A Note on the Computation Procedure for the Approximate Estimates of the SNELL Transformation

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SNELL transformation is one of the methods to transform ordered categorical data into numerical scores. The purpose of this note is to briefly illustrate the computation procedure for arriving at the approximate estimates of ordered categorical data as prescribed by E. J. Snell. To help understand the illustration, please download the following materials from the appropriate sources:

1. The paper published by E. J. Snell in 1964.
   Snell, E. (1964) "A Scaling Procedure for Ordered Categorical Data," *Biometrics*, 20(3), 592-607.
2. The paper published by C.H. Wu in 2007.
   Chien-Ho Wu (2007) "An Empirical Study on the Transformation of Likert-scale Data to Numerical Scores," *Applied Mathematical Sciences*, 1(58), 2851 – 2862
3. The illustration Example in Excel

The original data reported as Table 2 on p. 599 in Snell's paper is used as the data for transformation to facilitate the illustration of the computation procedure for achieving *approximate estimates*. Please note the following about the computation procedure as shown in the Excel file:

1. The original data set is divided into 12 groups and each data point is measured on a scale with 7 ordered categories. The figures recorded in the data set are the *frequencies* of various responses.
2. The main purpose of the second step of the computation procedure is to calculate the averages of the observed proportions for the extreme categories. The averages will help decide on the scores for the extreme categories. (Snell, 1964: p.596, section 6)
3. At Step 4, the formulas used to calculate the intervals for each category (Cells M23-M26 and Cell M27) are based on formulas 4 and 5 in Wu's paper (Wu, 2007: p.2853). These two formulas are derived from formulas 4 and 5 in Snell's paper (Snell, 1964: pp.595-596). Please take note that:

   YOU MUST CALCULATE VALUES FOR CELL M27 FIRST THEN M26, M25 etc. This calculation sequence is prescribed by the aforementioned formulas.

4. At Step 5, as suggested by Snell (Snell, 1964: p.594), x_1 is set to 0.
5. At step 6, scores s_2-s_6 are mid-points of intervals corresponding to ***Non**-extreme* categories. And since the average proportions of extreme categories (0.13 and 0.19 respectively) lie between 0.10 and 0.20, we take x_1*-1.1* as the score for the first category and x_6*+1.1* as the score for the last category.

You will find that the computed results are exactly the same as the results reported on the paper published by Snell *if* we round the computed results to the first decimal place.

For a Likert-scale survey data, each scale item can be considered as a group. And so if there are 10 scale items in the survey, there will be 10 groups of data in the original data set. The various frequencies recorded in the original data set will be the number of valid responses to the scale items.