Guide for Calculating Benchmarks Using Calibration Questions

1. **Step 1: Choose the relevant trio of calibration questions.**
   First, select the trio of calibration questions you want to use. You can find the available trios from the two UAS waves in the attached Excel file, in the sheet called **"Calibration Questions."** Each trio contains three calibration questions corresponding to: CQ_1 (low), CQ_2 (medium) and CQ_3 (high).
2. **Step 2: Determine the target value.**
   Next, determine the target value that the benchmark should match. Use the following rule:
   a. **If the calibration-question trio corresponds to a well-being aspect:** use as the target the **sample average rating of that aspect**, calculated across all respondents.
   b. **If the trio is a visual calibration-question trio with no corresponding well-being aspect:** use **67.5** as the target.
   c. **Exception:** if the visual trio is in a **"more-is-bad"** format (in our case, this applies only to the **pain visual trio**), use **37.5** as the target.
3. **Step 3: Compute the benchmark weight vector.**
   For the selected trio, compute the sample average rating of each calibration question across all respondents. Denote: $\boldsymbol{w_1}$ = average rating of the low CQ, $\boldsymbol{w_2}$ = average rating of the medium CQ, $\boldsymbol{w_3}$ = average rating of the high CQ. $\boldsymbol{\ell}$ = target. Compute the three benchmark weights as follows.

$$CQ_1\ weight\text{:}\ \frac{[(w_3 - w_1)(w_3 - \ell) + (w_2 - w_1)(w_2 - \ell)]}{(w_3 - w_2)^2 + (w_3 - w_1)^2 + (w_2 - w_1)^2}$$

$$CQ_2\ weight\text{:}\ \frac{[(w_3 - w_2)(w_3 - \ell) + (w_1 - w_2)(w_1 - \ell)]}{(w_3 - w_2)^2 + (w_3 - w_1)^2 + (w_2 - w_1)^2}$$

$$CQ_3\ weight\text{:}\ \frac{[(w_2 - w_3)(w_2 - \ell) + (w_1 - w_3)(w_1 - \ell)]}{(w_3 - w_2)^2 + (w_3 - w_1)^2 + (w_2 - w_1)^2}$$

   You can also find the benchmark weights for each CQ in the attached Excel file, in the sheet called **"Benchmark Weights."**
4. **Step 4: Calculate the individual benchmark.**
   To calculate the benchmark for respondent i on a given dimension, take that respondent's ratings on the three calibration questions in the selected trio. Denote respondent i's ratings by: $\boldsymbol{r_{1i}}$ = respondent i's rating of the low CQ, $\boldsymbol{r_{2i}}$ = respondent i's rating of the medium CQ, $\boldsymbol{r_{3i}}$ = respondent i's rating of the high CQ.
   The individual benchmark, denoted B_i, is the weighted sum of these three ratings:

$$B_i = CQ_1\ weight \cdot r_{1i} + CQ_2\ weight \cdot r_{2i} + CQ_3\ weight \cdot r_{3i}$$