THE QUESTION | NON-CONSECUTIVE SELECTION

There are 6 persons arranged in a row. Another person has to shake hands with 3 of them so that he should not shake hands with two consecutive persons. In how many distinct possible combinations can the handshakes take place?

Selection with Restrictions | Non-Consecutive Choices | Hidden Trap: starting from C(6,3) = 20

(a) 3
One short. The list below has 4 valid sets.

(b) 4 ✓
Valid sets: (1,3,5), (1,3,6), (1,4,6), (2,4,6).

(c) 5
Only 4 sets satisfy the rule. A fifth would need two neighbours.

(d) 6
Only 4 sets satisfy the rule. Six would need sets with neighbours.

CRACK THE HIDDEN RULE

When a selection cannot include neighbours, list it by the first pick. The numbers are small, and listing is faster and safer than a formula.

For choosing k non-adjacent from n in a row, the count is C(n - k + 1, k). Here that is C(4, 3).

$$C(n - k + 1, k) = C(6 - 3 + 1, 3) = C(4, 3) = 4$$

FIRST PICK 1	FIRST PICK 2	FIRST PICK 3
(1,3,5) (1,3,6) (1,4,6)	(2,4,6)	None possible

WORKED IN 3 CLEAN STEPS

1 Label the persons 1 to 6
He must pick 3 with no two numbers next to each other.

2 List by the first pick
Start at 1: (1,3,5), (1,3,6), (1,4,6). Start at 2: (2,4,6). Start at 3 needs 5 and 7: none.

3 Count
3 + 1 = 4 sets. Formula check: C(4,3) = 4.

ANSWER: (b) 4

THE 3-SECOND SHORTCUT

List by the first pick and stop when the numbers run out. The set is small. Confirm with C(n - k + 1, k): the gap rule leaves C(4,3) = 4.

list by first pick | no two neighbours | check C(n−k+1, k)

→ Total unrestricted choices are 20, which is not among the options and hints at a restriction.

→ Last pick must be 5 or 6, which keeps the list short.

WHY ASPIRANTS LOSE MARKS HERE

1. **Answering with C(6,3) = 20.** It ignores the no-neighbour rule.
2. **Missing the sets that end in 6.** (1,3,6), (1,4,6) and (2,4,6) all end in 6.
3. **Counting (1,2,4) or similar.** It has two neighbours and breaks the rule.

ATTEMPT	FLAG	SKIP
~40 sec	if you doubt the list	never
List and count.	Use C(n−k+1, k) to confirm.	Short and sure.

THE ONE-LINE TAKEAWAY

For no-neighbour selections, list by the first pick and confirm with C(n - k + 1, k).

Join XSAT →

Free daily CSAT decodes, delivered every morning.
t.me/MissionXUPSC · +91 79025 80728

© Mission X UPSC · XSAT Daily PYQ Decode · Trivandrum, Kerala