

Instruction Manual of Integrated Tool for Item Analysis and Response Data Analysis

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| VERSION DESCRIPTION | | |
|---------------------|-------------------|-------------------------------------|
| Version | Date | Description |
| V1 | November 24, 2020 | Japanese version was released |
| V2 | November 30, 2020 | Japanese version was modified |
| V3 | May 19, 2021 | English version was released |
| V4 | April 1, 2022 | Multiple keys scoring was supported |
| V5 | July 13, 2022 | Updated |

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INTRODUCTION

"Integrated Tool for Item Analysis & Response Data Analysis" is designed to analyze multiple-choice test data. One or more than one correct option items can be analyzed. Score data can also be analyzed except for partial credit data.

After setting examinees' response data and answer key data, and running the software, summary of test scores, results of item analysis and examinee analysis are shown. These information are helpful to understand item characteristics and examinees' performance. The software runs on Windows PC.

DOWNLOAD

To download the software and related files, please access to the ISHII Lab website.

<http://www.educa.nagoya-u.ac.jp/~ishii-h/english.html>

Click 'Item Analysis System' in sidebar and click "Batch Download" (zip file).. It contains the following files:

- ➡ Software (Excel Macro),
- ➡ Instruction Manual (PDF),
- ➡ Sample Response Data (Excel),
- ➡ Sample Key Data (Excel).

FILE PREPARATION

To conduct analysis, 3 files are required, which are: (1) Software (Excel macro file), (2) Response Data (Excel or CSV file), and (3) Key Data (Excel or CSV file),.

Software

As the core part, the software is based on Excel Macro. It can be used to read Response Data and Key Data files, to conduct analysis and save results.

The tabular and fixed contents in the file cannot be changed while some cells will be filled in accordance with your needs. Meanwhile, its '.xlsm' formats cannot be changed.

After analysis completed, the file can be saved as another file name to keep the results.

Integrated Tool for Item Analysis & Response Data

Analysis

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Input File :

1 Response Data(Excel)

2 Answer Key(Excel)

RUN! **Initialization**

Setting Information :

Tolerance Margin (%)

Demographic Data (First Column)
 (Last Column)

Multiple Choice Options

Menu

Response Data File

As shown in sample response data, the file is used to save examinees' response data. The file can be saved in one of 'xlsx', 'xls', 'csv' formats supported by Excel.

When making Response Data file, please follow the **following rules**:

- ➔ Input variable name in the **first row** and input response data from the **second row**. The variable name refers to the input rule allowed by Excel.
- ➔ Input personal identification of examinees in **column A**, such as candidate number, examinee ID etc.
- ➔ Input demographic information from **column B**, such as grade, gender etc. There is no limit on the number of columns, and you can skip it if there is no demographic data.
- ➔ Input the examinees' response data from the right side of the last column of demographic data. **Do not** enter anything in the right space of the last column of response data.
- ➔ Please unify the same symbols for all items. Symbols can be any format allowed by Excel, such as numbers, letters etc. and should be kept consistent in each item.
- ➔ Please leave it blank if the response is missing.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|-----|--------|-------|------|----|----|----|----|----|----|----|----|----|-----|
| 1 | NO. | School | Grade | Type | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | 1 | 1 | 1 | 1 | A | C | B | D | A | D | C | C | B | D |
| 3 | 2 | 1 | 2 | 2 | A | C | B | A | A | D | C | C | | D |
| 4 | 3 | 1 | 2 | 3 | A | C | B | D | A | D | C | C | B | D |

Integrated Tool for Item Analysis & Response Data Analysis

- ➔ When there are **multiple keys**, that is, examinees can take the score if they choose all of the keys, each response is separated by a comma with a Half width symbols, such as “A,B,C”. Do not enter “ABC” (No separation) or “A B C” (Separated by spaces) or “A, B, C” (Separated by a comma in Full width and Half width symbols).
- ➔ It is not required to enter the responses in a certain order. For example, {A, B, C} can be entered as {C, B, A}, and the results are the same. Nevertheless, it is recommended to enter the options in a certain order for easy inspection.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|-----|--------|-------|------|-------|-----|-----|----|----|----|----|----|----|-----|
| 1 | NO. | School | Grade | Type | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | 1 | 1 | 1 | 1 | 1 A,B | A,C | A,D | B | A | D | C | C | B | D |
| 3 | 2 | 1 | 2 | 2 | 2 A,B | A,C | A,D | B | A | D | C | C | B | D |
| 4 | 3 | 1 | 2 | 3 | 3 A,B | A,C | A,D | B | A | D | C | A | B | D |

- ➔ For some reasons, such as downloading the response data from some online learning platform, probably you will get a result that has been scored. For example, “1” means the answer is correct while “0” means the answer is incorrect. In this case, the system can still support analysis, although only the correct and error rate can be obtained, instead of rate of each option.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|-----|--------|-------|------|----|----|----|----|----|----|----|----|----|-----|
| 1 | NO. | School | Grade | Type | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | 2 | 1 | 2 | 2 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 1 |
| 4 | 3 | 1 | 2 | 3 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 1 |

Answer Key File

As shown in sample key data, the file is used to save correct answer information for multiple-choice items. The file can be saved in one of ‘.xlsx’, ‘.xls’, ‘.csv’ formats supported by Excel.

When making the Answer Key file, please follow the **following rules**:

- ➔ Input whatever in the first row, column A. However, the recommendation is ‘TEST’ or ‘Test’.
- ➔ Input the name of items in the **first row** from **column B**. The name of items should be consistent with the ones in Respond Data file, otherwise there will be errors when the software is run. Therefore, it is recommended to directly copy name of items in Respond Data file and paste them here.
- ➔ Input the specific test name in the **second row**, **column A**, such as ‘2021 Language final exam’, ‘Sample’ etc. Any language is acceptable.
- ➔ Input the key of items in the **second row** from **column B**. Please make sure that the symbols of items in the Key file are consistent with the ones in Response Data file.

Integrated Tool for Item Analysis & Response Data Analysis

➔ **Do not** input demographic item names in this file.

➔ **Do not** enter anything after the third row and last column when Key data is completed.

| | A | B | C | D | E | F | G | H | I | J | K |
|---|--------|----|----|----|----|----|----|----|----|----|-----|
| 1 | TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | Sample | A | C | B | B | A | D | C | C | B | D |

➔ When there are **multiple keys**, each key is separated by a comma with a Half width symbols, such as “A,B,C”. Do not enter “ABC”(No separation) or “A B C” (Separated by spaces) or “A, B, C” (Separated by a comma in Full width and Half width symbols).

| | A | B | C | D | E | F | G | H | I | J | K |
|---|--------|-----|-----|-----|----|----|----|----|----|----|-----|
| 1 | TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | Sample | A,B | A,C | D,A | B | A | D | C | C | B | D |

➔ As mentioned above in Response Date File section, **if the response data has been scored as {0, 1}, please set keys as “1”** (score), instead of the original options.

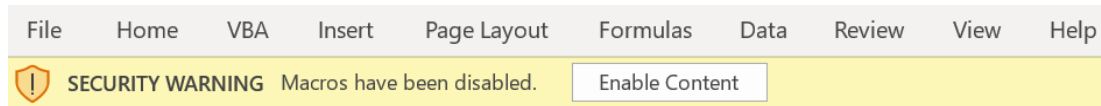
| | A | B | C | D | E | F | G | H | I | J | K |
|--------|----|----|----|----|----|----|----|----|----|-----|---|
| TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 | |
| Sample | | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Integrated Tool for Item Analysis & Response Data Analysis

HOW TO RUN THE SOFTWARE

Start the Software

Download the software and double-click to open it. When the following display appears,



Please click 'Enable Content' to confirm.

Input File Names

It is recommended to name documents and folders in English. Files named in Chinese or Japanese may not be displayed normally on other computers.

In the 'menu' worksheet, you will see the following display:

| Input File : | |
|------------------------|--------------------------------|
| 1 Response Data(Excel) | D:\Response Data (Sample).xlsx |
| 2 Answer Key(Excel) | D:\Key (Sample).xlsx |

Please click the 'Response Data' Button to find the path of Response Data file and press 'OK' to confirm.

Similarly, click the 'Answer Key' button to set for the Key data.

| 名前 | 更新日時 | 種類 | サイズ |
|-----------------------------|------------------|----------------------|-----|
| Response Data (Sample).xlsx | 2021/05/11 15:57 | Microsoft Excel フ... | |
| Key (Sample).xlsx | 2021/05/11 15:57 | Microsoft Excel フ... | |
| ItemAnalysisSystem.xlsm | 2021/03/16 23:14 | Microsoft Excel マ... | |

| | | |
|-----------|-----------------------------|----------------|
| ファイル名(N): | Response Data (Sample).xlsx | すべてのファイル (*.*) |
| ツール(L) | | OK |

Set Demographic Data Field

Set the first and last columns of Demographic Data in **Capital Letters** according to your own Response data. For example in Response Data (Sample), demographic data start from column B ('school') and end at column D ('types').

| | | |
|------------------|---|----------------|
| Demographic Data | B | (First Column) |
| | D | (Last Column) |

Integrated Tool for Item Analysis & Response Data Analysis

Set Multiple-Choice Options

Regardless of the type of symbols (Numbers, Letters, etc.), please set all symbols that are used in all items. If the numbers of options between items are inconsistent, set the symbol corresponding to the one with most options.

Be careful not to enter extra **space symbol**. **Spaces** will be considered part of the answer.

| | |
|-------------------------|---|
| Multiple Choice Options | A |
| | B |
| | C |
| | D |
| | |
| | |

Set Tolerance Margin

There may be abnormal conditions in examinees' response data. For example, examinees with high total score incorrectly answer easy items (items with high passing rate), or examinees with low total score correctly answer difficult items (items with low passing rate). The software identifies such abnormal responses with different color cells.

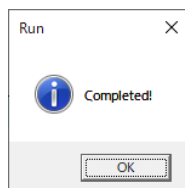
Tolerance Margin can be set as 0-100 for the sensitivity of abnormal conditions. The larger the value is, the higher the tolerance of abnormal conditions is and the fewer color cells are. The default is 50 (%).

For the setting of coloration, please refer to the section of 'Examinee Analysis' in 'Results Interpretation'.

| | |
|-------------------------|----|
| Tolerance Threshold (%) | 50 |
|-------------------------|----|

Run the Software

After all the above settings are completed, click the 'RUN!' button to conduct analysis. When the software runs successfully, an Info Window of 'Completed!' will be displayed. Click 'OK', then analysis results will be shown in worksheets. If it runs unsuccessfully, an Info Window of error message will be displayed. For more information, please refer to the section of 'Error Message'.

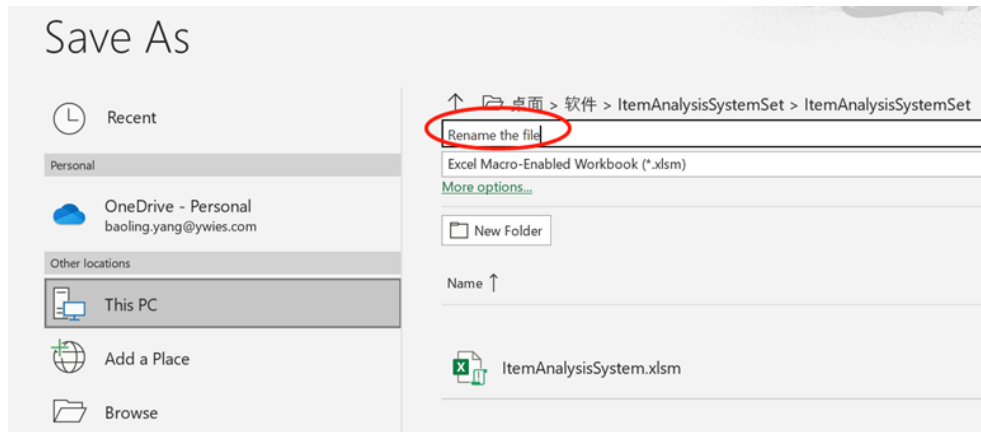


| | | | | | | | | | | | | | | | |
|------|--------------|-----------------|-------------|---------------|--------------------|----|----|----|----|----|----|----|----|----|-----|
| Menu | Answers Data | Correct Answers | Test Scores | Item Analysis | Examinees Analysis | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
|------|--------------|-----------------|-------------|---------------|--------------------|----|----|----|----|----|----|----|----|----|-----|

Integrated Tool for Item Analysis & Response Data Analysis

Save the Results

To keep analysis results, please click ‘Save As’ and save the file with different name. The renamed file contains the analysis results.



Start a New Round

To start a new analysis of other data, please open the existing software file and click the ‘Initialization’ button. All worksheet except for ‘menu’ will be removed. The previous setting information remains. Of course, you can also reset it for the new round of analysis if needed.



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RESULTS

When the software runs successfully, analysis results will form the following worksheets: Response Data, Answer Key, Test Scores, Item Analysis, Examinee Analysis and Item Characteristics. Item characteristics of each item is shown in each worksheet.

Response Data

This is the Response Data you entered earlier.

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|---|-----|--------|-------|------|----|----|----|----|----|----|----|----|----|-----|
| 1 | NO. | School | Grade | Type | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | 1 | 1 | 1 | 1 | A | C | B | D | A | D | C | C | B | D |
| 3 | 2 | 1 | 2 | 2 | A | C | B | A | A | D | C | C | | D |
| 4 | 3 | 1 | 2 | 3 | A | C | B | D | A | D | C | C | B | D |

Answer Key

This is the Key Data you entered earlier.

| | A | B | C | D | E | F | G | H | I | J | K |
|---|--------|----|----|----|----|----|----|----|----|----|-----|
| 1 | TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | Sample | A | C | B | B | A | D | C | C | B | D |
| 3 | KeyAll | A | C | B | B | A | D | C | C | B | D |
| 4 | Key1 | A | C | B | B | A | D | C | C | B | D |

If there are multiple keys, all the options will be displayed separately.

| | A | B | C | D | E | F | G | H | I | J | K |
|---|--------|-----|-----|-----|----|----|----|----|----|----|-----|
| 1 | TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | Sample | A,B | A,C | D,A | B | A | D | C | C | B | D |
| 3 | KeyAll | AB | AC | AD | B | A | D | C | C | B | D |
| 4 | Key1 | A | A | A | B | A | D | C | C | B | D |
| 5 | Key2 | B | C | D | | | | | | | |

This is the key sheet for 0/1 scored data.

| | A | B | C | D | E | F | G | H | I | J | K |
|---|--------|----|----|----|----|----|----|----|----|----|-----|
| 1 | TEST | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | Sample | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 3 | KeyAll | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 4 | Key1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

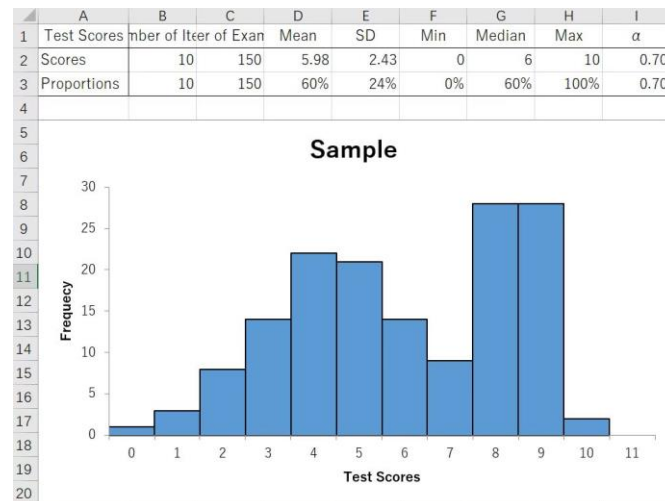
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Test Scores

In this part, summary of test scores is presented such as Number of Items, Number of Examinees, Mean, Standard Deviation (SD), Min, Median, Max, Coefficient Alpha, and histogram of test scores.

Coefficient Alpha (α) is an index of test reliability, which stands for smallness of measurement errors, that is, preciseness of test scores. The larger the coefficient Alpha is, the more reliable the test score is. The maximum value of Coefficient Alpha is + 1.

Another way to express test score is so called Proportion. Test scores can be converted into proportions. The calculation formula is: Scores / Number of Items \times 100%. The number of items, the number of examinees and Coefficient Alpha are consistent, regardless of the expression of Score or Proportion.



Item Analysis

Summary of item analysis results is shown in the following table:

| A | B | C | D | E | F | G | H | I | J | K | L | M |
|------|---------------------|---------|---------|------------|----------|---------------|-----|-----|-----|-----|-----|---------|
| Item | Number of Examinees | P Value | D Value | I - T Cor. | α | Del. α | Key | A | B | C | D | Missing |
| X1 | 150 | 57% | 76% | 0.47 | 0.70 | 0.66 | A | 57% | 12% | 21% | 9% | 1% |
| X2 | 150 | 50% | 93% | 0.51 | 0.70 | 0.65 | C | 18% | 10% | 50% | 22% | 0% |
| X3 | 150 | 70% | 61% | 0.44 | 0.70 | 0.66 | B | 12% | 70% | 14% | 4% | 0% |
| X4 | 150 | 24% | -17% | -0.27 | 0.70 | 0.77 | B | 21% | 24% | 15% | 41% | 0% |
| X5 | 150 | 55% | 93% | 0.54 | 0.70 | 0.64 | A | 55% | 20% | 15% | 9% | 1% |
| X6 | 150 | 57% | 68% | 0.41 | 0.70 | 0.67 | D | 19% | 15% | 9% | 57% | 0% |
| X7 | 150 | 73% | 59% | 0.42 | 0.70 | 0.67 | C | 10% | 9% | 73% | 8% | 0% |
| X8 | 150 | 83% | 41% | 0.43 | 0.70 | 0.67 | C | 7% | 3% | 83% | 7% | 0% |
| X9 | 150 | 58% | 54% | 0.32 | 0.70 | 0.68 | B | 9% | 58% | 17% | 13% | 2% |
| X10 | 150 | 69% | 56% | 0.37 | 0.70 | 0.68 | D | 12% | 7% | 9% | 69% | 3% |

Integrated Tool for Item Analysis & Response Data Analysis

This is an item analysis table containing multiple keys items:

| | A | B | C | D | E | F | G | H | I | J | K | L | M |
|----|------|-----------|---------|---------|----------|-------|-----------|-----|-----|-----|-----|-----|---------|
| 1 | Item | Number of | P Value | D Value | I-T Cor. | Alpha | Del.Alpha | Key | A | B | C | D | Missing |
| 2 | X1 | 100 | 21% | 74% | 0.73 | 0.73 | 0.66 | A,B | 48% | 53% | 43% | 48% | 8% |
| 3 | X2 | 100 | 23% | 78% | 0.74 | 0.73 | 0.65 | A,C | 48% | 41% | 55% | 48% | 8% |
| 4 | X3 | 100 | 19% | 70% | 0.70 | 0.73 | 0.66 | D,A | 48% | 45% | 48% | 51% | 8% |
| 5 | X4 | 100 | 18% | 67% | 0.68 | 0.73 | 0.67 | B | 54% | 18% | 18% | 5% | 5% |
| 6 | X5 | 100 | 71% | 89% | 0.52 | 0.73 | 0.69 | A | 71% | 14% | 10% | 4% | 1% |
| 7 | X6 | 100 | 50% | 44% | 0.16 | 0.73 | 0.75 | D | 10% | 18% | 19% | 50% | 3% |
| 8 | X7 | 100 | 79% | 70% | 0.42 | 0.73 | 0.70 | C | 6% | 7% | 79% | 7% | 1% |
| 9 | X8 | 100 | 64% | 4% | -0.14 | 0.73 | 0.79 | C | 9% | 10% | 64% | 13% | 4% |
| 10 | X9 | 100 | 58% | 56% | 0.26 | 0.73 | 0.73 | B | 13% | 58% | 13% | 12% | 4% |
| 11 | X10 | 100 | 73% | 41% | 0.16 | 0.73 | 0.74 | D | 7% | 5% | 9% | 73% | 6% |

This is an item analysis table for scored data.

| A | B | C | D | E | F | G | H | I | J | K |
|------|-----------|---------|---------|----------|----------|---------------|-----|-----|-----|---------|
| Item | Number of | P Value | D Value | I-T Cor. | α | Del. α | Key | 0 | 1 | Missing |
| X1 | 150 | 57% | 76% | 0.47 | 0.70 | 0.66 | 1 | 43% | 57% | 0% |
| X2 | 150 | 50% | 93% | 0.51 | 0.70 | 0.65 | 1 | 50% | 50% | 0% |
| X3 | 150 | 70% | 61% | 0.44 | 0.70 | 0.66 | 1 | 30% | 70% | 0% |
| X4 | 150 | 24% | -17% | -0.27 | 0.70 | 0.77 | 1 | 76% | 24% | 0% |
| X5 | 150 | 55% | 93% | 0.54 | 0.70 | 0.64 | 1 | 45% | 55% | 0% |
| X6 | 150 | 57% | 68% | 0.41 | 0.70 | 0.67 | 1 | 43% | 57% | 0% |
| X7 | 150 | 73% | 59% | 0.42 | 0.70 | 0.67 | 1 | 27% | 73% | 0% |
| X8 | 150 | 83% | 41% | 0.43 | 0.70 | 0.67 | 1 | 17% | 83% | 0% |
| X9 | 150 | 58% | 54% | 0.32 | 0.70 | 0.68 | 1 | 42% | 58% | 0% |
| X10 | 150 | 69% | 56% | 0.37 | 0.70 | 0.68 | 1 | 31% | 69% | 0% |

Item:

Names or serial number of items.

Number of Examinees:

The number of participants in the test, which is consistent through all items.

P Value:

Proportion of correct (passing rate) of each item (%).

D Value:

As an indicator of item discrimination, D Value refers that examinees with higher total score are more likely to answer the item correctly while examinees with lower total score are more likely to answer the item incorrectly.

D value is calculated by subtracting the pass rate of low group (the lower 27%) from the one of high group (the top 27%). The range of D value is -100% ~ +100%. The greater D value is, the greater discrimination is.

When D value is negative, it means that examinees with lower score are more likely to answer correctly. This requires special attention, therefore, it will be indicated with text in red.

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I-T Cor.:

As an indicator of item discrimination, I-T Cor. refers to the correlation between item scores ('I') and the total score of other items (Total score minus Score of the Item, 'T'). The range of I-T Cor. value is $-1 \sim +1$. The greater the value is, the greater the discrimination is.

When value of I-T Cor. is negative, it means that examinees with lower score are more likely to answer correctly. This requires special attention, therefore, it will be indicated with text in red.

Coefficient Alpha:

Coefficient Alpha is an index of test reliability. There is only one Coefficient Alpha value for a test and all items share the same value.

Del. Alpha:

Del. Alpha refers that Coefficient Alpha is calculated without the item (the item is not included). If Coefficient Alpha \geq Del. Alpha, it means that the item is acceptable for the test. While if Coefficient Alpha $<$ Del. Alpha, the item is not acceptable.

Key:

Correct answer of each item.

Choice:

The choice rate (%) of the option. The colored cell is the correct option.

Missing:

Missing rate (%) of the item. It is worth noting that if the number of response options exceeds the one of key options, it will also be recorded as missing.

Sum of choice rates and missing rate equals to the number of keys $\times 100\%$.

Integrated Tool for Item Analysis & Response Data Analysis

Examinee Analysis

The results of Examinee Analysis are as follows:

| | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P |
|---|-----|--------|-------|------|--------|------------|-----|----|----|----|----|----|----|----|----|-----|
| 1 | NO. | School | Grade | Type | Scores | Proportion | X1 | X2 | X3 | X4 | X5 | X6 | X7 | X8 | X9 | X10 |
| 2 | 1 | 1 | 1 | 1 | 1 | 9 | 90% | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 3 | 2 | 1 | 2 | 2 | 2 | 8 | 80% | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 |
| 4 | 3 | 1 | 2 | 3 | 3 | 9 | 90% | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 5 | 4 | 1 | 3 | 2 | 2 | 9 | 90% | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 |
| 6 | 5 | 2 | 1 | 1 | 1 | 8 | 80% | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 1 | 1 |
| 7 | 6 | 2 | 2 | 3 | 3 | 3 | 30% | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 |
| 8 | 7 | 2 | 2 | 1 | 8 | 80% | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 1 | 0 |

Examinee ID and Demographic Variables:

Those data come from Response Data file.

Scores:

Test score of each examinee which is the number of items the examinee answered correctly.

Proportions:

Proportion (%) of correctly answered items by the examinee. The calculation formula is:
 $\text{Score} / \text{Number of Items} \times 100\%$.

Item:

Each response is scored with 1 or 0. '1' means the answer is correct, '0' means the answer is incorrect including non-response.

When examinees with high total score incorrectly answer easy items, the cells will be displayed in yellow. When examinees with low total score correctly answer difficult items, the cells will be displayed in light blue. The criteria of judgements are as follows:

Let B denote the cumulative relative frequency of total score X from the highest total score, D denote Tolerance Margin, and P denote P Value of the item. For the examinee with score X :

Abnormal Case A: When the item score = 0 and $P - B > D$,

Examinees fail to pass easy items which they would answer correctly, beyond Tolerance Margin limit.

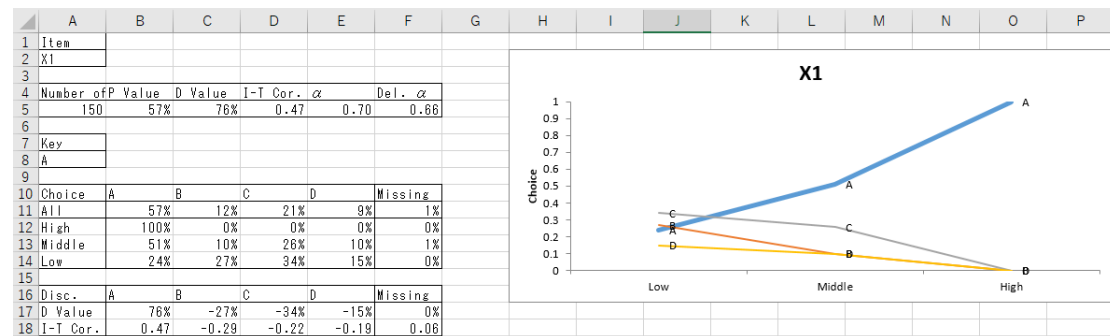
Abnormal Case B: When the item score = 1 and $B - P > D$,

Examinees pass difficult items which they would answer incorrectly, beyond Tolerance Margin limit.

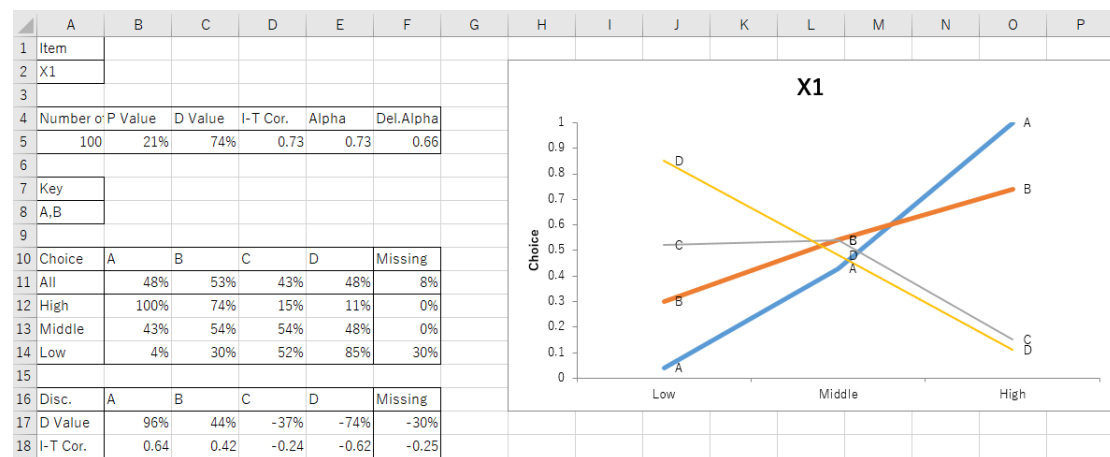
Integrated Tool for Item Analysis & Response Data Analysis

Item Characteristics

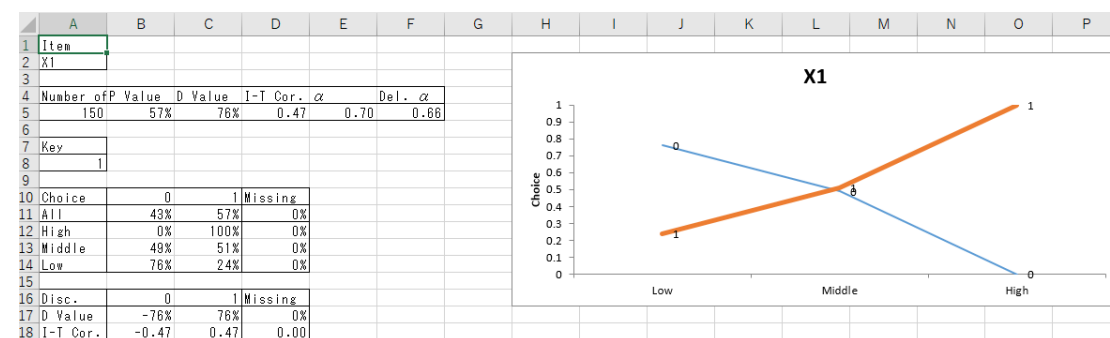
The detailed item characteristics are shown as follows:



This is an example of multiple keys item.



This is an example of 0/1 scored data.



In this part, summary of item characteristics is presented, including Number of Examinees, P Value, D Value, I-T Cor., Coefficient Alpha, Del. Alpha, Key, etc.

Choice and Missing rate (%) for All group, High group (top 27%), Middle group (middle 46%), and Low group (lower 27%) are also presented.

D-value and I-T Cor., which were used as discrimination indicators, are presented for each choice and missing data, regardless of correct answer or not. For the correct answer option, D

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Analysis

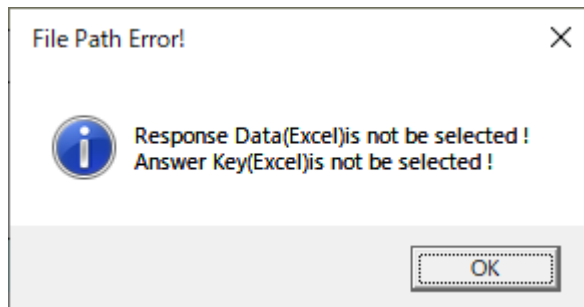
value and I-T Cor. are expected to be positive (+), while for distractors and missing, those are expected to be negative (-).

The Trace Line (Choice Ratio Analysis Chart) is a line chart, in which the Y-axis is choice rate of options and the X-axis is presented in three groups: low, middle, and high. The line of correct answer is displayed with bold line. For high quality items, it is expected that the graph of correct answer rises in upper right corner and the ones of distractors fall into the lower right corner.

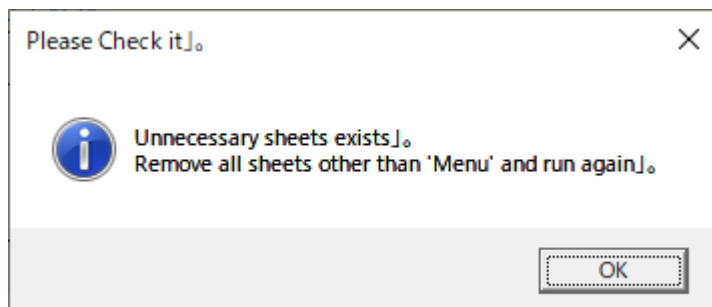
Integrated Tool for Item Analysis & Response Data Analysis

ERROR MESSAGES

If you run the software without selecting a file --> Please specify the file.

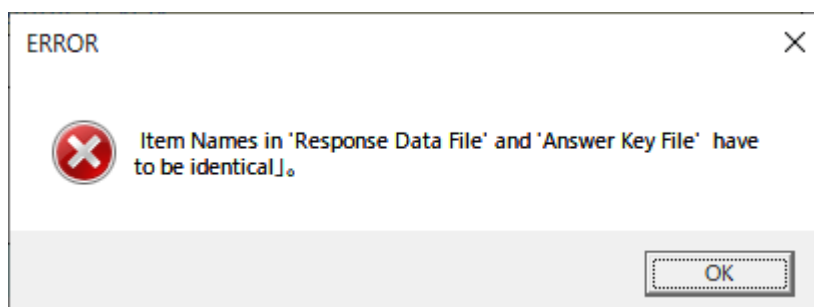


If there are still results of the last analysis (worksheets) --> Please press the 'Initialization' button.



If item names in Response Data are inconsistent with the ones in Answer Key --> Please make item names consistent.

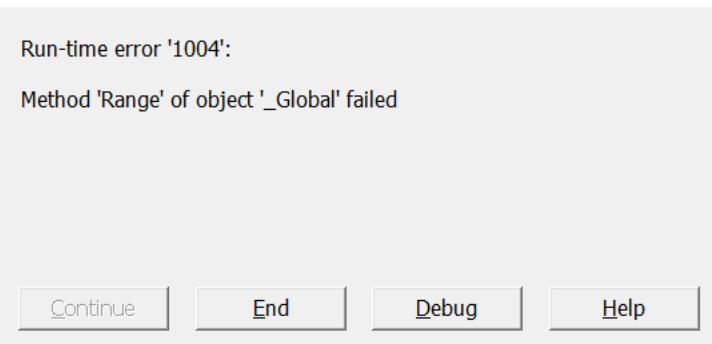
If enter incorrect letter when setting the demographic data --> Please set the last column correctly according to your data carefully.



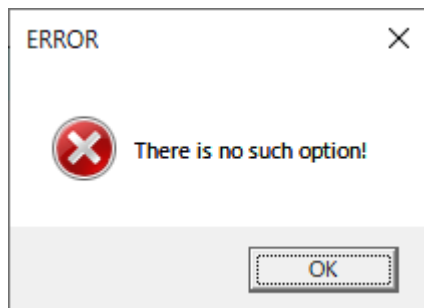
If you run the software without setting the last column of demographic data --> Please enter right value of the last column.

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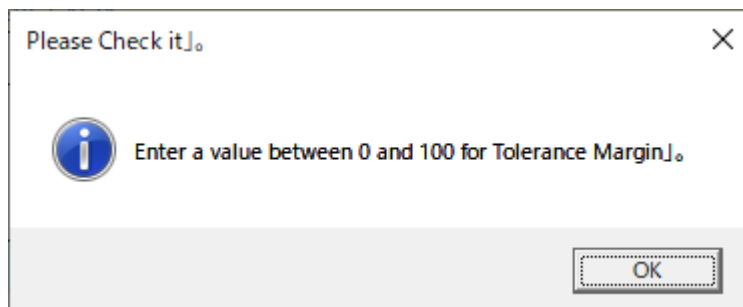
Microsoft Visual Basic



If option symbols in setting are not consistent with the ones in Answer Key --> Please make symbols consistent.



If input a value out of range 0~100 for Tolerance Margin --> Please enter a value between 0 and 100 for Tolerance Margin.



RELATED INFORMATION

Software Environment

The software is based on Excel Macro Language. Please run it under Windows system which supports Excel Macro Language (some windows systems may not be compatible).

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