

## **Sample Variance (S<sup>2</sup>)** Method 1:

Step 1	Enter all	data in	Excel	software	program
--------	-----------	---------	-------	----------	---------

Step 2: Find the mean by using the AVERAGE function: =AVERAGE(B2:B12)



The average (mean) goes to any empty cell, say B13.

## Step 3: Subtract the mean (average) from each number in the sample:

- move cursor to column C2
- Type: =**B2-\$B\$13** (mean value is in col **B13**, we will lock as a constant value)
- Click Enter. (You shall see the value of x-mean = -13.64 in column C2)
- move cursor to the corner of column C2 and drag until col C12

CI	ipboard 🗳			Fo	ont		12
SU	M -		×	~	f <sub>x</sub>	=B2	2-\$B\$13
	А		В		C		D
1	Burgers			Fat	x - mea	n	
2	А			7	=B2-\$B\$	13	
3	В			9			
4	С			16			
5	D			18			
6	E			15			
7	F			16			
8	G			22			
9	н			25			
10				27			
11	J			33			
12	F			39			
13	mean	[	20	.64			
14							

C	ipboard 🗳	Fo	ont	rs.
C2	Ŧ	: × ~	fx =B2	2-\$B\$13
	А	В	С	D
1	Burgers	Fat	x - mean	
2	A	7	-13.64	
3	В	9	-11.64	
4	С	16	-4.64	
5	D	18	-2.64	
6	E	15	-5.64	
7	F	16	-4.64	
8	G	22	1.36	
9	н	25	4.36	
10	1	27	6.36	
11	J	33	12.36	
12	F	39	18.36	
13	mean	20.64		<b>.</b>
14				

The differences go to column C, beginning in C2.

Step 4: Square each difference and put the results to column **D**, beginning in **D**2:

- Move cursor to column **D2**
- Type: =C2^2
- Click Enter. (You shall see the value of  $(x-mean)^2 = 185.9504$  in column D2)
- move cursor to the corner of column D2 and drag until col D12

						C	lipboard 🛛 🗳	F	ont	Ali Ali	gnment
D2	2	• I × 🗸	$f_x = C_x$	.^2		D	13	• I × •	f <sub>x</sub>		
	A	В	С	D	E		Δ	В	C	D	F
1	Burgers	Fat	x - mean	(x-mean)^2		1	Burgers	Fat	x - mean	(x-mean)^2	
2	A	7	-13.64	185.9504		2	A	7	-13.64	185,9504	
3	В	9	-11.64			3	B	9	-11.64	135,4050	
4	C	16	-4.64			4	c	16	-4.64	21,4959	
5	D	18	-2.64			5	D	18	-2.64	6,9504	
6	E	15	-5.64			6	E	15	-5.64	31.7686	
7	F	16	-4.64			7	F	16	-4.64	21.4959	
8	G	22	1.36			8	G	22	1.36	1.8595	
9	н	25	4.36			9	н	25	4.36	19.0413	
10	1	27	6,36			10	1	27	6.36	40.4959	
11	j	33	12.36			11	J	33	12.36	152.8595	
12	F	39	18.36			12	F	39	18.36	337.2231	
13	mean	20.64	20100			13	mean	20.64			
14		20.04				14					
14						15					

- **Step 5:** Add up the squared differences and divide the result by (n 1) or the number of items in the sample minus 1:
  - Move cursor to column **D15**
  - Type: =SUM(D2:D12)/(COUNT(B2:B12) 1)
  - or =SUM(D2:D12)/(12-1)
  - Click Enter. (You shall see the value of variance 95.5455 in column D15)

Clip	oboard	5		Font	5	Alignment	Cli	pboard 🖪	1	Font	ß	Alignment
B2		*	: >	$\checkmark \checkmark f_x$	=SUM(D2:D12)/(COUN	T(B2:B12)-1)	C1	7	• 1 3	K 🗸 fx		
	А		В	С	D	E		А	В	С	D	E
1	Burgers		Fat	x-mean			1	Burgers	Fat	x-mean		
2	Α	Ī	7	-13.64	185.95		2	A	7	-13.64	185.95	
3	В		9	-11.64	135.40		3	В	9	-11.64	135.40	
4	С		16	-4.64	21.50		4	C	16	-4.64	21.50	
5	D		18	-2.64	6.95		5	D	18	-2.64	6.95	
6	E		15	-5.64	31.77		0	E	15	-5.04	31.77	
7	F		16	-4.64	21.50		8	G	22	-4.04	1.96	
8	G		22	1.36	1.86		9	н	22	4.36	1.80	
9	н		25	4.36	19.04		10	- i	27	6.36	40.50	
10	1		27	6.36	40.50		11	J	33	12.36	152.86	
11	J		33	12.36	152.86		12	F	39	18.36	337.22	
12	F		39	18.36	337.22		13	mean	20.64			
13	mean	•	20.64				14			SUM	954.55	
14				SUM	954.55		15			Sample Var	95.45454545	
15				VAR	=SUM(D2:D12)/(COUN	T(B2:B12)-1)	16					
16					, , , , , , , , , , , , , , , , , , , ,	、 , -,	17					
17							18					

Cli	ipboard f	2	Font	5		Alignment
B2		* : ×	$\checkmark f_x$	=VAR.S(B2	:B12)	
	А	В	С		D	
1	Burgers	Fat	x-mean	(x	-mean)^2	
2	Α	7	-13	3.64	185.95	i
3	В	9	-11	L.64	135.40	)
4	С	16	-4	1.64	21.50	)
5	D	18	-2	2.64	6.95	i
6	E	15	-5	5.64	31.77	
7	F	16	-4	1.64	21.50	)
8	G	22	1	L.36	1.86	i
9	н	25	4	1.36	19.04	l.
10	1	27	6	5.36	40.50	)
11	J	33	12	2.36	152.86	i
12	F	39	18	3.36	337.22	
13	mean	20.64				
14			SUM		954.55	
15			Sample Var		95.45454545	
16						
17		Method 2	Sample Var	=VAR.S	(B2:B12)	
18						
19						

Method 2:	Move cursor to D17	or any empty space and Type:	=VAR.S(B2:B12)
-----------	--------------------	------------------------------	----------------

cl	ipboard	۲ <u>م</u>	Font	Di la	Alignme
B1	7	* 1 ×	$\checkmark f_x$ M	ethod 2	
	А	В	с	D	
1	Burgers	Fat	x-mean	(x-mean)^2	
2	Α	7	-13.64	185.	95
3	В	9	-11.64	135.	40
4	С	16	-4.64	21.	50
5	D	18	-2.64	6.	95
6	E	15	-5.64	31.	77
7	F	16	-4.64	21.	50
8	G	22	1.36	1.	86
9	н	25	4.36	19.	04
10	1	27	6.36	40.	50
11	J	33	12.36	152.	86
12	F	39	18.36	337.	22
13	mean	20.64			
14			SUM	954.	55
15			Sample Var	95.454545	45
16					
17		Method 2	Sample Var	95.454545	45
18					
19					

b) Find the value of sample standard deviation:

Find the value of **sample standard deviation**:

- Move cursor to column **D18**
- Type: **=SQRT(D17**)
- Click Enter.

You shall see the value of sample standard deviation 9.770084209 in column D18

C	lipboard	12	Font	E2	Alignment
D1	18	• I ×	√ fx =5	QRT(D17)	
	A	В	с	D	E
1	Burgers	Fat	x-mean	(x-mean)^2	
2	A	7	-13.64	185.95	
3	В	9	-11.64	135.40	
4	C	16	-4.64	21.50	
5	D	18	-2.64	6.95	
6	E	15	-5.64	31.77	
7	F	16	-4.64	21.50	
8	G	22	1.36	1.86	
9	н	25	4.36	19.04	
10	- I	27	6.36	40.50	
11	J	33	12.36	152.86	
12	F	39	18.36	337.22	
13	mean	20.64			
14			SUM	954.55	
15			Sample Var	95.45454545	
16					
17		Method 2	Sample Var	95.45454545	
18			Standard Dev	9.770084209	
19					
20					

Sample Variance of fast-food chains = 95.4545

Sample standard deviation = 9.77