Permutation test

Test a difference by shuffling the group labels.

1. Start

Take the observed data. Compute the observed statistic.

Group A = {2, 4, 6} mean = 4

Group B = {5, 7, 9} mean = 7

diff = 3

2. Shuffle the labels — no replacement

Pool all six values. Give three back to each group. Keep the sizes equal.

Pooled: 2 4 5 6 7 9

One shuffle: 2 4 9 **A*** 5 6 7 **B***

3. Recompute the statistic

Use the shuffled groups. Compute the statistic again.

mean(B*) − mean(A*) = 6 − 5 = 1

4. Build the null distribution

Repeat the shuffle B times. Here list all 20 splits for the exact test.



centre = 0

repeat B times

5. Read the p-value

Mark the observed value. Shade the values as far from 0 as the observed value.



p = 4 / 20 = 0.20

Why this works

If the groups are the same, the labels carry no information.
So a label shuffle shows the statistic under the null.
Assumption: exchangeability under the null.

Group A Group B shaded bars = as far from 0 as the observed value

Worked example: two groups of three. Statistic = mean(B) − mean(A).