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Ranking candidates at G.C.E A/L examinations

S Arivalzahan and S Muralitharan*

Department of Mathematics and Statistics, University of Jaffna, Jaffna.

The Z-score method is being used as a tool for ranking students at G.C.E. (A/L) examinations. The Z-score method is a better ranking method for comparison than the previous aggregated marks method. The Z-score is calculated using the formula

$$Z = \frac{(raw\ marks - mean\ marks)}{Standard\ Deviation\ of\ the\ marks}$$

Z-score method works well under the Normality assumption. Even though the Z-score method has been in use for several years, detailed research is needed on the appropriateness of the Z-score method. In our initial investigations, we identified two-drawbacks of the Z-score method. For skewed non-Normal distributions, the parameters mean and Standard Deviation (SD) are sensitive to extreme values. In most of the real world cases, the marks would not follow the Normal distribution and hence the distribution of the marks would be skewed or bimodal. For non-Normal data the SD would be unnecessarily large which affects the ranking system. We propose a Median Centered Score (MCS) method which is robust for non-Normal distributions. Since median and Inter Quartile Deviation (IQD) are less sensitive to extreme values we replace the mean and SD by median and IQD respectively for the calculation of the MCS. Thus,

$$MSC = \frac{(raw\ marks - median\ marks)}{IQD\ of\ the\ marks}$$

Using simulated data we show that our proposed MCS works better than the existing Z-score method. The other drawback of the existing Z-score method is that it is not easy for a non-mathematics person to understand the idea, as the range of the average Z-score is between -3 to +3 while the range of the raw mark is between 0 and 100. In order that the final values of student ranks are easily understood by persons particularly from a non-mathematical background, we propose the following user friendly equation,

$$MCS(UFMCS) = \frac{MCS}{MAMCS - MIMCS} \times 100$$

where MAMCS and MIMCS are respectively the maximum and minimum value of the MCS for a particular subject and MIMCS <0, MAMCS>0.

Thus, the average Z-score values which were in the range of -3 to +3 have been transformed to the range of 0 to 100.

arivu90@gmail.com Tel: 0718474710