Permutations
With restrictions

The problems gain awkwardness….

How many 5 letter permutations of the letters ABCDEFGH exist?

1

How many 5 letter permutations of the letters ABCDEFGH exist?

1

8	7	6	5	4

$$= {}_8P_5$$

How many 5 letter permutations of the letters ABCDEFGH have D in the starting position?

2

Fix D in it's place
Remove it from n and r.

How many 5 letter permutations of the letters ABCDEFGH have D in the starting position?

2

$$= {}_7P_4$$

Fix D in it's place
Remove it from n and r.

How many 5 letter permutations of the letters ABCDEFGH have B at the front and E at the end?

3

Fix B and E in place
Remove them from n and r.

How many 5 letter permutations of the letters ABCDEFGH have B at the front and E at the end?

3

$$= {}_6P_3$$

Fix B and E in place
Remove them from n and r.

How many 5 letter permutations of the letters ABCDEFGH contain the word BE?

4

How many 5 letter permutations of the letters ABCDEFGH contain the word BE?

B	E	6	5	4

4

$$= {}_6P_3 \times 4 \text{ places}$$

Fix B and E in place
Remove them from n and r.
Then, calculate the places they can go.

B	E	6	5	4
6	B	E	5	4
6	5	B	E	4
6	5	4	B	E

How many 5 letter permutations of the letters ABCDEFGH have A and B (in that order) separated by one letter?

How many 5 letter permutations of the letters ABCDEFGH have A and B (in that order) separated by one letter?

A	6	B	5	4

5

$$= {}_6P_3 \times 3 \text{ places}$$

A	6	B	5	4
6	A	5	B	4
6	5	A	4	B

Fix B and E in place
Remove them from n and r.
Then, calculate the places they can go.

How many 5 letter permutations of the letters ABCDEFGH have A and B (in any order) separated by one letter?

6

How many 5 letter permutations of the letters ABCDEFGH have A and B (in any order) separated by one letter?

A	6	B	5	4

6

$$= {}_6P_3 \times 3 \text{ places} \times 2$$

Fix B and E in place
Remove them from n and r.
Then, calculate the places they can go.
Multiply by 2 – A and B can switch.

A	6	B	5	4
6	A	5	B	4
6	5	A	4	B

How many 5 letter permutations of the letters ABCDEFGH have the letters not in alpha order?

7

How many 5 letter permutations of the letters ABCDEFGH have the letters not in alpha order?

8	7	6	5	4

7

$= {}_8P_5$ - in order

$= {}_8P_5 - 4$

$= 6716$

Summary

1. How many 5 letter permutations? $= {}_8P_5$
2. 5 letter perms have D in the start? $= {}_7P_4$
3. Begin with B & end with E? $= {}_6P_3$
4. 5 letter perms contain the word BE? $= {}_6P_3 \times 4$ places
5. A and B (in that order) separated by a letter? $= {}_6P_3 \times 3$ places
6. A and B (in any order) separated by a letter? $= {}_6P_3 \times 3$ places $\times 2$
7. Not in alpha order? $= {}_8P_5 - 4$ (all - in order)