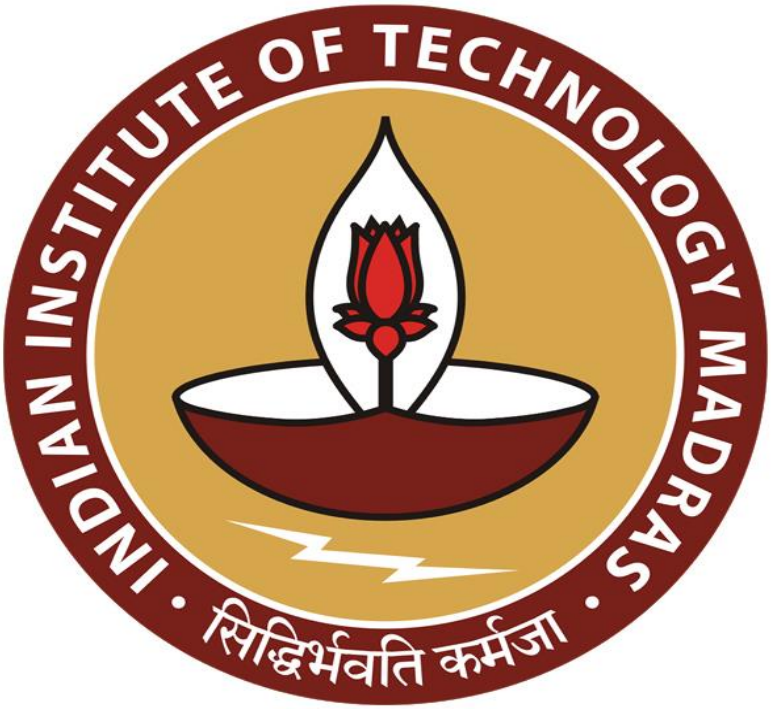

IIT Madras

ONLINE DEGREE

Statistics for Data Science - 1
Prathyush P
Support Team
Indian Institute of Technology, Madras
Week - 5 Tutorial - 6

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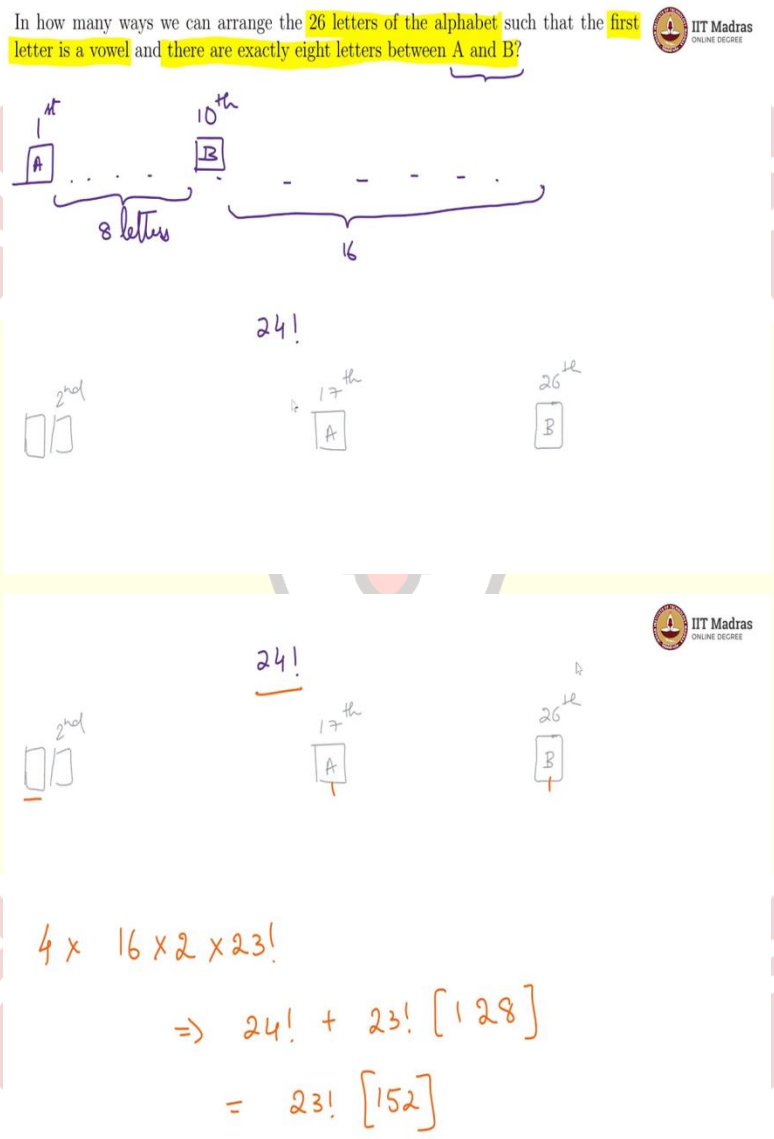

In our last question, we are looking at the number of ways we can arrange the 26 letters of the alphabet, that is, A to Z such that the first letter is a vowel. So the first letter is A or E or I or O or U and there are exactly 8 letters between A and B.

So this is the first box and then we have the rest. And this can be filled in 5 ways but since we are looking at this condition here, let us start with filling it with A. Then B will be somewhere here, in the 10th position; this is the first position and there are 8 letters in between. So now, these are 10. So what is left is the remaining 16 letters and these 8+16, the 24 letters can be rearranged in 24! ways and all of them are valid by our conditions.

Now, suppose the first letter is not A. So then the first letter can be E or O or I or U. And we also know that the last letter if it is B, then A has to be the, if this is the 26th, then A has to be the 17th letter so as to accommodate 8 letters in between which mean A can go anywhere from the 2nd position to the 17th position.

So we have 4 choices for the first one which gives us 4. And now A can go from, A can be anywhere from 2nd to the 17th. So there are 16 choices for A and since you can shuffle A and B in this case, I mean B can come first and A can come afterwards, so we can multiply by 2 now. And then what are the remaining letters? First letter is fixed and we have A and B filled. So 3 letters are filled. So the remaining 23 can be rearranged in 23! ways.

So we earlier had 24 factorial and now, we have $4 \times 16 \times 2 \times 23!$, which gives us $24! \times 23!$ (128). If we take further 23 factorial common, we will get $152 \times 23!$.