

Spardhaguru Skill Edge Aptitude Academy

1st Floor, 608, Panchamantra Rd, P and T Block, Jayanagar, Kuvempunagara, Mysuru, Karnataka 570023

Permutations and Combinations (P&C) is one of the most scoring sections in **Banking (IBPS, SBI), Railways (RRB), and SSC** exams once you master the fundamental logic rather than just memorizing formulas.

Here is a breakdown filling in the missing pieces from your notes, followed by the specific exam strategies and shortcut tips popularized by Murthy Sir for competitive exams.

1. Complete Formula & Concept Reference

Factorial

Definition: $n! = n \times (n-1) \times (n-2) \times \dots \times 3 \times 2 \times 1$

Examples: $5! = 5 \times 4 \times 3 \times 2 \times 1 = 120$

$4! = 4 \times 3 \times 2 \times 1 = 24$

Special Value: $0! = 1$

Permutations (Arrangement → Order Matters)

When the sequence of selection changes the result (e.g., forming words, seating arrangements, digit codes):

$$P(n, r) = {}^n P_r = \frac{n!}{(n-r)!} = n(n-1)(n-2) \dots (n-r+1)$$

Examples: ${}^6 P_2 = 6 \times 5 = 30$

${}^7 P_3 = 7 \times 6 \times 5 = 210$

Arranging n objects taken all at a time: ${}^n P_n = n!$

Repeated Objects Rule: If n total items contain p_1 identical items of type 1, p_2 identical items of type 2, etc.:

$$\text{Total Permutations} = \frac{n!}{p_1! \times p_2! \times \dots \times p_r!}$$

Combinations (Selection → Order Does NOT Matter)

When group formation is all that matters (e.g., selecting teams, picking committees, choosing cards):

$$C(n, r) = {}^n C_r = \frac{n!}{r!(n-r)!} = \frac{{}^n P_r}{r!}$$

Key Properties:

- ${}^n C_n = 1$ and ${}^n C_0 = 1$
- Symmetry Property:** ${}^n C_r = {}^n C_{n-r}$

Examples:

$${}^{11} C_4 = \frac{11 \times 10 \times 9 \times 8}{4 \times 3 \times 2 \times 1} = 330$$

$${}^{16} C_{13} = {}^{16} C_3 = \frac{16 \times 15 \times 14}{3 \times 2 \times 1} = 560$$

2. Murthy Sir's Exam Tips & Shortcuts for Banking, Railway & SSC

In competitive exams, writing out the full factorial formulas causes severe time loss. Apply these direct shortcuts during your tests:

Shortcut 1: Fast Factorials (Memorize 1! To 7!)

Save calculation time by memorizing these standard factorials:

Factorial	Value
1!	1
2!	2
3!	6
4!	24
5!	120
6!	720
7!	5,040

Shortcut 2: The "Decreasing Multiplication" Trick for ${}^n C_r$

Instead of writing the factorial fraction:

To evaluate ${}^{10} C_3$: Write the top number decreasing 3 times, over 3!:

$$\frac{10 \times 9 \times 8}{3 \times 2 \times 1} = 120$$

To evaluate ${}^8 C_2$: Write the top number decreasing 2 times, divided by 2:

$$\frac{8 \times 7}{2 \times 1} = 28$$

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Shortcut 3: Apply ${}^nC_r = {}^nC_{n-r}$ for High r Values

If the lower number is large, subtract it from the top number first:

- ${}^{20}C_{18} \rightarrow$ do NOT expand 18!
- Use ${}^{20}C_2 = \frac{20 \times 19}{2 \times 1} = 190$

3. High-Frequency Exam Question Types & Quick Rules

Type A: "AND" vs "OR" Rule

AND means **Multiply** ($\times$): Used when tasks must happen together (e.g., "Select 2 men **AND** 3 women").

OR means **Add** ($+$): Used when tasks are mutually exclusive alternatives (e.g., "Select a team of 3 men **OR** 3 women").

Type B: Word Formation Problems (Vowels Together vs Never Together)

Rule for "Vowels Always Together":

- Group all vowels into a single unit or "box".
- Treat that box as 1 item along with the remaining consonants.
- Arrange the total items.
- Multiply by the internal arrangements of the vowels inside the box.

Rule for "Vowels Never Together":

Never Together = Total Permutation - Always Together

Type C: Handshake & Match Problems

If n people shake hands with each other once, total handshakes = ${}^nC_2 = \frac{n(n-1)}{2}$.

If n teams play each other once in a tournament, total matches = nC_2 .

Type D: Circular Permutations

Arranging n distinct objects around a round table = $(n-1)!$.

Arranging n objects like beads in a necklace or flowers in a garland (where clockwise and counterclockwise look identical) = $\frac{(n-1)!}{2}$.

Exam	High-Priority Concepts
Banking (SBI / IBPS)	Category 2 (Vowels Together), Category 4 (Committee Formation), Category 5 (At Least Conditions)
SSC (CGL / CHSL)	Category 1 (Basic Evaluation), Category 3 (Restricted Positions), Category 6 (Digits & Divisibility)
Railways (RRB NTPC)	Category 1 (Basic Evaluation), Category 2 (Word Formations), Combination Basics

CONCEPT QUESTION

Category 1: Basic Evaluation & Standard
Exam Weightage: High for SSC & Railways; Low/Medium for Banking.

1. Evaluate: ${}^{75}P_2$

- a) 2775 b) 150
c) 5550 d) None of these

2. Find the values of (i) ${}^{60}P_3$ and (ii) 4P_4

- a) 205320,24 b) 267057,20
c) 256575,24 d) 179287,15

3. Find the values of (i) ${}^{10}C_3$, (ii) ${}^{100}C_{98}$, and (iii) ${}^{50}C_{50}$

- a) 150,4500,2 b) 120,4950,1
c) 150,2356,4 d) 130,4679,3

4. How many words can be formed using all letters of 'BIHAR'?

- a) 150 b) 140
c) 156 d) 120

5. How many words can be formed using all letters of 'LOGARITHMS' (taking 4 at a time, no repetition)?

Options:

- a) 40 b) 400

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c) 5040

d) 2520

6. How many words can be formed using all letters of 'DELHI'?

a) 10

b) 25

c) 60

d) 120

7. How many words can be formed using all letters of 'Chennai'?

a) 5040

b) 2520

c) 3028

d) 120

8. How many words can be formed using all letters of 'Apple'?

a) 60

b) 40

c) 56

d) 120

9. How many words can be formed using all letters of 'Leader'?

a) 150

b) 140

c) 156

d) 360

10. How many words can be formed using all letters of 'Machine'?

a) 1506

b) 1402

c) 1056

d) 5040

11. How many words can be formed using all letters of 'RUMOUR'?

a) 180

b) 90

c) 30

d) 720

e) None of these

12. How many words can be formed using all letters of 'ALLAHABAD'?

a) 3780

b) 1890

c) 7560

d) 2520

e) None of these

13. How many words can be formed using all letters of 'Engineering'?

a) 277300

b) 227700

c) 277200

d) None of these

14. How many words can be formed using all letters of 'Mississippi'?

a) 34650

b) 34560

c) 34300

d) None of these

Category 2: Grouping Conditions (Vowels Together / Vowels Never Together)

Exam Weightage:

Extremely High for Banking (IBPS, SBI) and SSC CGL.

15. How many words can be formed using 'DAUGHTER' so that vowels always come together?

a) 4320

b) 4500

c) 4400

d) 6000

16. How many words can be formed using 'SIGNATURE' so that vowels always come together?

a) 720

b) 1440

c) 288

d) 3600

e) None of these

17. How many words can be formed using 'OPTICAL' so that vowels always come together?

a) 120

b) 720

c) 4320

d) 2160

e) None of these

18. How many words can be formed using 'SOFTWARE' so that vowels always come together?

a) 120

b) 360

c) 1440

d) 13440

e) 720

19. How many words can be formed using 'LEADING' so that vowels always come together?

a) 360

b) 480

c) 720

d) 5040

e) None of these

20. How many words can be formed using 'JUDGE' so that vowels always come together?

a) 48

b) 120

c) 124

d) 160

21. How many words can be formed using 'AUCTION' so that vowels always come together?

a) 30

b) 48

c) 144

d) 576

e) None of these

22. How many words can be formed using 'BANKING' so that vowels always come together?

a) 120

b) 240

c) 360

d) 540

e) None of these

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23. How many words can be formed using 'CORPORATION' so that vowels always come together?

- a) 50400 b) 40500
c) 54400 d) 65000

24. How many words can be formed using 'DIRECTOR' so that vowels always come together?

- a) 2180 b) 2400
c) 2380 d) 2160

25. How many words can be formed using 'ENGINEERING' so that vowels always come together?

- a) 5200 b) 4500
c) 4200 d) 5000

26. How many words can be formed using 'MISSISSIPPI' so that vowels always come together?

- a) 420 b) 450
c) 820 d) 840

27. How many words can be formed using 'MATHEMATICS' so that vowels always come together?

- a) 10080 b) 4989600
c) 120960 d) None of these

28. How many words can be formed using 'EXTRA' so that vowels are NEVER together?

- a) 130 b) 120
c) 150 d) 140

29. How many words can be formed using 'ENGINEERING' so that vowels are NEVER together?

- a) 27300 b) 27200
c) 27400 d) 23700

30. How many words can be formed using 'CORPORATION' so that vowels are NEVER together?

- a) 3326400 b) 327600
c) 327400 d) 423700

Category 3: Restricted Position Arrangements (Odd/Even Places & Gap Method)

Exam Weightage:

Very High for Banking (Prelims/Mains) and SSC CGL.

31. In how many ways can 'DETAIL' be arranged so that vowels occupy ONLY odd positions?

- a) 32 b) 48
c) 36 d) 60 e) 120

32. In how many ways can 'CABINET' be arranged so that vowels occupy ONLY odd positions?

- a) 210 b) 576
c) 144 d) 60 e) 3456

33. In how many ways can 'MACHINE' be arranged so that vowels occupy ONLY odd positions?

- a) 210 b) 576
c) 144 d) 60 e) 3456

34. In how many ways can 21 English books and 19 Hindi books be placed on a shelf so that no two Hindi books are together?

- a) 3990 b) 1050
c) 25200 d) 21400 e) None of these

Category 4: Team & Committee Selection (Combinations)

Exam Weightage:

Extremely High for Banking (PO/Clerk) & SSC.

35. In how many ways can a cricket eleven be chosen out of 15 players?

- a) 1365 b) 1323
c) 1453 d) 1546

36. In how many ways can a group of 5 men and 2 women be made out of 7 men and 3 women?

- a) 63 b) 90
c) 126 d) 45 e) 135

37. In how many ways can a committee of 5 men and 6 women be formed from 8 men and 10 women?

- a) 266 b) 5040
c) 11760 d) 86400 e) None of these

38. Committee of 5 members from 6 men and 5 ladies, consisting of 3 men and 2 ladies?

- a) 400 b) 500
c) 200 d) 300

39. Out of 7 consonants and 4 vowels, how many words of 3 consonants and 2 vowels can be formed?

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- a) 210 b) 1050
c) 25200 d) 21400 e) None of these

Category 5: Conditional Selections ("At Least" Problems)

Exam Weightage:

High Difficulty / SBI PO & IBPS PO Mains Priority.

40. From 7 men and 6 women, select 5 persons for a committee so that at least 3 men are included.

- a) 564 b) 645
c) 735 d) 756 e) None of these

41. In a group of 6 boys and 4 girls, select 4 children such that at least one boy is included.

- a) 159 b) 194
c) 205 d) 209 e) None of these

42. A box contains 2 white, 3 black, and 4 red balls. Draw 3 balls such that at least one black ball is included.

- a) 32 b) 48
c) 64 d) 96 e) None of these

Category 6: Digits & Divisibility Permutations

Exam Weightage:

High for SSC CGL / CHSL and Railways.

43. How many 3-digit numbers divisible by 5 can be formed from digits 2, 3, 5, 6, 7, 9 (no repetition)?

- a) 5 b) 1540
c) 199 d) 3672 e) None of these

Practice Questions

1. Evaluate: ${}^{12}P_3$

- a) 1320 b) 1180
c) 1440 d) 1200

2. Find the value of ${}^{15}C_3$.

- a) 455 b) 364
c) 545 d) 273

3. In how many different ways can the letters of the word 'PENCIL' be arranged?

- a) 120 b) 360
c) 720 d) 5040

4. How many different words can be formed using all letters of 'BHOPAL'?

- a) 720 b) 120
c) 360 d) 5040

5. How many arrangements can be made out of the letters of 'TRIANGLE'?

- a) 5040 b) 40320
c) 362880 d) 20160

6. How many ways can the letters of the word 'MUMBAI' be arranged?

- a) 360 b) 720
c) 180 d) 120

7. In how many ways can the letters of the word 'STATISTICS' be arranged?

- a) 50400 b) 25200
c) 181440 d) 362880

8. How many different words can be formed from the letters of 'SUCCESS'?

- a) 420 b) 840
c) 5040 d) 210

9. In how many ways can 5 people sit on 5 chairs in a row?

- a) 25 b) 120
c) 60 d) 24

10. Evaluate ${}^nC_0 + {}^nC_1 + {}^nC_n$ for $n = 5$.

- a) 6 b) 7
c) 32 d) 12

11. How many words can be formed using 'ORANGE' so that vowels always come together?

- a) 120 b) 144
c) 360 d) 720

12. How many words can be formed using 'FLOWER' so that vowels always come together?

- a) 120 b) 180
c) 240 d) 360

13. How many words can be formed using 'DISPLAY' so that vowels always come together?

- a) 1440 b) 720

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c) 5040

d) 2880

14. How many words can be formed using 'ACTION' so that vowels always come together?

a) 720

b) 288

c) 360

d) 144

15. How many words can be formed using 'DESIGN' so that vowels are NEVER together?

a) 240

b) 480

c) 360

d) 520

16. How many words can be formed using 'ARTICLE' so that vowels are NEVER together?

a) 720

b) 1440

c) 4320

d) 5040

17. How many words can be formed using 'PENCIL' so that vowels are NEVER together?

a) 480

b) 240

c) 360

d) 600

18. How many words can be formed using 'TOTAL' so that vowels always come together?

a) 12

b) 24

c) 48

d) 60

19. How many words can be formed using 'ACCOUNT' so that vowels always come together?

a) 180

b) 240

c) 360

d) 720

20. How many words can be formed using 'MONDAY' so that vowels are NEVER together?

a) 240

b) 360

c) 520

d) 480

21. In how many ways can 'STATION' be arranged so that vowels occupy only even positions?

a) 36

b) 72

c) 144

d) 288

22. In how many ways can 'PERSON' be arranged so that vowels occupy only odd positions?

a) 144

b) 72

c) 288

d) 360

23. In how many ways can 'GARNET' be arranged so that vowels occupy only even places?

a) 72

b) 96

c) 144

d) 288

24. How many ways can 'SMART' be arranged such that it ALWAYS begins with 'S'?

a) 24

b) 120

c) 48

d) 12

25. How many ways can 'ROSE' be arranged such that it begins with 'R' and ends with 'E'?

a) 1

b) 2

c) 4

d) 24

26. In how many ways can 5 boys and 4 girls sit in a row so that NO two girls sit together?

a) 1440

b) 2880

c) 17280

d) 43200

27. In how many ways can 4 men and 3 women sit in a row alternately?

a) 144

b) 72

c) 288

d) 576

28. How many words starting with 'C' and ending with 'T' can be formed from 'CASTLE'?

a) 12

b) 120

c) 24

d) 48

29. Out of 8 men and 5 women, select a committee of 4 persons with NO restrictions.

a) 715

b) 1287

c) 495

d) 1001

30. Form a team of 4 players from 6 boys and 4 girls containing EXACTLY 2 boys and 2 girls.

a) 60

b) 90

c) 120

d) 150

31. Form a committee of 5 from 6 men and 4 women containing 3 men and 2 women.

a) 60

b) 80

c) 120

d) 240

32. 12 people attend a party and shake hands with each other once. Find total handshakes.

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- a) 66 b) 132
c) 78 d) 144
- 33. How many diagonals can be drawn in an Octagon (8 sides)?**
a) 16 b) 20
c) 28 d) 24
- 34. In how many ways can 3 cards be drawn from a well-shuffled deck of 52 cards?**
a) 1326 b) 2600
c) 22100 d) 17576
- 35. How many triangles can be formed using 10 non-collinear points in a plane?**
a) 120 b) 720
c) 240 d) 360
- 36. From 5 red and 4 blue balls, select 3 red and 2 blue balls.**
a) 30 b) 60
c) 120 d) 45
- 37. In how many ways can a student attempt 5 questions out of 8 in an examination?**
a) 40 b) 120
c) 336 d) 56
- 38. Pick 4 apples from 5 green and 3 yellow apples such that 2 are green and 2 are yellow.**
a) 30 b) 15
c) 60 d) 45
- 39. Select a committee of 4 from 5 men and 4 women containing AT LEAST 2 women.**
a) 60 b) 81
c) 126 d) 105
- 40. Select a team of 4 from 6 boys and 5 girls such that AT LEAST 1 girl is included.**
a) 330 b) 15
c) 315 d) 300
- 41. Draw 3 balls from 4 red and 5 black balls such that AT LEAST ONE red ball is chosen.**
a) 74 b) 84
c) 64 d) 54
- 42. Select 3 members from 4 teachers and 3 students with AT MOST 1 student included.**
a) 18 b) 22
c) 35 d) 28
- 43. Pick 3 balls from 5 white and 4 black balls with AT LEAST 2 white balls chosen.**
a) 40 b) 30
c) 60 d) 50
- 44. Form a panel of 4 from 5 professors and 4 researchers with AT LEAST 3 professors.**
a) 45 b) 40
c) 50 d) 60
- 45. How many 3-digit numbers can be formed using digits 1, 2, 3, 4, 5 (no repetition)?**
a) 120 b) 24
c) 60 d) 125
- 46. How many 4-digit EVEN numbers can be formed using digits 1, 2, 3, 4, 5, 6 (no repetition)?**
a) 360 b) 180
c) 120 d) 90
- 47. How many 3-digit numbers divisible by 5 can be formed using digits 0, 1, 2, 3, 4, 5 (no repetition)?**
a) 36 b) 40
c) 32 d) 48
- 48. How many 4-digit numbers greater than 5000 can be formed using digits 3, 4, 5, 6, 7 (no repetition)?**
a) 24 b) 48
c) 60 d) 72
- 49. How many 3-digit ODD numbers can be formed using digits 2, 3, 4, 5, 6, 7 (no repetition)?**
a) 120 b) 60
c) 90 d) 40
- 50. How many 4-digit numbers can be formed using digits 0, 1, 2, 3, 4 (no repetition)?**
a) 120 b) 24
c) 96 d) 72