Section 1.2

1. Calculate the sample variance and the sample standard deviation for the following data.
2. 13, 19, 14, 16, 19, 12, 11, 13.

According to our formula: Mean=m=

The sample variance measures the average squared deviation of each data point from the sample mean. It’s calculated as:

s²=

The sample standard deviation is simply the square root of the sample variance:

s=

|  |  |  |  |
| --- | --- | --- | --- |
| x | m | x-m | (x-m)² |
| 13 | 14.625 | -1.625 | 2.64 |
| 19 | 14.625 | 4.375 | 19.14 |
| 14 | 14.625 | -0.625 | 0.39 |
| 16 | 14.625 | 1.375 | 1.89 |
| 19 | 14.625 | 4.375 | 19.14 |
| 12 | 14.625 | -2.625 | 6.89 |
| 11 | 14.625 | -3.625 | 13.14 |
| 13 | 14.625 | -1.625 | 2.64 |
| Total |  |  | 65.87 |

For calculating the sample variance and the sample standard deviation, we should use n-1 instead of n. So,

Variance is s²= Total/(n-1) = 65.87/7=9.41 and

Standard deviation is == 3.07.

1. 82, 93, 98, 89, 88.

According to our formula: Mean=m=90

|  |  |  |  |
| --- | --- | --- | --- |
| x | m | x-m | (x-m)² |
| 82 | 90 | -8 | 64 |
| 93 | 90 | 3 | 9 |
| 98 | 90 | 8 | 64 |
| 89 | 90 | -1 | 1 |
| 88 | 90 | -2 | 4 |
| Total |  |  | 142 |

Variance is s²= Total/(n-1) = 142/4=35.5 and

Standard deviation is == 5.96

According to our formula: Mean=m=80

|  |  |  |  |
| --- | --- | --- | --- |
| x | m | x-m | (x-m)² |
| 76 | 80 | -4 | 16 |
| 84 | 80 | 4 | 16 |
| 69 | 80 | -11 | 121 |
| 92 | 80 | 12 | 144 |
| 58 | 80 | -22 | 484 |
| 89 | 80 | 9 | 81 |
| 73 | 80 | -7 | 49 |
| 97 | 80 | 17 | 289 |
| 85 | 80 | 5 | 25 |
| 77 | 80 | -3 | 9 |
| Total |  |  | 1234 |

Variance is s²= Total/(n-1) = 1234/9=137.11 and

Standard deviation is == 11.71

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 76 | 84 | 69 | 92 | 58 |
| 89 | 73 | 97 | 85 | 77 |

1. Calculate the standard deviation of the following grouped data.

Firstly, I will find midpoint for each class ranges:

Let’s draw our table:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Grade** | **Frequency(f)** | **Midpoints(md)** | **f\*md** | **m** | **md-m** | (**md-m)²** | **f\*(md-m)²** |
| 50-59 | 3 | 54.5 | 163.5 | 79.2 | -24.7 | 610.09 | 1830.27 |
| 60-69 | 5 | 64.5 | 322.5 | 79.2 | -14.7 | 216.09 | 1080.45 |
| 70-79 | 9 | 74.5 | 670.5 | 79.2 | -4.7 | 22.09 | 198.81 |
| 80-89 | 12 | 84.5 | 1014 | 79.2 | 5.3 | 28.09 | 337.08 |
| 90-100 | 8 | 95 | 760 | 79.2 | 15.8 | 249.64 | 1997.12 |
| Total | 37 |  | 2930.5 |  |  |  | 5443.73 |

Our Mean is m=

s²= 5443.73/(37-1)=151.22

s= = 11.71=12.3

|  |  |
| --- | --- |
| **Grade** | **Frequency(f)** |
| 50-59 | 3 |
| 60-69 | 5 |
| 70-79 | 9 |
| 80-89 | 12 |
| 90-100 | 8 |

1. Calculate the sample variance and the sample standard deviation for the following data.

|  |  |
| --- | --- |
| X | F |
| 5 | 4 |
| 8 | 2 |
| 11 | 3 |
| 14 | 1 |
| 19 | 2 |
|  |  |

Mean=m==

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **x** | **f** | **x\*f** | **m** | **x-m** | **(x-m)²** | **f\*(x-m)²** |
| 5 | 4 | 20 | 10.08 | -5.08 | 25.81 | 103.24 |
| 8 | 2 | 16 | 10.08 | -2.08 | 4.33 | 8.66 |
| 11 | 3 | 33 | 10.08 | 0.92 | 0.85 | 2.55 |
| 14 | 1 | 14 | 10.08 | 3.92 | 15.37 | 15.37 |
| 19 | 2 | 38 | 10.08 | 8.92 | 79.57 | 159.14 |
| Total | 12 | 121 |  |  |  | 288.96 |

Variance is s²= Total/(n-1) = 288.96/11=26.27 and

Standard deviation is == 5.13