It is, hence, more useful in case of long tests as compared to shorter ones. However, to rectify the defects of shortness, Spearman-Brown's formula can be employed, enabling correlation as if each part were full length.

Imp: $$r = \frac{2 r_{hh}}{1 + r_{hh}}$$ (where r_{hh} is correlation between two halves)

(iv) Cronbach's Alpha (α) :—

Proposed by Cronbach (1951)

Average of all possible split-half coefficients, corrected by the Spearman-Brown formula.

The formula for coefficient alpha is

$$r_\alpha = \left[\frac{N}{N-1}\right]\left[1 - \frac{\Sigma \sigma_j^2}{\sigma^2}\right]$$ ✓

where r_α is coefficient alpha.

N is the no. of items.

σ^2 is the variance of one item,

$\Sigma \sigma_j^2$ is the sum of variance of all items, and

σ^2 is the variance of the total test scores.

NOTES As with all reliability estimates, coefficient alpha can vary between 0.00 and 1.00.

Coefficient alpha extends the Kuder-Richardson method to type of tests with item that are not scored as 0 and 1. For ex. Coefficient Alpha could be used with an attitude scale in which examinees indicate on each item whether they strongly

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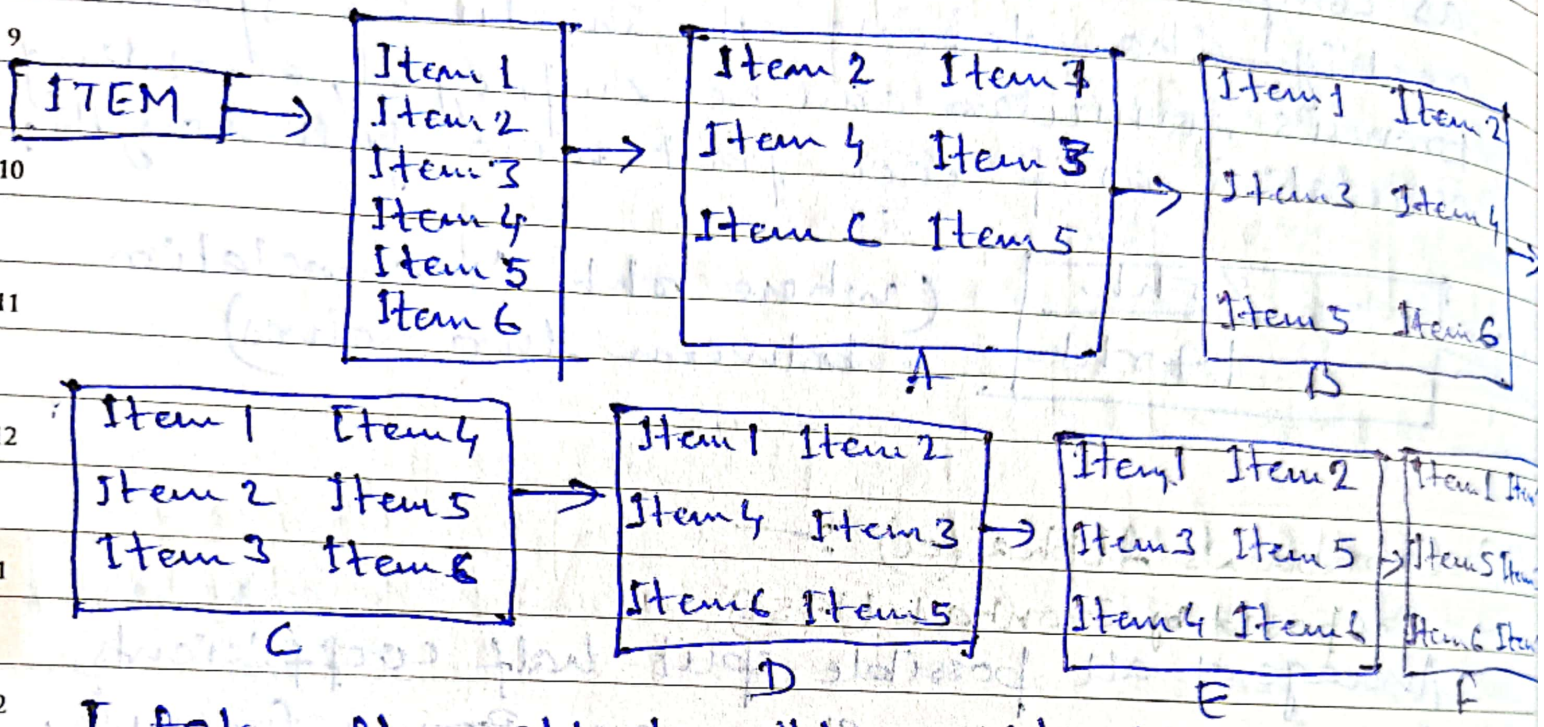
Wk	M	T	W	T	F	S	S
5						1	2
6	3	4	5	6	7	8	9
7	10	11	12	13	14	15	16
8	17	18	19	20	21	22	23
9	24	25	26	27	28		

In Coefficient Alpha, you take the average of all possible split-half correlation.



I take the all possible combinations and I take the correlation among the items for all these and then I average them out. So finally I take a average of all 6 items.

$$\text{Average} = \frac{A+B+C+D+E+F}{6}$$

→ Split-half reliability average

→ α - Cronbach alpha or alpha

This α is modification of rejection formula.

NOTES

(iv) Kuder-Richardson Estimate of Reliability —

The coefficient of internal consistency could also be obtained with the help of Kuder-Richardson formula number 20.

One of the technique for item analysis is item difficulty index. Item difficulty is the proportion or percentage of those answering correctly to an item.

For ex. — symbol 'p' is used to represent the difficulty index. Suppose an item 'X' has $p = 0.67$. this means item 'X' was answered correctly by 74% of those who answered the item. To compute the reliability with the help of Kuder-Richardson formula number 20, the following formula is used:

Content Sampling

$$KR\text{-}20 = \frac{N}{N-1}\left[1 - \frac{\Sigma pq}{\sigma^2}\right]$$

Where

N = the number of items on the test,

σ^2 = the variance of scores on the total test

p = the proportion of examinees getting each item correct.

q = the proportion of examinees getting each item wrong.

Kuder-Richardson formula 20 is an index of Reliability that is relevant to the special case where each item is scored 0 or 1 (e.g right or wrong)

NOTES

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~~KR~~

$$KR\text{-}21 = \frac{N}{N-1}\left[1 - \frac{N\bar{p}\bar{q}}{\sigma^2}\right]$$

Where,

$\bar{p}$ = the average proportion of right answer

$\bar{q}$ = the average proportion of wrong answer

Content sampling can be check through Kudar-Richardson formula.

Reliability in short :