Statistics Worksheet: Sums of Squares

1. What is the definitional formula for the Sum of Squares?

The definitional formula for the SS is 

2. List each of the steps necessary to calculate the sum of squares using the definitional formula.

Steps:

* Calculate the mean.
* Subtract the mean from each x value to obtain deviations from the mean. At this point, if you were to add the deviations from the mean, your sum would be 0.
* Square each deviation from the mean.
* Sum the squared deviations from the mean. This is the sum of squares.

1. What is the computational formula for the Sum of Squares?

The computational formula for the SS is 

4. Explain how calculating is different from calculating.

To calculate  *first* we square each x value and *then* add the squared x values.

To calculate *first* we add of all of the x values and *then* square the sum of x.

5. A sample of *n* = 4 scores has a ∑X = 8 and ∑X2 = 40. Using the computational formula, calculate the value of the sums of squares for this sample (SS)?

Steps:

* First, plug in the values for ∑X and ∑X2 given.
* Square 8 and divide by *n* (4) and then subtract that number from 40.



6. Calculate SS using the definitional formula for the following scores: 1, 1, 1, and 6.

Steps:

* Calculate the mean. 
* Subtract the mean from each individual score (X) to find the deviations from the mean. If we were to add the deviations from the mean at this point, the sum would equal 0.

|  |  |
| --- | --- |
| ***X*** | ***X - M*** |
| 1 | 1 – 2.25 = -1.5 |
| 1 | 1 – 2.25 = -1.5 |
| 1 | 1 – 2.25 = -1.5 |
| 6 | 6 2.25 = 4.5 |

* Square each deviation from the mean.

|  |  |  |
| --- | --- | --- |
| ***X*** | ***X - M*** | ***X - M2*** |
| 1 | -1.5 | 2.25 |
| 1 | -1.5 | 2.25 |
| 1 | -1.5 | 2.25 |
| 6 | 4.5 | 20.25 |

* Sum the squared deviations from the mean. 2.25+2.25+2.25+2.25+20.25 = 27



7. Calculate SS using the computational formula for the following set scores: 1, 1, 4, 1, and 3.

Steps:

* Calculate  by *first* squaring each X value and *then* adding the squared x values. You should get 28.

|  |  |
| --- | --- |
| ***X*** | ***X2*** |
| 1 | 1 |
| 1 | 1 |
| 4 | 16 |
| 1 | 1 |
| 3 | 9 |

* Calculate by *first* adding of all of the x values and *then* squaring the sum of X. The; thus, 102 = 100.
* Plug in the values for ∑X, ∑X2, and *n*.



8. Calculate SS using the definitional formula for the following scores: 8, 3, and 1.

|  |  |  |
| --- | --- | --- |
| ***X*** | ***X - M*** | ***X - M2*** |
| 8 | 4 | 16 |
| 3 | -1 | 1 |
| 1 | -3 | 9 |



9. Calculate SS using the definitional formula for the following scores: 1, 6, 10, 9, 4, and 6.

|  |  |  |
| --- | --- | --- |
| ***X*** | ***X - M*** | ***X - M2*** |
| 1 | -5 | 25 |
| 6 | 0 | 0 |
| 10 | 4 | 16 |
| 9 | 3 | 9 |
| 4 | -2 | 4 |
| 6 | 0 | 0 |



10. Calculate SS using the definitional formula for the following scores: 2, 3, 0, and 5.

|  |  |  |
| --- | --- | --- |
| ***X*** | ***X - M*** | ***X - M2*** |
| 2 | -.05 | .25 |
| 3 | .05 | .25 |
| 0 | -2.25 | 6.25 |
| 5 | 2.25 | 6.25 |

