

Example 18

Self Tutor

Calculate the standard deviation of the data set: 2, 5, 4, 6, 7, 5, 6.

$$\bar{x} = \frac{2+5+4+6+7+5+6}{7} = 5$$

$$s = \sqrt{\frac{\sum(x - \bar{x})^2}{n}}$$

$$= \sqrt{\frac{16}{7}} \approx 1.51$$

Score (x)	$x - \bar{x}$	$(x - \bar{x})^2$
2	-3	9
4	-1	1
5	0	0
5	0	0
6	1	1
6	1	1
7	2	4
35		16

Make sure you always use the standard deviation of the **population** as highlighted in the screenshots.



The following screendumps indicate the result when we calculate the standard deviation for this data set:

Casio fx-CG20

```

1-Variable
x̄ = 5
Σx = 35
Σx² = 191
σx = 1.51185789
sx = 1.63299316
n = 7
    
```

TI-84 Plus

```

1-Var Stats
x̄ = 5
Σx = 35
Σx² = 191
sx = 1.632993162
σx = 1.511857892
n = 7
    
```

TI-nspire

```

1.1 1.2 DEG AUTO REAL
OneVar data,1: stat.results
One-Variable Statistics
"X̄" 5.
"Σx" 35.
"Σx²" 191.
"sx := Σn-x" 1.63299
"σx := σn-x" 1.51186
"n" 7.
    
```

Example 19

Self Tutor

Use technology to estimate the standard deviation for this distribution of examination scores:

Mark	Frequency	Mark	Frequency
0 - 9	1	50 - 59	16
10 - 19	1	60 - 69	24
20 - 29	2	70 - 79	13
30 - 39	4	80 - 89	6
40 - 49	11	90 - 99	2

In order to estimate the standard deviation of already grouped data, the mid-interval values are used to represent all data in that interval.

We then use technology to estimate the standard deviation.

Class interval	Mid-interval value	Frequency	Class interval	Mid-interval value	Frequency
0 - 9	4.5	1	50 - 59	54.5	16
10 - 19	14.5	1	60 - 69	64.5	24
20 - 29	24.5	2	70 - 79	74.5	13
30 - 39	34.5	4	80 - 89	84.5	6
40 - 49	44.5	11	90 - 99	94.5	2

Casio fx-CG20

```

1-Variable
x̄ = 59.75
Σx = 4780
Σx² = 308200
σx = 16.8058769
sx = 16.9119087
n = 80
    
```

TI-84 Plus

```

1-Var Stats
x̄ = 59.75
Σx = 4780
Σx² = 308200
Sx = 16.91190877
σx = 16.80587695
↓n = 80
    
```

TI-nspire

```

OneVar one,two: stat.results
Title "One-Variable Statistics"
"x" 59.75
"Σx" 4780.
"Σx²" 308200.
"sx := sn-1x" 16.9119
"σx := σn-1x" 16.8059
"n" 80.
    
```

The standard deviation $s \approx 16.8$.

Example 20



The following exam results were recorded by two classes of students studying Spanish:

Class A: 64 69 74 67 78 88 76 90 89 84 83 87 78 80 95 75 55 78 81

Class B: 94 90 88 81 86 96 92 93 88 72 94 61 87 90 97 95 77 77 82 90

Compare the results of the two classes including their spread.

Class A:

Casio fx-CG20

```

1-Variable
x̄ = 78.4736842
Σx = 1491
Σx² = 118765
σx = 9.62654455
sx = 9.89033434
n = 19
    
```

TI-84 Plus

```

1-Var Stats
x̄ = 78.47368421
Σx = 1491
Σx² = 118765
Sx = 9.890334345
σx = 9.626544557
↓n = 19
    
```

TI-nspire

```

OneVar class.a.1: stat.results
Title "One-Variable Statistics"
"x" 78.4737
"Σx" 1491.
"Σx²" 118765.
"sx := sn-1x" 9.89033
"σx := σn-1x" 9.62654
"n" 19.
"MinX" 55.
    
```

Class B:

```

1-Variable
x̄ = 86.5
Σx = 1730
Σx² = 151236
σx = 8.91908067
sx = 9.15078368
n = 20
    
```

```

1-Var Stats
x̄ = 86.5
Σx = 1730
Σx² = 151236
Sx = 9.150783688
σx = 8.91908067
↓n = 20
    
```

```

OneVar class.b.1: stat.results
Title "One-Variable Statistics"
"x" 86.5
"Σx" 1730.
"Σx²" 151236.
"sx := sn-1x" 9.15078
"σx := σn-1x" 8.91908
"n" 20.
"MinX" 61.
    
```

	Mean	Standard deviation
Class A	78.5	9.63
Class B	86.5	8.92

Class B has a higher mean than class A, indicating that the students in class B generally performed better in the exam.

Class A has a higher standard deviation than class B, indicating that the results in class A were more dispersed.