Score Normalization

About Normalization

Normalization means adjusting values measured on different scales to a notionally common scale

Need for Normalization in Exam

Exam pertaining for a particular post/course could be spread across multiple shifts which will have different question paper for each shift. Hence the normalization of scores need to be carried out for all the candidates who had written the exam, across shifts for the same post/course.

Normally, after the exam, candidates are provided a window of few days, post the publishing of question paper and the correct keys. Based on the objections raised, SMEs work on that and with customer consultation finalize to ignore some objected questions and the remaining questions will be considered for score evaluation and subsequently the score normalization

Inputs required for score normalization process

1. Raw score report of the candidates who appeared for a particular post, across all shifts

2. The actual number of valid questions to be considered, post the objection

Score Normalization logic

The following has to be calculated across all shifts for all the candidates who have written the exam for the same post

Total Number of Questions (A)

Defined as the number of questions available in the question paper. (eg. 120 questions)

As an example, ASSUME the question papers has 120 questions

Total Number of Correct Questions (B)

Defined as the number of valid questions which have to be considered for score evaluation and score normalization, post the finalization of questions after the candidates have raised objections (if any)

B = A - # of questions which are removed post candidate objections

ASSUME there are 3 invalid questions in (A)

Then B = 120-3 = 117

Example: ASSUME a candidate has attempted 103 questions, of which 98 are correct responses and 5 are wrong responses. 14 un-attempted questions will be Blanks

Total Correct Responses (D)

Defined as the number of responses which are answered correctly by the candidate for the total number of correct questions (B)

In the example D = 98

Total Wrong Responses (E)

Defined as the number of responses which are answered incorrectly by the candidate for the total number of correct questions (B)

In the example E = 5

Total Blanks (F)

Defined as the number of questions which are not attempted by the candidate for the total number of correct questions (B)

In the example F = 14

Negative Marks Allotment (G)

In case if there is negative marking then marks will be deducted for every wrong answer. Consider 1 mark for every correct answer and 0.5 marks get deducted for every wrong answer.

In the example G = 2.5 as 5 responses are wrong

Candidate Score (prior to normalization) (H)

Total Correct responses (D) – negative marks allotted (G)

In the example H = D-G = 98 – 2.5 = 95.5

Candidate Score to be considered for Normalization (C)

Consider the case where scores will be based on 100. So, score (H) of every candidate has to be multiplied by the factor: 100/B

In the example C = (H/B)*100 = (95.5/117)*100 = 79.5833333

Now we need to calculate Average and Standard Deviation for each Shift

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Calculation of Standard Deviation Example : 9 candidates attended a shift

Xav is the average which is total marks divided by no. of candidates.

	C or X (raw score for 100)	x = (X-Xav)	x^2
1	29	-36	1296
2	47	-18	324
3	38	-27	729
4	74	9	81
5	65	0	0
6	92	27	729
7	56	-9	81
8	83	18	324
9	101	36	1296
N = 9	Total = L = ∑X = 585		$\sum x^2 = 4860$

Xav = : L / No. of candidates present for that particular shift = 585/9 = 65

Standard Deviation = $\sqrt{(\sum x^2)/N} = \sqrt{4860/9} = \sqrt{540} = 23.24$

Total Raw Scores for all candidates in a shift (L)

Sum of Raw candidates raw scores (X) for all candidates in a shift

: L = ∑X

In the SD example L=585

Simple Average **(Xav)**

Total Raw score for all candidates in a shift (L) / Total candidate (Present) count for a shift

: L / No. of candidates present for that particular shift.

In the SD example Xav = 65

Standard Deviation **(S)**

Calculated at a shift level based on the candidate's normalized scores (J)

To be calculated as explained in the example

Normalized Score for each candidate (Xn)

Xn=(S2/S1)*(X-Xav)+Yav

S2	Is the SD of the shift with the Highest Average Score taken as base for normalization
S1	Standard Deviation for the corresponding shift (to be scaled to S2)
X	Raw score of a candidate
Xav	Simple average of the Shift
Yav	Average corresponding to shift with highest Average (taken as base for normalization)

Criteria for choosing the base for normalization is generally taken as the shift with 'Highest Average' of raw scores. Only exception is made if this shift (with highest average) has far less number of candidates as compared to other shifts. In that case we take the next shift with 'highest Average' as base for normalization.

70% of the average attendance is the limit. Any value below this should not be considered for the base.