

# SUMMATION NOTATION

STEP-BY-STEP EXAMPLES

Let's do some examples



$$\sum_{i=1}^n \sum_{j=1}^m x_{ij} = ?$$

Quick review (see video linked below first if this is new)

$$\sum_{i=1}^6 i = 1 + 2 + 3 + 4 + 5 + 6 = 21$$

Rows

1	34	5	17	2
2	9	13	23	4
3	21	17	20	6
4	15	63	36	8
5	94	90	8	12

Columns

Data set 1

ID	A	B	C	D	E
1	4	5	2	11	21
2	9	8	3	15	15
3	7	10	1	18	23
4	8	17	6	16	45
5	13	14	12	20	60
6	22	25	30	41	55

1 2 3 4 5

How many rows? 6 rows  
How many columns? 5 columns

What is  $x_{1,3}$ ?  $x_{1,3} = 2$   
What is  $x_{3,1}$ ?  $x_{3,1} = 7$   
What is  $x_{4,5}$ ?  $x_{4,5} = 45$

Data set 1

ID	A	B	C	D	E
1	4	5	2	11	21
2	9	8	3	15	15
3	7	10	1	18	23
4	8	17	6	16	45
5	13	14	12	20	60
6	22	25	30	41	55

What is  $\sum_{i=1}^3 x_{i,1} = ?$   
What is  $\sum_{i=1}^3 x_{1,i} = ?$

Data set 1

ID	A	B	C	D	E
1	4	5	2	11	21
2	9	8	3	15	15
3	7	10	1	18	23
4	8	17	6	16	45
5	13	14	12	20	60
6	22	25	30	41	55

What equation represents the mean of the area surrounded by these dashed lines?

What equation represents the mean of the area surrounded by these dotted lines?

Data set 1

ID	A	B	C	D	E
1	4	5	2	11	21
2	9	8	3	15	15
3	7	10	1	18	23
4	8	17	6	16	45
5	13	14	12	20	60
6	22	25	30	41	55

$$\sum_{i=1}^3 \sum_{j=2}^4 x_{ij} = \sum_{j=2}^4 x_{1,j} + \sum_{j=2}^4 x_{2,j} + \sum_{j=2}^4 x_{3,j}$$

$$\sum_{i=1}^3 \sum_{j=2}^4 x_{j,i} = \sum_{j=2}^4 x_{j,1} + \sum_{j=2}^4 x_{j,2} + \sum_{j=2}^4 x_{j,3}$$

$\sum_{i=1}^3 \sum_{j=2}^4 x_{ij} = 73$   
 $\sum_{i=1}^3 \sum_{j=2}^4 x_{ji} = 69$

Data set 1

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1	4	5	2	11	21
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5	13	14	12	20	60
6	22	25	30	41	55

What is  $\sum_{i=1}^3 \sum_{j=2}^4 x_{ij} = ?$   
What is  $\sum_{i=1}^3 \sum_{j=2}^4 x_{ji} = ?$

Data set 1

ID	A	B	C	D	E
1	4	5	2	11	21
2	9	8	3	15	15
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$\sum_{i=1}^3 x_{i,1} = 20$   
 $\sum_{i=1}^3 x_{1,i} = 11$

Data set 1

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1	4	5	2	11	21
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4	8	17	6	16	45
5	13	14	12	20	60
6	22	25	30	41	55

What equation represents the mean of the area surrounded by these dashed lines?

What equation represents the mean of the area surrounded by these dotted lines?

$$\bar{x} = \frac{\sum_{i=1}^2 \sum_{j=2}^5 x_{ij}}{8}$$

$$\bar{x} = \frac{\sum_{i=4}^6 \sum_{j=2}^3 x_{ij}}{6}$$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

1 2 3 4

How many rows? 9 rows  
How many columns? 4 columns

What is  $x_{3,4}$ ?  $x_{3,4} = 18$   
What is  $x_{5,2}$ ?  $x_{5,2} = 14$   
What is  $x_{7,3}$ ?  $x_{7,3} = 32$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

What is  $\sum_{m=1}^4 x_{m,3} = ?$   
What is  $\sum_{m=1}^4 x_{3,m} = ?$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

What is  $\sum_{m=1}^4 x_{m,3} = 54$   
What is  $\sum_{m=1}^4 x_{3,m} = 42$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

What equation represents the mean of the area surrounded by these dashed lines?

What equation represents the mean of the area surrounded by these dotted lines?

$$\bar{x} = \frac{\sum_{m=3}^4 \sum_{n=1}^3 x_{m,n}}{6}$$

$$\bar{x} = \frac{\sum_{m=1}^7 \sum_{n=2}^4 x_{m,n}}{21}$$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

What equation represents the mean of the area surrounded by these dashed lines?  
What equation represents the mean of the area surrounded by these dotted lines?

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

$\sum_{m=3}^4 \sum_{n=2}^3 x_{m,n} = 135$   
 $\sum_{m=7}^9 \sum_{n=2}^3 x_{m,n} = 299$

$$\sum_{m=3}^4 \sum_{n=2}^4 x_{m,n} = \sum_{n=2}^4 x_{3,n} + \sum_{n=2}^4 x_{4,n} + \sum_{n=2}^4 x_{5,n}$$

$$\sum_{m=7}^9 \sum_{n=2}^3 x_{m,n} = \sum_{n=2}^3 x_{7,n} + \sum_{n=2}^3 x_{8,n} + \sum_{n=2}^3 x_{9,n}$$

Data set 2

ID	A	B	C	D
1	21	22	23	5
2	1	4	6	7
3	2	10	12	18
4	3	17	13	16
5	8	14	15	20
6	11	25	19	9
7	24	31	32	33
8	41	45	48	51
9	55	66	77	88

What is  $\sum_{m=3}^4 \sum_{n=2}^4 x_{m,n} = ?$   
What is  $\sum_{m=7}^9 \sum_{n=2}^3 x_{m,n} = ?$