

How to calculate Sample Variance (S^2) and Standard Deviation (S) using Excel

$$\text{Variance } (S^2) = \frac{\sum(x_i - \bar{x})^2}{n-1} \quad S = \sqrt{S^2} = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$$

Question: The following data represent the total fat for burgers items from a sample of fast-food chains. Find the variance, and standard deviation.

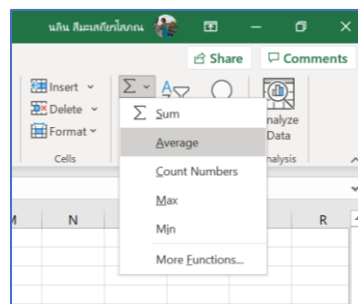
7, 9, 16, 18, 15, 16, 22, 25, 27, 33, 39

■ Sample Variance (S^2) Method 1:

Step 1 Enter all data in Excel software program

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

Burgers	Fat
A	7
B	9
C	16
D	18
E	15
F	16
G	22
H	25
I	27
J	33
F	39
mean	



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 $x\text{-mean}$ = -13.64 in column C2)
- move cursor to the corner of column C2 and drag until col C12

Burgers	Fat	x - mean
A	7	=B2-\$B\$13
B	9	
C	16	
D	18	
E	15	
F	16	
G	22	
H	25	
I	27	
J	33	
F	39	
mean	20.64	

Burgers	Fat	x - mean
A	7	-13.64
B	9	-11.64
C	16	-4.64
D	18	-2.64
E	15	-5.64
F	16	-4.64
G	22	1.36
H	25	4.36
I	27	6.36
J	33	12.36
F	39	18.36
mean	20.64	

The differences go to column C, beginning in C2.

Step 4: Square each difference and put the results to column D, beginning in D2:

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

	A	B	C	D	E
1	Burgers	Fat	x - mean	$(x-\text{mean})^2$	
2	A	7	-13.64	185.9504	
3	B	9	-11.64		
4	C	16	-4.64		
5	D	18	-2.64		
6	E	15	-5.64		
7	F	16	-4.64		
8	G	22	1.36		
9	H	25	4.36		
10	I	27	6.36		
11	J	33	12.36		
12	F	39	18.36		
13	mean	20.64			

	A	B	C	D	E
1	Burgers	Fat	x - mean	$(x-\text{mean})^2$	
2	A	7	-13.64	185.9504	
3	B	9	-11.64	135.4050	
4	C	16	-4.64	21.4959	
5	D	18	-2.64	6.9504	
6	E	15	-5.64	31.7686	
7	F	16	-4.64	21.4959	
8	G	22	1.36	1.8595	
9	H	25	4.36	19.0413	
10	I	27	6.36	40.4959	
11	J	33	12.36	152.8595	
12	F	39	18.36	337.2231	
13	mean	20.64			

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)/(11-1)`
- Click Enter. (You shall see the value of variance 95.5455 in column D15)

	A	B	C	D	E
1	Burgers	Fat	x - mean		
2	A	7	-13.64	185.95	
3	B	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	H	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		VAR		<code>=SUM(D2:D12)/(COUNT(B2:B12)-1)</code>	

	A	B	C	D	E
1	Burgers	Fat	x - mean		
2	A	7	-13.64	185.95	
3	B	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	H	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	

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

	A	B	C	D
1	Burgers	Fat	x-mean	(x-mean)^2
2	A	7	-13.64	185.95
3	B	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	H	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		=VAR.S(B2:B12)
18				
19				

	A	B	C	D
1	Burgers	Fat	x-mean	(x-mean)^2
2	A	7	-13.64	185.95
3	B	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	H	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				
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



	A	B	C	D	E
1	Burgers	Fat	x-mean	(x-mean)^2	
2	A	7	-13.64	185.95	
3	B	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	H	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