Session 15

Assignment 1 Question

Problem Statement 1 :

You survey households in your area to find the average rent they are paying. Find the standard deviation from the following data:

$1550, $1700, $900, $850, $1000, $950.

Solution:

A : Calculate Mean

Mean = (Σ xi) / n

Σ of xi = $\underline{\$1550 + \$1700 + \$900 + \$850 + \$1000 + \$950}$ = $1158.33
                                          6

The Mean is $1158.33

B : Calculate Standard Deviation

$$SD = \sqrt{\frac{\sum |x - \bar{x}|^2}{n}}$$

Where :

SD = Standard Deviation
x = each value in the data set
$\bar{x}$ = Mean is the data set
n = number of values in the data set

Step 1 : Calculate mean

Σ of xi = $\underline{\$1550 + \$1700 + \$900 + \$850 + \$1000 + \$950}$ = $1158.33

Step 2 : Subtract the mean calculated from step 1 from each value. This gives you the differences:

$1550 – $1158.33 = $391.67

$1700 – $1158.33 = $541.67

$900 – $1158.33 = -$258.33

$850 – $1158.33 = -$308.33

$1000 – $1158.33 = $158.33

$950 – $1158.33 = $208.33

Step 3: Square the differences you found in Step 3:

$391.672 = 153405.3889

$541.672 = 293406.3889

-$258.332 = 66734.3889

-$308.332 = 95067.3889

$158.332 = 25068.3889

$208.332 = 43401.3889

Step 4: Add up all of the squares you found in Step 3 and divide by 5 (which is 6 – 1):

(153405.3889 + 293406.3889 + 66734.3889 + 95067.3889 + 25068.3889 + 43401.3889) / 5 = 135416.66668

Step 5: Find the square root of the number you found in Step 4 (the variance):

$\sqrt{135416.66668}$ = 367.99

The standard deviation is 367.99.

Problem Statement 2:

Find the variance for the following set of data representing trees in California (heights in

feet):

3, 21, 98, 203, 17, 9

Variance Formula:

$$S^2 = \frac{\sum X^2 - \frac{(\sum X)^2}{n}}{n-1}$$

Step 1: Add up the numbers in your given data set.

3 + 21 + 98 + 203 + 17 + 9 = 351

Step 2: Square your answer:

351 × 351 = 123,201

…and divide by the number of items. We have 6 items in our example so:

123,201 / 6 = 20,533.5

Step 3: Square each item in the data set & get the sum of squares

3 × 3 + 21 × 21 + 98 × 98 + 203 × 203 + 17 × 17 + 9 × 9

Add those numbers (the squares) together:

9 + 441 + 9604 + 41209 + 289 + 81 = 51,633

Step 4: Subtract the value calculated in Step 2 from the the value of Step 3.

51,633 − 20,533.5 = 31,099.5

Step 5: Subtract 1 from the number of items in your data set*. For our example:

6 − 1 = 5

Step 6: Divide the number in Step 4 by the number in Step 5. This gives you the variance:

31,099.5 / 5 = 6,219.9

Problem Statement 3:

In a class on 100 students, 80 students passed in all subjects, 10 failed in one subject, 7 failed in two subjects and 3 failed in three subjects. Find the probability distribution of the variable for number of subjects a student from the given class has failed in.

Solution:

For a random student,

The probability of failing in 0 subjects, P(X=0) = 0.8

The probability of failing in 1 subjects, P(X=1) = 0.1

The probability of failing in 2 subjects, P(X=2) = 0.07

The probability of failing in 3 subjects, P(X=3) = 0.03

The probability distribution can be shown as:

X	0	1	2	3
P(X)	0.8	0.1	0.07	0.03