Statistics Ch2.Q3 Solutions

Soham Ghosh Bmath 1937

September 21, 2020

1. **Given:** A is the mean of n values, say $x_1, x_2, \ldots, x_n$, that is $A = \frac{\sum_{i=1}^{n} x_i}{n}$.

   A new set of values is given by $y_1, \ldots, y_n$, where $y_i = a.x_i + b$. Let $\overline{y}$ be the mean of the y_i's.
   $\overline{y} = \frac{\sum_{i=1}^{n} y_i}{n} = \frac{\sum_{i=1}^{n} a.x_i+b}{n} = \frac{a\sum_{i=1}^{n} x_i+n.b}{n} = a.\frac{\sum_{i=1}^{n} x_i}{n} + b = a.A + b$
   Thus the mean of the new values is $\boxed{a.A + b}$.

2. **Given:** B is the standard deviation of n values, say $x_1, x_2, \ldots, x_n$, that is $B = \sqrt{\frac{\sum_{i=1}^{n}(x_i-A)^2}{n-1}}$, where A is the mean of x_i's.
   A new set of values is given by $y_1, \ldots, y_n$, where $y_i = a.x_i+b$. Let s be the standard deviation of the y_i's From 1, we know mean of y_i's $= \overline{y} = a.A+b$.

   $s = \sqrt{\frac{\sum_{i=1}^{n}(y_i-\overline{y})^2}{n-1}} = \sqrt{\frac{\sum_{i=1}^{n}(a.x_i+b-a.A-b)^2}{n-1}} = \sqrt{\frac{a^2\sum_{i=1}^{n}(x_i-A)^2}{n-1}} = |a|.\sqrt{\frac{\sum_{i=1}^{n}(x_i-A)^2}{n-1}} = |a|.B$
   Thus the standard deviation of the new values is $\boxed{|a|.B}$.