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IIT Madras
ONLINE DEGREE

Statistics for Data Science - 1
Professor. Usha Mohan
Prathyush P (Support Team)
Department of Management Studies
Indian Institute of Technology, Madras
Week - 03
Tutorial - 04

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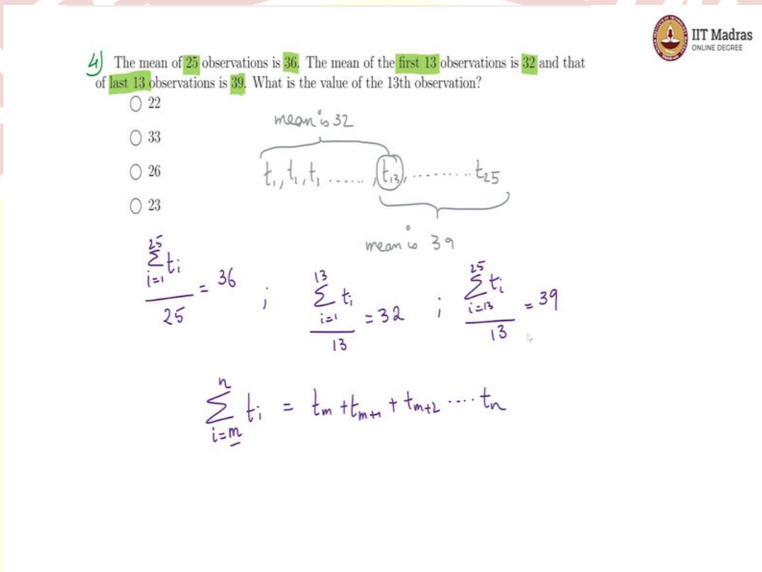

For our fourth question, we are told that the mean of 25 observations is 36 and the mean of the first 13 observations is 32 and the last 13 observations is 39, which means the thirteenth observation must be included in both of the calculations. Because, so we have observations, let us call them t_1, t_2, t_3, so on and look at the t_{13}one, it comes right in the middle and then we have till t_{25}.

So, the first 13 would include these and the mean is 32. The last 13 would include these and the mean is 39, so this particular term is there in both calculations. So, what we get from these three different pieces of information is, when you talk about all 25 put together, the mean is 36. So, that means the total sum $\frac{\sum_{i=1}^{25} t_i}{25} = 36$.

Then we also know that $\frac{\sum_{i=1}^{13} t_i}{13} = 32$ and $\frac{\sum_{i=13}^{25} t_i}{13} = 39$. So, in case you are confused about what this Σ_i going from something to something let us call this m to n t_i means, this is basically the Σ implies a summation so you are adding things. And what are you adding?

You are adding t_i's, where the i variable goes from m to n. So, that would be t_m plus because you are starting from m and everything on the way till n so, $t_m + t_{m+1} + t_{m+2} + \ldots + t_n$, this is what the summation notation indicates.

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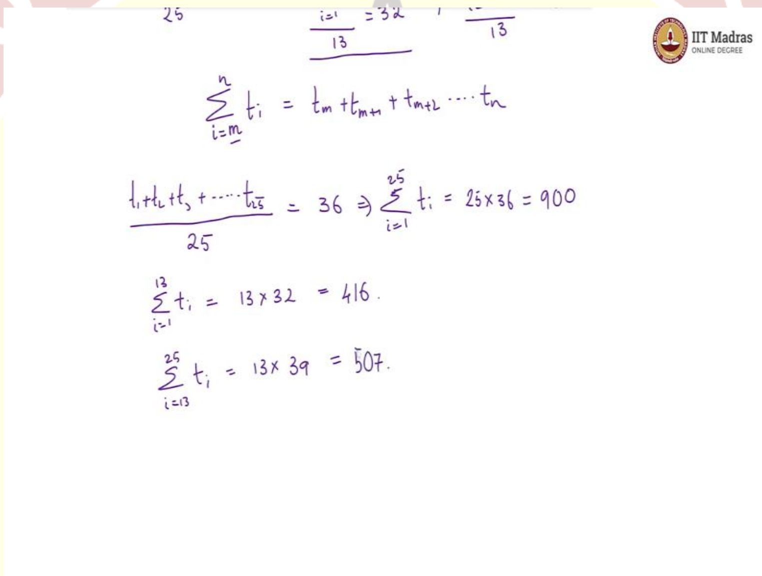

So, in this particular first case what we are basically saying is $t_1 + t_2 + t_3 + \ldots + t_{25}$, that is what it means, where i goes from 1 to 25.

$\frac{t_1+t_2+t_3+\ldots+t_{25}}{25}=36$

$\sum_{i=1}^{25} t_i = 25 \times 36 = 900$

And now from the second piece of information we get that

$\sum_{i=1}^{13} t_i$, that is the sum of the first 13 terms is so what is the mean, the mean is 32, so

$\sum_{i=1}^{13} t_i = 13 \times 32 = 416$.

And this portion, the last one where $\sum_{i=13}^{25} t_i$= 13 times because a 13 observation overall into 39, this is the given mean, so this is essentially 507.

$\sum_{i=13}^{25} t_i$= 507

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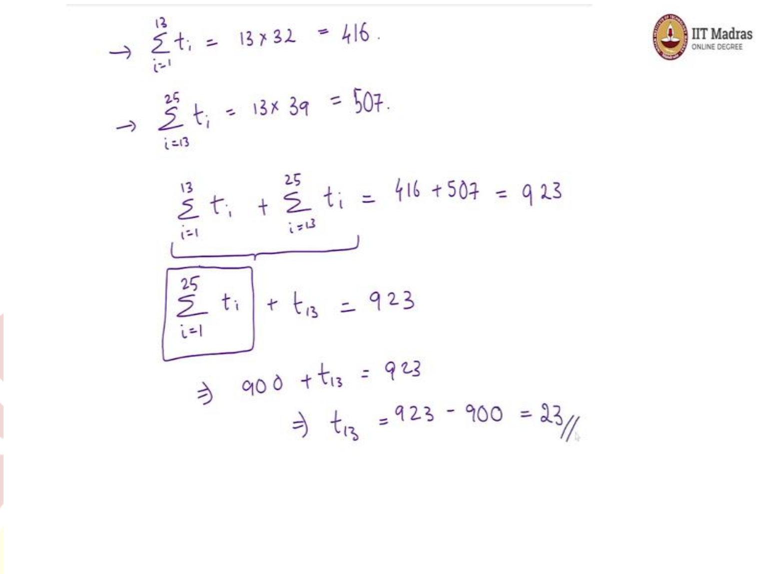

So, now what we have is the sum of the first 25 terms is there, sum of the first 13 terms is there and sum of the last 13 terms is there. So, if I added these two, this and this, I will get

$\sum_{i=1}^{13} t_i + \sum_{i=13}^{25} t_i = 416 + 507 = 923.$

However, these two put together are basically $\sum_{i=1}^{25} t_i + t_{13}$ which is because our t_{13} is showing up once in both of these summations.

Therefore, when I combine them one t_{13} goes into the total summation and the other extra is lying here, so this is going to give us 923 and this sum, the total sum we know is 900 which means 900 + $t_{13} = 923$ and that indicates that $t_{13} = 923 - 900 = 23$.