repetitions are not allowed.

A. Very short answers - 1 mark each

1. Evaluate $5!$ and $0!$.
2. How many two-digit numbers can be formed from 1, 2, 3 without repetition?
3. State the relation between nPr and nCr .
4. How many diagonals does a pentagon have?
5. Explain the difference between choosing a captain and vice-captain and choosing two team members.

B. Short answers / practice - 2 marks each

6. Find n if $nP_2 = 42$.
7. Find n if $nC_2 = 45$.
8. How many chords are determined by 18 distinct points on a circle?
9. How many four-letter arrangements can be formed from the letters of PLANET without repetition?
10. How many committees of 3 can be selected from 7 people if one specified person must be included?
11. Find $8C_2$.
12. Find $7P_3$.
13. How many ways can five distinct books be arranged in a row?
14. Count distinct arrangements of LEVEL.
15. Choose two girls from six. How many selections are possible?
16. How many three-digit numbers use 1,2,3,4 without repetition?
17. How many committees of two can be formed from five people excluding one specified person?
18. Find n if $nC_1 = 9$.
19. How many arrangements of ABCDE begin with A?
20. Explain why choosing r objects is equivalent to choosing the $n-r$ objects excluded.

C. Short answers - 3 marks each

21. How many distinct arrangements can be made from the letters of SCHOOL? Explain the repeated-letter adjustment.
22. How many five-digit numbers using 0, 1, 2, 3, 4 without repetition are divisible by 5?
23. A committee of 4 is chosen from 5 boys and 4 girls. Find the number with exactly 2 girls and with at least 2 girls.
24. How many arrangements of MONDAY have the vowels together? Find how many have them separated.
25. From 6 different books, how many arrangements of 4 on a shelf include two specified books?

D. Long answers - 5 marks each

26. Derive the expressions for nPr and nCr using the counting principle. Explain and prove $nCr = nC(n-r)$.
27. Find the number of distinct arrangements of MISSISSIPPI. Then find the number in which all four I's are together, explaining the repeated-letter counts.
28. Using digits 0 to 6 without repetition, count five-digit even numbers. Organise the cases by the last digit and explain the leading-zero restriction.
29. From 6 men and 5 women, select a committee of 5 containing at least 2 women. Find how many such committees contain a specified man and exclude a specified woman.
30. Prove $nCr + nC(r-1) = (n+1)Cr$ by a selection argument. Use the identity to evaluate $8C_3 + 8C_2$ and explain its combinatorial meaning.

ANSWER KEY - Numerical / short answers

- 1) 120; 1. 2) 6. 3) $nPr = r! nCr$. 4) 5. 6) 7. 7) 10.
8) 153. 9) 360. 10) 15. 11) 28. 12) 210. 13) 120.
14) 30. 15) 15. 16) 24. 17) 6. 18) 9. 19) 24.
21) 360. 22) 24. 23) 60; 81. 24) 240 together; 480 separated. 25) 144. 27) 34650; 840. 28) 1260.
29) 381; with specified man and without specified woman: 81. 30) 84.