Homework 2: Descriptive Statistics and Variability

1. Calculate the sums of squares for the following set of data: 4, 6, 7, 8, 10.

|  |  |  |
| --- | --- | --- |
|  | X | X^2 |
|  | 4 | 16 |
|  | 6 | 36 |
|  | 7 | 49 |
|  | 8 | 64 |
|  | 10 | 100 |
|  |  |  |
| Sum | 35 | 265 |

$$SS= \sum\_{}^{}\left(x^{2}\right)-\frac{\left(\sum\_{}^{}x\right)^{2}}{n}$$

$$SS= 265-\frac{\left(35\right)^{2}}{5}= 265-245=20$$

1. The numbers that follow represent the total number of hours of sleep that I received each night for the first week of the semester: 6, 7, 7, 6, 7, 4.5, 8.  Find, the mean, median, mode, variance and standard deviation for these data.  Show your work.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Day | Hrs. Sleep | x2 |  | M | (x – M) | (x – M)2 |
| Sunday | 6 | 36 |  | 6.5 | -0.5 | 0.25 |
| Monday | 7 | 49 |  | 6.5 | 0.5 | 0.25 |
| Tuesday | 7 | 49 |  | 6.5 | 0.5 | 0.25 |
| Wednesday | 6 | 36 |  | 6.5 | -0.5 | 0.25 |
| Thursday | 7 | 49 |  | 6.5 | 0.5 | 0.25 |
| Friday | 4.5 | 20.25 |  | 6.5 | -2 | 4 |
| Saturday | 8 | 64 |  | 6.5 | 1.5 | 2.25 |
|  |  |  |  |  |  |  |
| Sum | **45.5** | **303.25** |  |  |  | **7.5** |

Mean = Σ(x) / 7

 = 45.5 / 7

 = **6.5**

Median = 4.5 6 6 **7** 7 7 8

 There are seven observations, so we select the [(7/2) + ½]= 4th observation.

 The 4th observation is 7(highlighted in red).

Mode = Also equals **7**; it occurs three times.

Short Cut:

s2 = (Σ(x2) – [(Σx)2/n]) / n-1

 = [**303.25** – (**45.52** / 7)] / 6

 = [303.25 – (2070.25 / 7)] / 6

 = (303.25 – 295.75) / 6

 = 7.5 / 6

 = **1.25** (variance)

s = √1.25

 = **1.12** (standard deviation)

If you did it the long way, you would divide the sum of the squared deviations (**7.5**) by 6 to get the variance, and then take the square root to get the standard deviation.

Why is this a sample and not a population? Because you don’t have every night of sleep in my whole entire life, I only gave you a subset of nights. So this is a sample.

1. Let’s say that the second week of the semester, the mean number of hours that I slept was exactly the same as it was for the first week, BUT, the variance was twice as large. For which week (first or second) would I be more likely to have gotten an unusually small (or large) amount of sleep? Explain your answer.

When the variance is larger, the data are more spread out; when the variance is small, the data are more closely packed together. Therefore, if the variance was larger for the second week of the semester, I would expect more extreme values (small or large) in the second week of the semester.

1. Oddly, I wound up getting 12 hours of sleep one night during the third week of the semester. Which MCT would likely be most affected by that single anomalous score?

A value of 12 would represent an outlier in the distribution and the mean is the MCT that is most affected by outliers.