Examples from Permutations
Data Science and A.I. Lecture Series

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- Solution:
  - Total digits: 9
  - Required 4-digit numbers $= P(9, 4) = \frac{9!}{(9-4)!} = 9 \times 8 \times 7 \times 6 = 3024$

- How many numbers lying between 100 and 1000 can be formed with the digits 0, 1, 2, 3, 4, 5 if the repetition of the digits is not allowed?

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    - Total 3-digit numbers $= P(6, 3)$
    - Numbers with 0 in the hundreds place $= P(5, 2)$
    - Required numbers $= P(6, 3) - P(5, 2) = 120 - 20 = 100$

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    - Simplify to $n^2 - 7n - 30 = 0$
    - Solve: $(n-10)(n+3) = 0 \Rightarrow n = 10$ (as $n > 0$)

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  - Solve: $r^2 - 11r + 24 = 0 \Rightarrow (r-8)(r-3) = 0$

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  - $r = 8$ or $r = 3$

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- Solution:
  - (i) Treat vowels (A, U, E) as a single unit: $6! \times 3! = 4320$
  - (ii) Total arrangements $= 8!$, Subtract case (i): $8! - 6! \times 3! = 36000$

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- Solution:
  - Total discs $= 9$
  - Arrangements $= \frac{9!}{4! \times 3! \times 2!} = 1260$

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