

SOLUTIONS: DESCRIPTIVE STATISTICS

Please note that the data is ordered from lowest value to highest value. This is necessary if you wish to compute the medians and quartiles by hand. You do not have to order the data if you are going to use the computer to solve the problem.

PROBLEM 1: #colds / year
n=16 subjects

0 1 2 2 **Q1** 3 3 3 4 **Median** 4 4 4 5 **Q3** 5 6 8 10

- Sample mean = $64/16 = 4$ colds
- Sample median = 4 colds
- Sample mode = 4 colds
- First Quartile (approximation) = 2.5 colds
- Third Quartile (approximation) = 5 colds
- Range = 10
- IQR = 2.5 colds
- Variance = $94/15 = 6.27$ coldssquared
- Standard deviation = 2.50 colds
- Coefficient of variation = 62.5%

This is the output from MS Excel using descriptives.

<i>Column1</i>	
Mean	4
Standard Error	0.625832779
Median	4
Mode	4
Standard Deviation	2.503331114
Sample Variance	6.266666667
Kurtosis	1.218205742
Skewness	0.874215095
Range	10
Minimum	0
Maximum	10
Sum	64
Count	16

To convert to a Z-score: The 0 becomes $(0 - 4) / 2.50 = -1.6$; the 1 becomes $(1 - 4) / 2.50 = -1.2$; the 2 becomes $(2 - 4) / 2.50 = -.8$; the 3 becomes $(3 - 4) / 2.5 = -.4$ and the 4 becomes a 0; etc. All values below the mean have negative Z scores and all values above the mean have positive Z scores.

PROBLEM 2: average wait in minutes for a train; n=15

0
4
5
5
6
8
9
10 = median
10
11
12
15
16
17
45

Sample mean = $173/15 = 11.53$ minutes
Sample median = 10 minutes
Sample mode = 5 minutes and 10 minutes (bimodal)
First Quartile (approximation) = 5 minutes
Third Quartile (approximation) = 15 minutes
Range = 45 minutes
IQR = 10 minutes
Variance = $1511.73/14 = 107.98$ minutes squared
Standard deviation = 10.39 minutes
Coefficient of variation = 90.1%

<i>Column1</i>	
Mean	11.53333333
Standard Error	2.683044942
Median	10
Mode	5
Standard Deviation	10.39138838
Sample Variance	107.9809524
Kurtosis	8.309180638
Skewness	2.572332337
Range	45
Minimum	0
Maximum	45
Sum	173
Count	15

To convert the, say, 45 to a Z-score: $(45 - 11.53) / 10.39 = 3.22$

PROBLEM 3: # employee absences; n = 12 employees

0 0 1 **Q1** 1 1 2 **median** 2 2 2 **Q3** 3 4 6

Sample mean = $24/12 = 2$ absences
Sample median = 2 absences
Sample mode = 2 absences
First Quartile (approximation) = 1 absence
Third Quartile (approximation) = 2.5 absences
Range = 6 absences
IQR = 1.5 absences
Variance = $32/11 = 2.91$ absences squared
Standard deviation = 1.71 absences
Coefficient of variation = 85.5%
Z-score for, say, the 6 $(6 - 2) / 1.71 = +2.34$

PROBLEM 4: Quiz scores ⊗ n = 13 students

0 0 0 0 0 5 6 7 8 9 10 10 10

Sample mean = $65/13 = 5$
Sample median = 6
Sample mode = 0
First Quartile (approximation) = 0
Third Quartile (approximation) = 9.5
Range = 10
IQR = 9.5
Variance = $230/12 = 19.17$
Standard deviation = 4.38
Coefficient of variation = 87.6%
Z-score for, say, the 10 $(10 - 5) / 4.38 = +1.14$

**PROBLEM 5: # defects in a sample of 12 cars
(n=12)**

2 3 8 **Q1** 8 9 10 **median** 10 12 15 **Q3** 18 22 63

Sample mean = $180/12 = 15$ defects
 Sample median = 10 defects
 Sample mode = 8, 10 defects
 First Quartile (approximation) = 8 defects
 Third Quartile (approximation) = 16.5 defects
 Range = 61 defects
 IQR = 8.5 defects
 Variance = $2868/11 = 260.73$ defectssquared
 Standard deviation = 16.15 defects
 Coefficient of variation = 107.7%
 Z-score for, say, the 63 $(63 - 15) / 16.15 = +2.97$

PROBLEM 6: Time to do job (minutes); n = 20 employees

4 5 5 6 7 8 8 9 10 10 **median** 10 10 11 12 12 13 14 15 15 16

Sample mean = $200/20 = 10$ minutes
 Sample median = 10 minutes
 Sample mode = 10 minutes
 First Quartile (approximation) = 7.5 minutes
 Third Quartile (approximation) = 12.5 minutes
 Range = 12 minutes
 IQR = 5 minutes
 Variance = $240/19 = 12.63$ minutessquared
 Standard deviation = 3.55 minutes
 Coefficient of variation = 35.5%
 Z-score for, say, the 4 $(4 - 10) / 3.55 = -1.69$
 Z-score for, say, the 16 $(16 - 10) / 3.55 = +1.69$

PROBLEM 7: Yield in Bushels for Farmer Jones Apple Orchard; n = 16 trees

1 1 2 2 2 2 3 3 4 4 5 5 6 7 8 10

Sample mean = $65/16 = 4.06$ bushels
 Sample median = 3.5 bushels
 Sample mode = 2 bushels
 First Quartile (approximation) = 2 bushels
 Third Quartile (approximation) = 5.5 bushels
 Range = 9 bushels
 IQR = 3.5 bushels
 Variance = 6.86 bushelssquared
 Standard deviation = 2.62 bushels
 Coefficient of variation = 64.5%
 Z-score for, say, the 1 $(1 - 4.06) / 2.62 = -1.17$

PROBLEM 8: Employee Absences at the XYZ Company three month period: n = 16

0 0 1 1 3 4 5 6 median 7 7 7 8 9 9 10 12

Sample mean = $89/16 = 5.56$ absences
 Sample median = 6.5 absences
 Sample mode = 7 absences
 First Quartile (approximation) = 2 absences
 Third Quartile (approximation) = 8.5 absences
 Range = 12 absences
 IQR = 6.5 absences
 Variance = 14 absencesquared
 Standard deviation = 3.74 absences
 Coefficient of variation = 67.24%
 Z-score for, say, the 0 $(0 - 5.56) / 3.74 = -1.49$
 Z-score for, say, the 12 = +1.72

PROBLEM 9: Number of passengers – B99 Train to JFK; n=10 randomly selected days

60 70 80 90 90 median 90 100 100 120 200

Sample mean = $1000/10 = 100$ passengers
 Sample median = 90 passengers
 Sample mode = 90 passengers
 First Quartile (approximation) = 80 pass.; Third Quartile (approximation) = 100 pass.
 Range = 140 passengers; IQR = 20 passengers
 Variance = $13,600 / 9 = 1511.11$ pass.squared; standard deviation = 38.87 passengers
 Coefficient of variation = 38.87%