

Permutations With restrictions

The problems gain awkwardness....

How many 5 letter permutations of the letters
ABCDEFGH exist?



How many 5 letter permutations of the letters
ABCDEFGH exist?



$$= {}_8P_5$$

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?



$$= {}_7P_4$$

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?



$$= {}_6P_3$$

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?



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

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

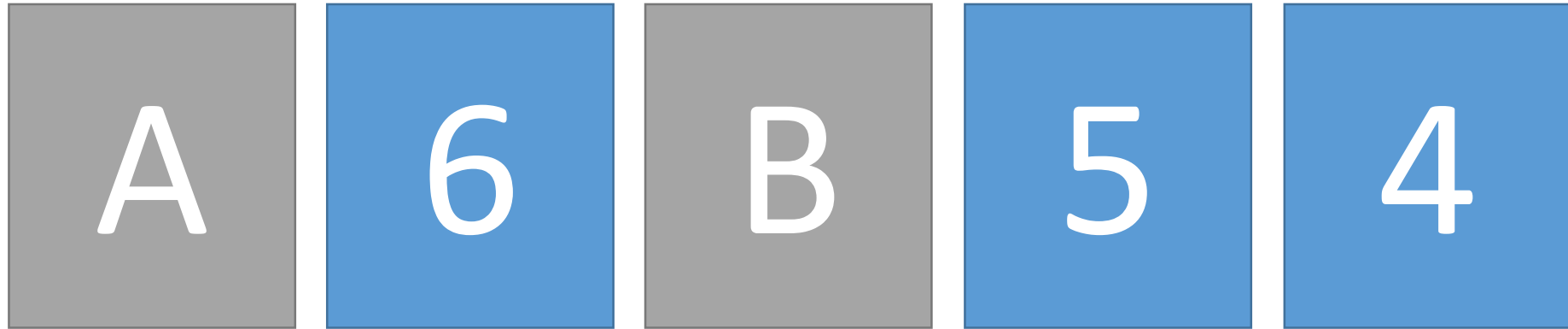
Fix B and E in place
Remove them from n and r.
Then, calculate the places they can go.

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



5

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



5

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



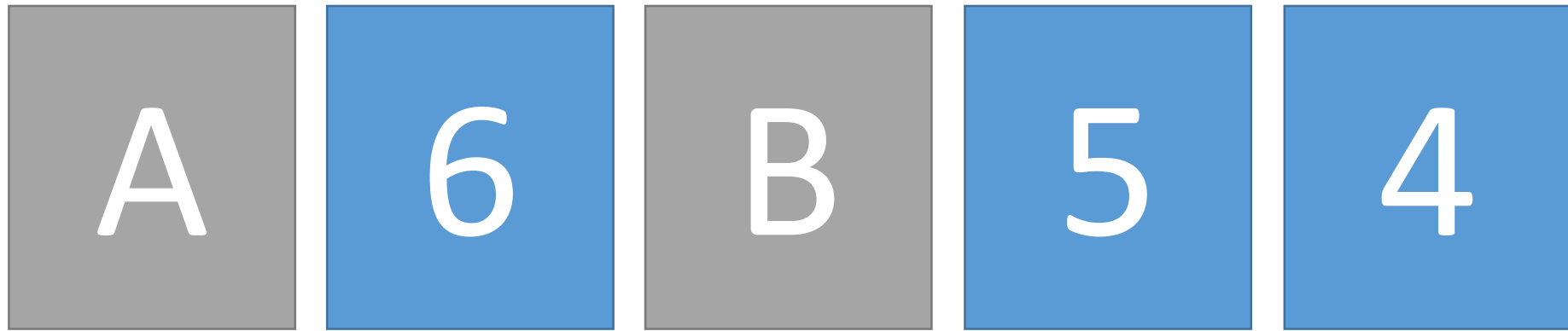
Fix B and E in place
Remove them from n and r.
Then, calculate the places they can go.

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?



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



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.**

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?



$= {}_8P_5$ - 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?

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

5

A and B (in that order) separated by a letter?

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

6

A and B (in any order) separated by a letter?

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

7

Not in alpha order?

$$= {}_8P_5 - 4 \text{ (all - in order)}$$