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SRN: PES2UG19CS296 Date: 07.09.2020

STATISTICS FOR DATA SCIENCE

ASSIGNMENT 16

1. Choose any **example of your own** for exploring linear transformation and elaborate the following based on it.
2. Adding a constant
3. Subtracting a constant (self- study)
4. Multiplying a constant
5. Dividing a constant (self – study)
6. After exploring the example, answer the following.
7. How linear transformations affect the mean and standard deviation of a distribution as well?
8. How does adding or subtracting a constant affect the mean and standard deviation?
9. How does multiplying and dividing a constant affect the mean and standard deviation?

Answer.

Consider the set of values

23, 30, 15, 12, 45, 60, 88, 89, 91, 6

After sorting: 6, 12, 15, 23, 30, 45, 60, 88, 89, 91

Mean: 459 /10 = **45.9**

Standard deviation = ((Σ(x-Mean)2)/n)0.5 = ((10336.9/10))0.5 = **32.151**

1. LET THE CONSTANT IN ALL CASES BE **10**
2. After adding 10 to each element, we get

16, 22, 25, 33, 40, 55, 70, 98, 99,101

Mean: 559 /10 = **55.9**

Standard deviation = ((Σ(x-Mean)2)/n)0.5 = ((10336.9/10))0.5 = **32.151**

1. After subtracting 10 from each element, we get

-4, 2, 5, 13, 20, 35, 50, 78, 79,81

Mean: 359 /10 = **35.9**

Standard deviation = ((Σ(x-Mean)2)/n)0.5 = ((10336.9/10))0.5 = **32.151**

1. After multiplying 10 with each element, we get

60, 120, 150, 230, 300, 450, 600, 880, 890, 910

Mean: 4590 /10 = **459**

Standard deviation = ((Σ(x-Mean)2)/n)0.5 = ((1033690/10))0.5 = **321.51**

1. After dividing each element by 10, we get

0.6, 1.2, 1.5, 2.3, 3.0, 4.5, 6.0, 8.8, 8.9, 9.1

Mean: 45.9 /10 = **4.59**

Standard deviation = ((Σ(x-Mean)2)/n)0.5 = ((103.369/10))0.5 = **3.2151**

1. a. All linear transformations alter the mean but not necessarily the standard deviation or variance.

b. When a constant ‘a’ is added to all the elements, **mean becomes old mean + a** and the **standard deviation remains unaltered**.

When a constant ‘a’ is subtracted from all the elements, **mean becomes old mean - a** and the **standard deviation remains unaltered**.

So, addition and subtraction only alter the mean.

c. When a constant ‘a’ is multiplied with all the elements, **mean becomes old mean \* a** and the **standard deviation becomes old standard deviation \*a .**

When all the elements are divided by a constant ‘a’, **mean becomes old mean / a** and the **standard deviation becomes old standard deviation /a.**

So, multiplication and division alter both mean and standard deviation.