jMetrik Guide

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Introduction

This guide will walk you through getting your data into jMetrik and running an item analysis. jMetrik does many more things than just classical test theory (CTT) item analysis, though. You may want to explore more as you learn. Rasch/IRT analysis, DIF analysis, multiple models, etc., are all available! But for now, let's just look at some items with CTT analyses.

Keywords: software, how-to, item analysis

Necessary software

You need the following software:

1. A text editor

   —*Not* a word processor—a program that is just for working with text files. I recommend Notepad++ for Windows or BBEdit for Mac (the free version is fine). If you already have a text editor you like (e.g., Sublime, Atom); you don't need me to tell you what a text editor is.

2. jMetrik
   —Of course!
3. Microsoft Excel
   —Or an Excel-alike such as LibreOffice Calc. Please don't try to use Apple Numbers for *anything.*

Overall process

The process has the following steps:

1. Installing jMetrik
2. Doing the analyses in jMetrik
3. Exporting your analyses to text and/or CSV
4. *Extra:* Getting your data into jMetrik

Let's begin!

1. Installing jMetrik

The installation files can be downloaded from the jMetrik download page here. Please refer to the platform-specific instructions below.

Windows

Unless you know that you have Java installed (you probably don't), please download the "Windows Installer with JRE" installer from the jMetrik download page as shown below.

After downloading, simply install the software. By default, the software will start after installation, but there's nothing to do with it yet, so please just close it.

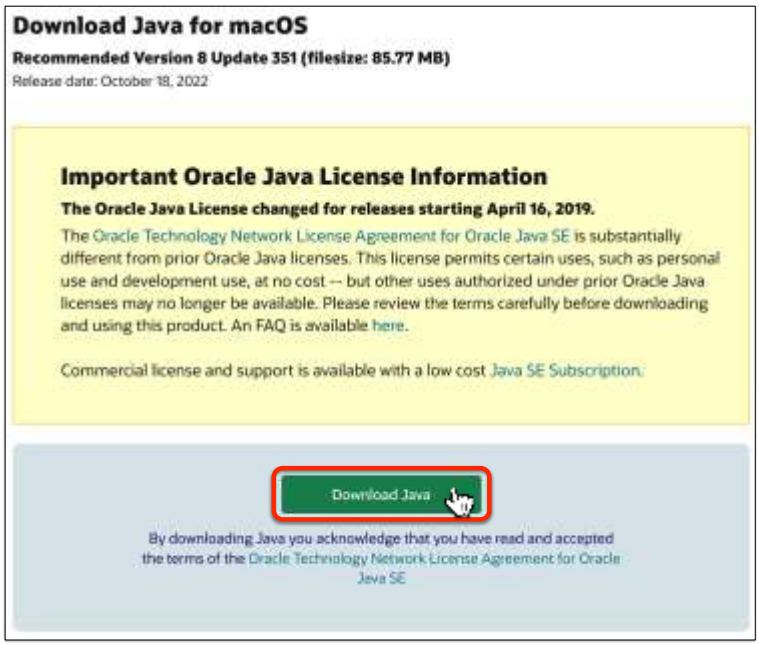
Macintosh

macOS 12 (Monterey) and above does not like the Java installer used by jMetrik, and claims you need to log in as root (the highest-level user of your computer, which is disabled by default) to install. Doing this is possible[1], but should be avoided by novice users. A workaround for more novice users is to install Java separately, then run jMetrik directly. Novice instructions follow, and a video of the process may be viewed here.

Step 1. Install Java

You will need to install Java manually and then run jMetrik as a file. Don't be alarmed. Java is just software that other software can run on. That's why the program can run on Windows, Mac, Linux… *whatever*, and still look the same. It's actually running in a Java virtual machine. There's nothing you need to do but install it.

1. Download Java from here.



2. Double-click the Java installer disk image.

NOTE: The name will be slightly different as new versions come out.

3. A window will open with the installer icon. Double-click the installer.

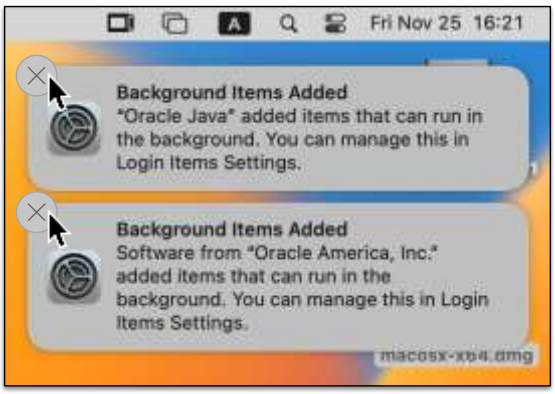
[1] Refer to the Apple support page on enabling/disabling the root user (https://support.apple.com/en-us/HT204012). Once enabled, log in as root and install the jMetrik package that includes the Java Runtime Environment (JRE). Then, log out as root and log in with your normal administrator account. Finally, *disable the root user* again. jMetrik will run normally and not request root access again.

4. Apple will then ask you if you really want to run the software you have just double-clicked. Tell them that yes, in fact, you *do* want to do the thing you have just done. Click “Open.”

5. The installer opens. Click “Install,” even though “Remove,” bizarrely, is the default.

6. You will need to enter your Mac password to continue.

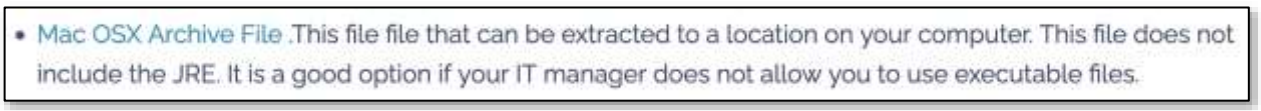
7. Apple will then helpfully tell you that you have installed things that can run. This is very helpful information indeed. *Click the Xes on these and never think about them again.*



8. Finally, the installation will finish. Click “Close.”

Step 2. Download and decompress jMetrik

1. Download the **Mac OSX Archive File** installer from the jMetric download page as shown below.



2. Move the downloaded file to someplace convenient. (The Downloads folder is not convenient.)

3. Double-click the archive file.

4. A folder called “jmetrik” will appear. Open it.

5. ***Right-click*** the “jmetrik-4.X.X.jar” file (*NOT* the “jMetrik” file) and select “Open”:

—If you double-click it, you will get a message refusing to open it because it is from an “unidentified developer.” We are bypassing that.

6. You may get a message asking if you really want to open it. Click "Open."

7. The software will (finally) open.

2. Getting your data into jMetrik

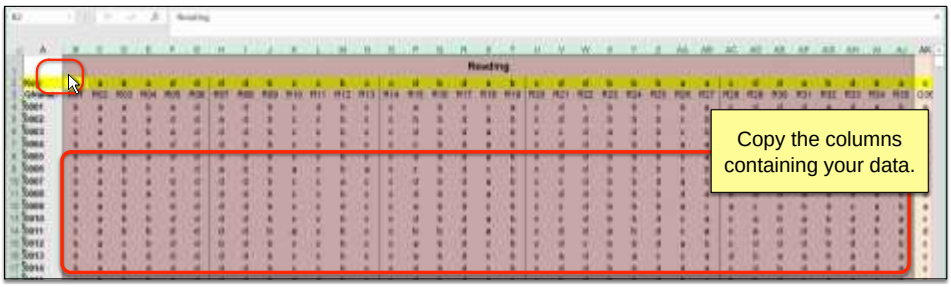
jMetrik reads plaintext files. There are myriad ways to make them, but I'm going to show you the way that I prefer. (*NOTE:* I am showing the process on Windows, but the process on the Mac is exactly the same.)

The overall process is as follows:

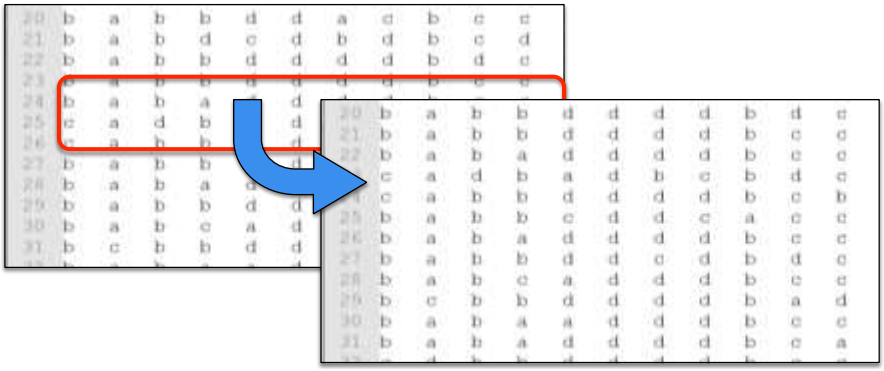
1. Make a data file for use in jMetrik
2. Make a score file for use in jMetrik

Step 1. Making the data file for jMetrik

1. Open your data file in Excel.
2. Select the columns (you can click the row names and drag) with the data for items you'd like to analyze and copy them (ctrl-C on Windows, ⌘-C on Mac, or click the "Copy" button on the Home tab of the ribbon, or right-click and select "Copy"—however you normally do it!). ***Only copy the columns with data in them.*** You do not want any columns with information like student numbers or names. Just the answers.



3. Make a new file in your text editor (by default, most editors make a new file when you open them).
4. Paste into the new text file (ctrl-V on Windows, ⌘-V on Mac, right-click…).
5. The top line needs to be the "names" of the questions. Simply highlight and delete anything above that.



6. Save the file with an easy-to-identify name (e.g., ReadingABCD.txt).

Step 2. Making the score file for jMetrik

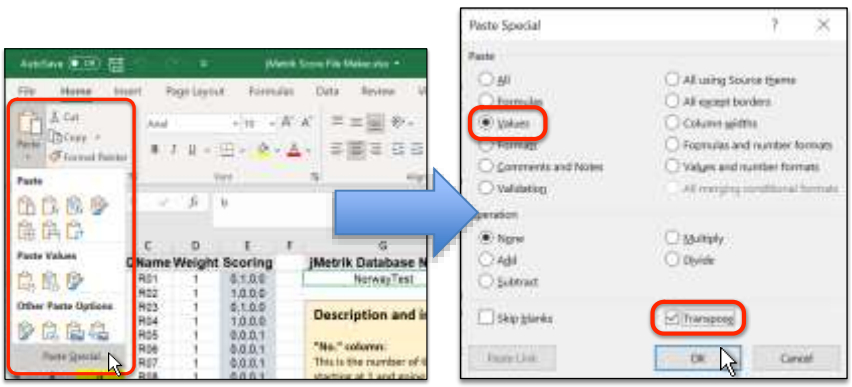
jMetrik needs to be given information on how to score the data. This can be done in jMetrik directly, but it's time-consuming. I find it much faster and easier to simply give it a file with the code it needs. I have prepared an Excel file that creates these files:

https://hosted.jalt.org/teval/sites/jalt.org.teval/files/jMetrik%20Score%20File%20Maker.xls

—The file includes text boxes that tell you how to use it. It can be adapted to be used with any data you have with minimal changes.

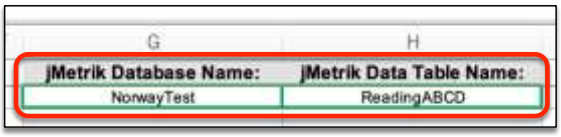
1. Open the "jMetrik Score File Maker.xls" file and make sure it is open to the "jMetrik Key" tab.
2. Return to your dataset in Excel and copy the key and names of your items. **Take care to *only* copy the key and the question names.**

3. Paste your item names and key into the jMetrik Score File Maker. Be sure to paste values only. You may neet to transpose (Click the first row in the "Key" column and then click the drop-down arrow next to "Copy" in the Home tab of the Ribbon. Select "Paste Special" and in the window that appears, select "Values" and—if necessary—"Transpose," then click OK.)

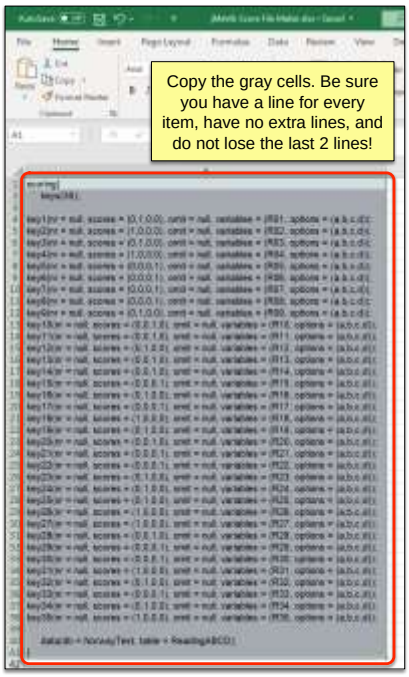


4. *(May be necessary)* If you need to add or remove lines, do so. Be sure that the first column of sequential numbers goes all the way down, and you copy the "Scoring" code down if you have more than 30 items.

5. Enter the jMetrik database and table names you plan to use. ***NOTE:*** **These must match what you make in jMetrik later so that jMetrik knows how to use the score file!**



6. Click on the "jMetrik Score File" tab.
7. *(May be necessary)* If you need to add or remove lines, do so. Ensure that you do not lose the last two lines of the gray cells, as they tell jMetrik what database and table the scoring data pertains to.
8. Select and copy the gray cells.



9. Make a new file in your text editor.
10. Paste into the new text file.
11. Save the file with an easy-to-remember name (e.g., "Reading Score File.txt")

Now you can do the analysis in jMetrik!

3. Doing the analysis in jMetrik

jMetrik uses a database with tables of information in it to do the analyses. For this reason, there are a few steps we need to take before we can start working on a project. The basic process is as follows:

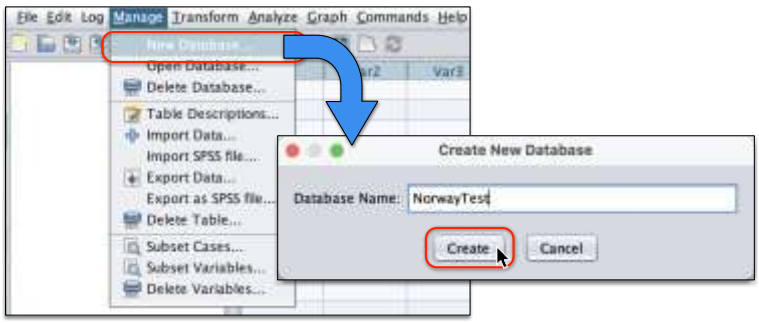
1. Make and open a new database
2. Import data
3. Import the score file and run it
4. Run the analyses

You can use the same database as much as you like, but I recommend making a new one for any new test. For example, it would make sense to use the same database for all of the sections of a particular test, but if you started working on a different test, it would make sense to make a new one and use that instead.

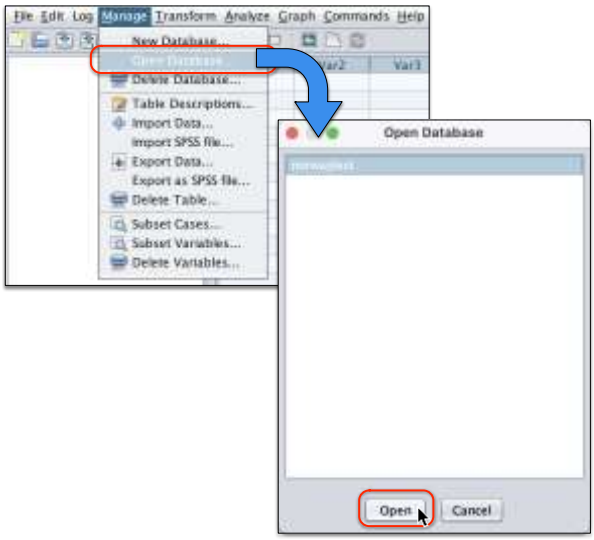
You will need to open a database every time you use the program. Don't be alarmed if you start the program and you don't see anything listed. You just need to tell it which database you want to use!

Making and opening a new database

1. Start jMetrik (if you are using a non-Intel Macintosh, it might take a little while to start the first time, as Rosetta 2 needs to make a translated binary to run on the Apple ARM CPUs—if you don't know what that means, don't worry; just wait. It will run normally after the first time.).
2. Go to the Manage menu and select "New Database…"
3. In the window that comes up, give your database a name (e.g., "ReadingTest") and click "Create." ***NOTE:*** **This name must match the database name you set in the "jMetrik Score File Maker" Excel file!**



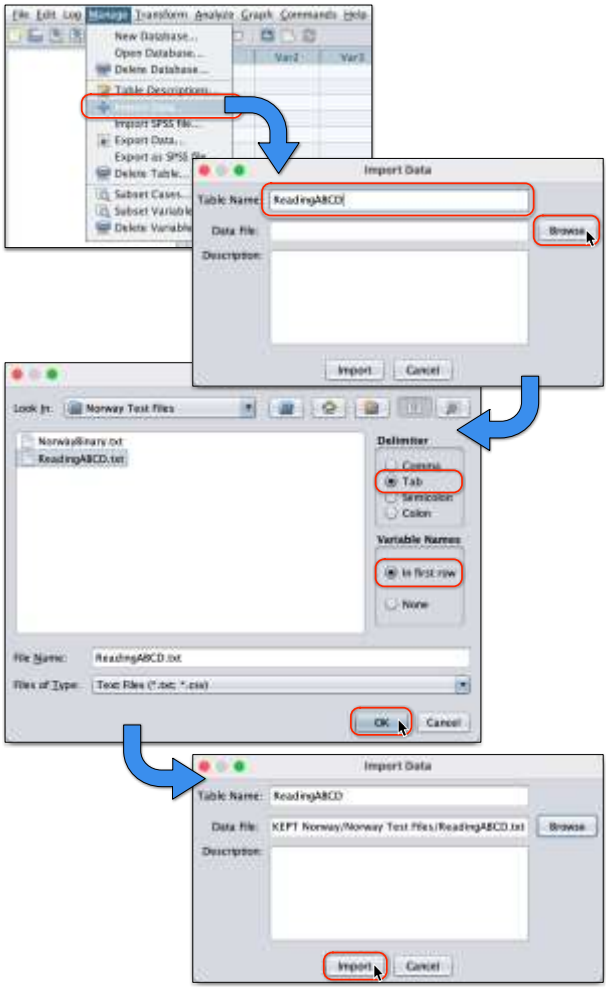
4. Return to the Manage menu and select "Open Database…"
5. Select your database from the list and click "Open."



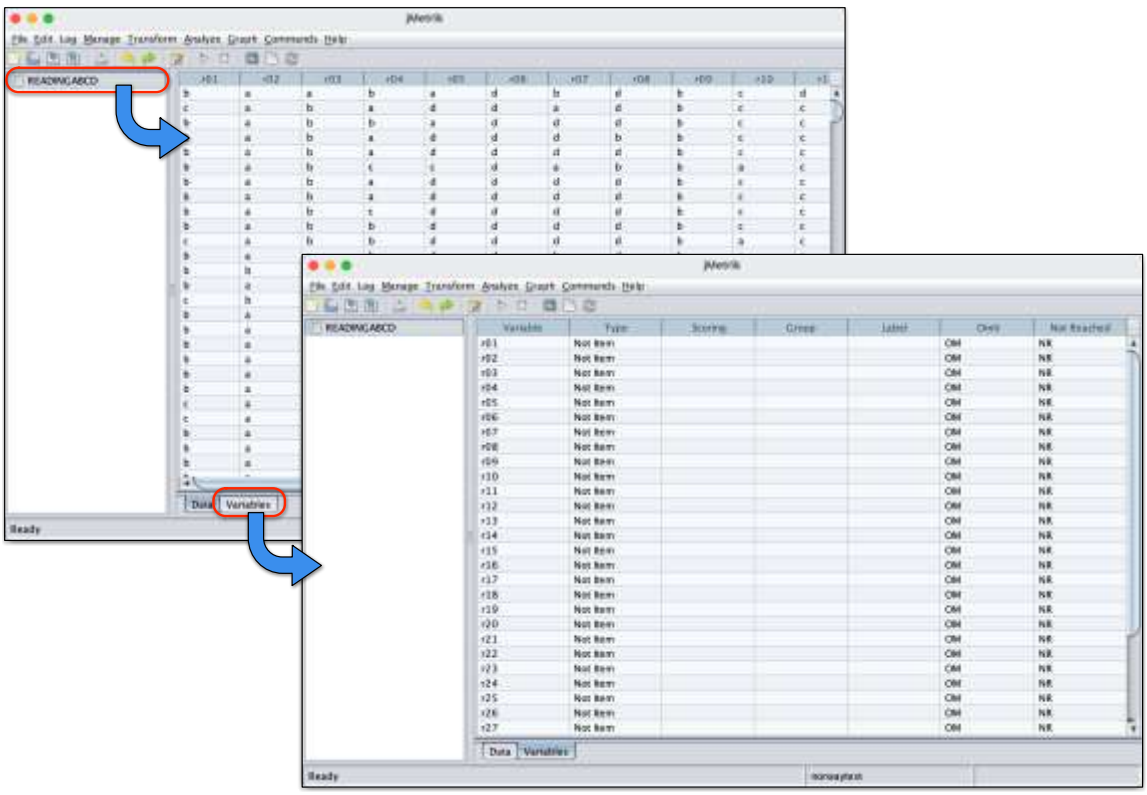
Importing data

(See the next page for a diagram.)

1. Go to the Manage menu and select "Import Data…"
2. Give a name to your table (e.g., "ReadingABCD").
3. NOTE: This name must match the table name you set in the "jMetrik Score File Maker" Excel file, if you're making your own files!
4. Click "Browse" and locate the score file you made.
5. Select "Tab" for the Delimiter and "In first row" for the Variable Names.
6. Click OK.
7. On the "Import" window, click "Import."



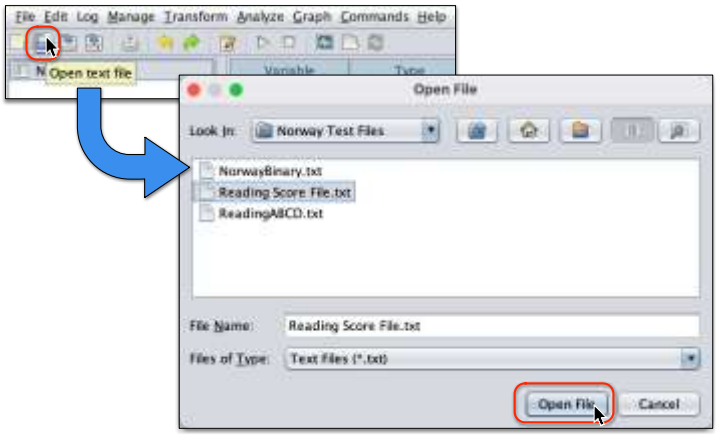
8. You will see a new entry on the left side of the main jMetrik window. Click it to see your imported data.
9. Click the "Variables" tab at the bottom to see the scoring… Uh-oh… It doesn't know these are items. We have to give it the score file so it knows (next section).



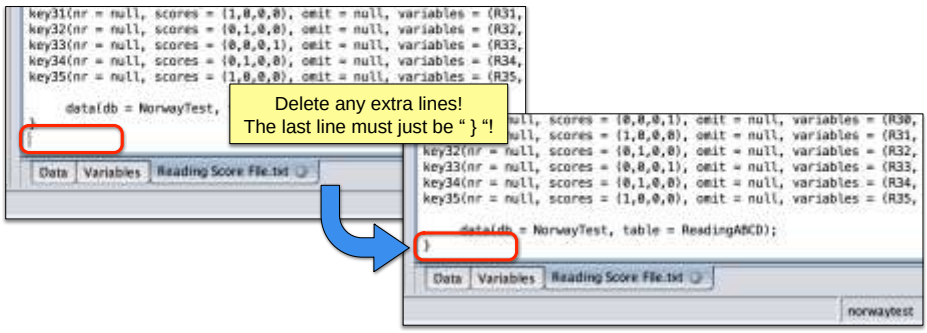
Importing and running the score file

This process tells jMetrik that the variables are items, and how to score them.

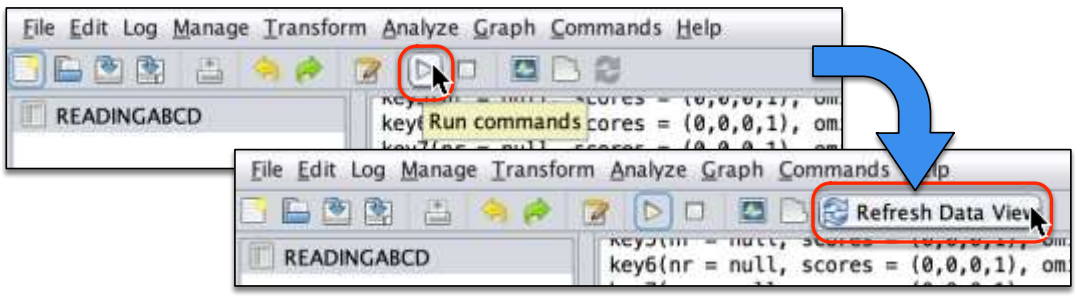
1. Click the “Open text file” button in the jMetrik toolbar (second button from the left).
2. Locate your score file and click “Open File.” Your file will open in a new tab in jMetrik



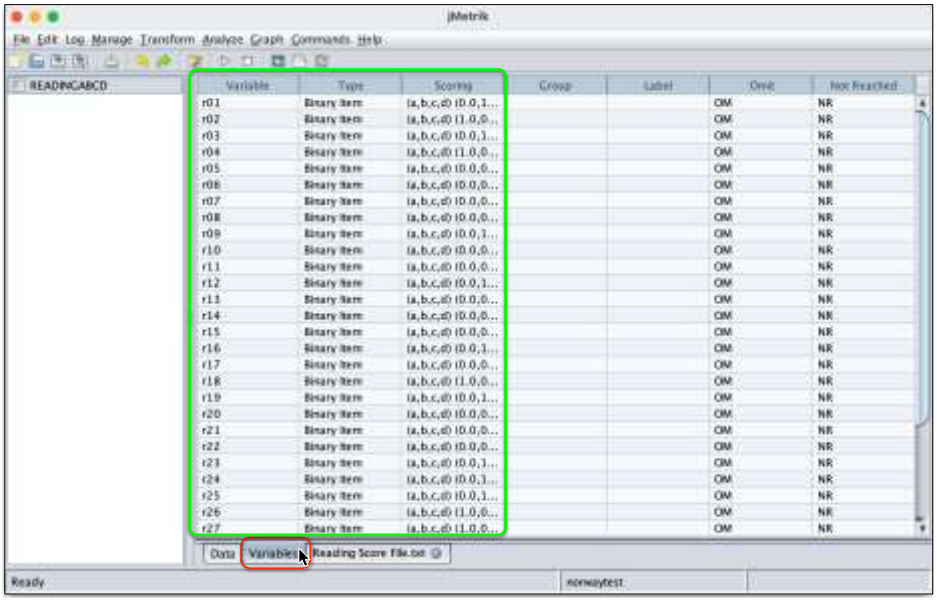
3. Your text editor and/or jMetrik might have snuck an extra line or two at the bottom of the file. You need to delete those for it to work. The last line needs to be just a single curly bracket (}).



4. Click the “Run commands” button in the toolbar (it looks like a “play” button—a triangle pointing right). This runs the code in the score file.
5. The “Refresh Data View” button becomes clickable. Click it!



6. Return to the “Variables” tab and check that your items have all been scored:

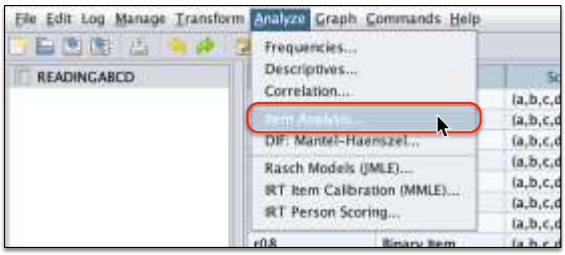


Now it's time to run some analyses!

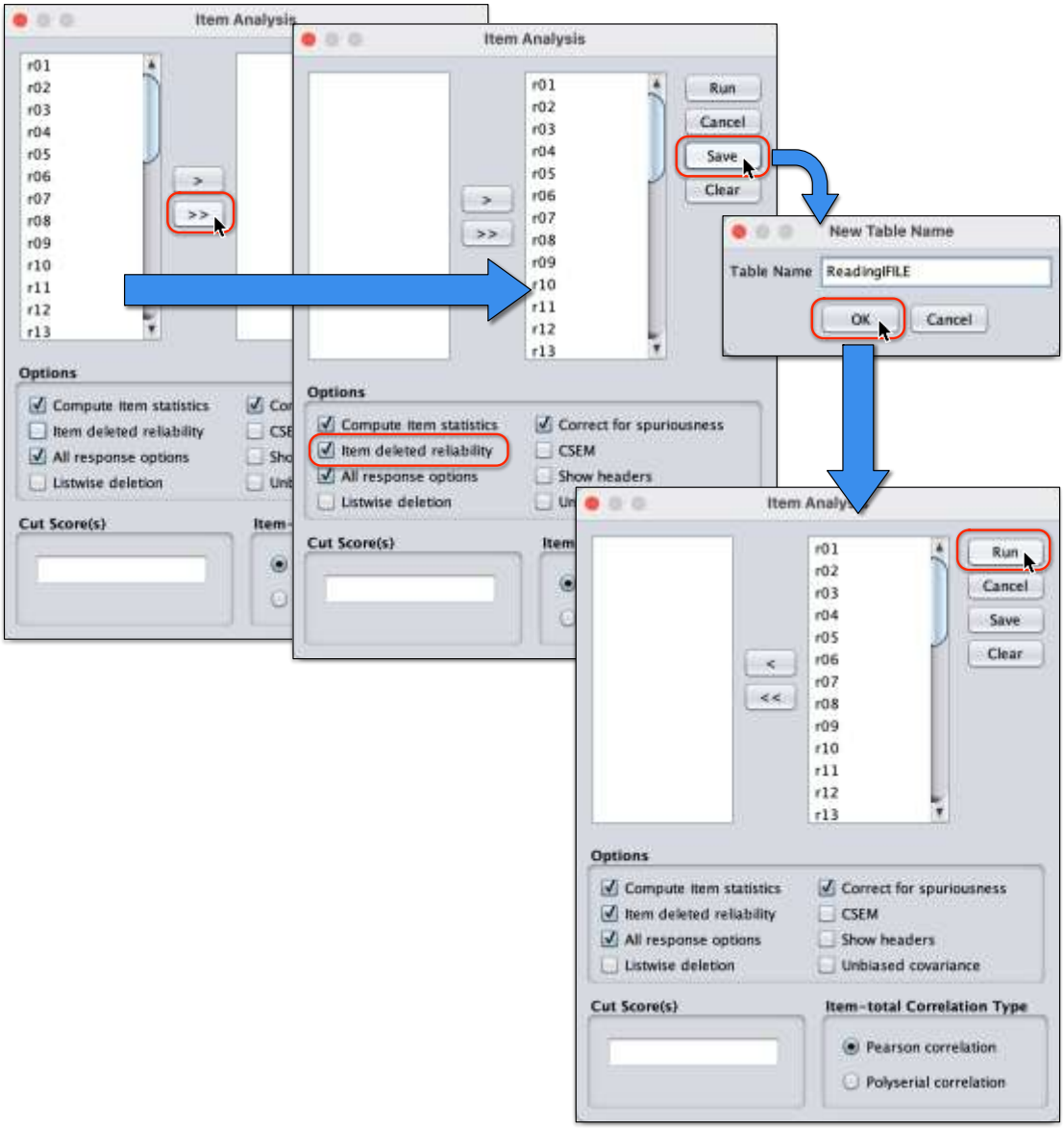
Running the analyses

We're finally ready for the fun part.

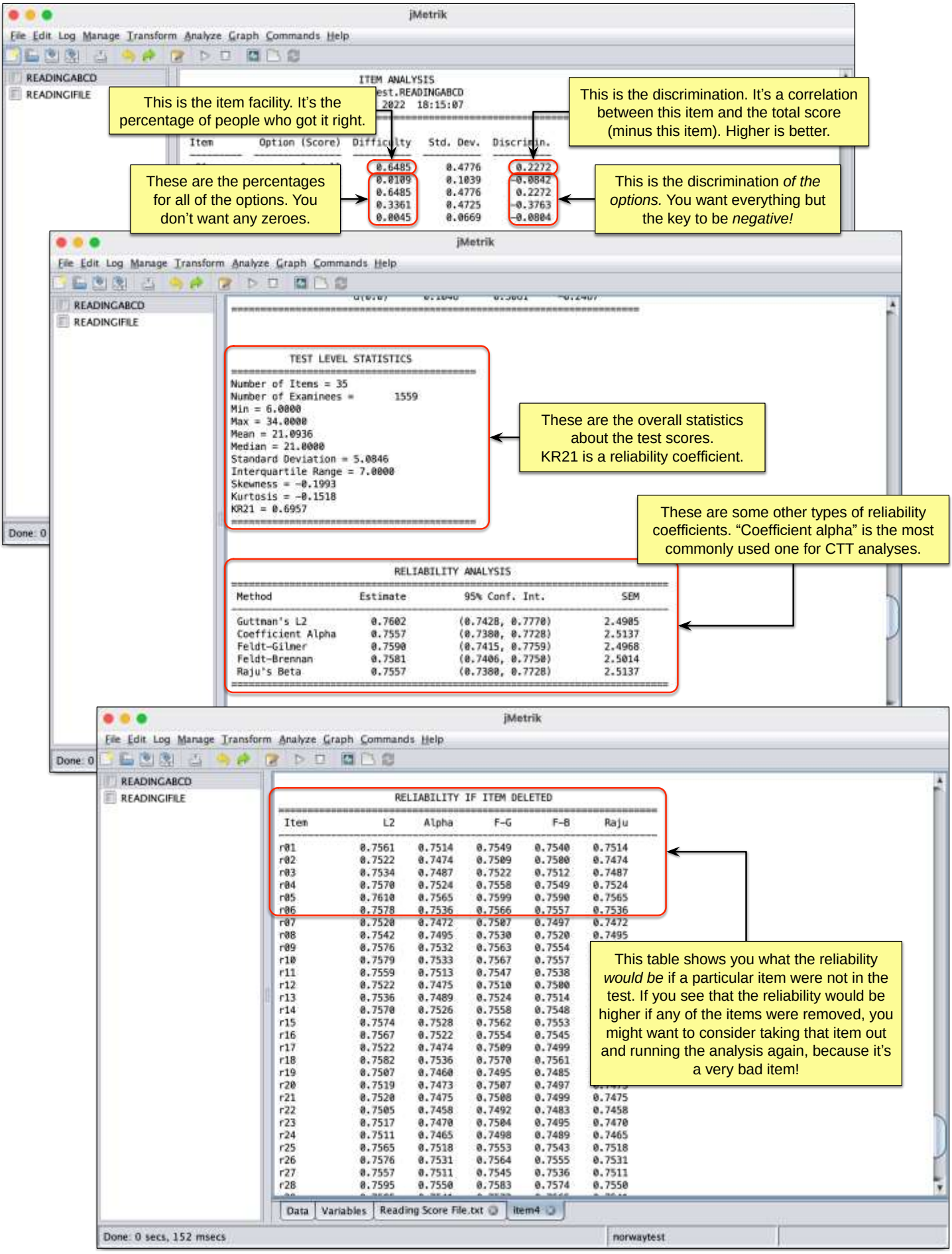
1. Go to the Analyze menu and select "Item Analysis…" A window with settings appears.



2. Click the " > > " button to move all the items to the right side. This tells jMetrik that we want to look at all of them (You can also do individual items, etc., if you like.)
3. Click the "Item deleted reliability" checkbox.
4. *(Optional, but recommended.)* Click the "Save" button to save the results as a data table. This can be really convenient for exporting to Excel if you need to do that. Give the table an easy name (I always call item analyses "IFILE") and click OK.
5. Click the Run button (see the image on the next page).



6. The analysis runs and the results appear in a text window. See the next page for a breakdown.


jMetrik
File Edit Log Manage Transform Analyze Graph Commands Help
READINGABCD
READINGIFILE
ITEM ANALYSIS
Item Option (Score) Difficulty Std. Dev. Discrim.
0.6485 0.4776 0.2272
0.0109 0.1039 -0.0842
0.6485 0.4776 0.2272
0.3361 0.4725 -0.3763
0.0045 0.0669 -0.0804
This is the item facility. It's the percentage of people who got it right.
This is the discrimination. It's a correlation between this item and the total score (minus this item). Higher is better.
These are the percentages for all of the options. You don't want any zeroes.
This is the discrimination of the options. You want everything but the key to be negative!
TEST LEVEL STATISTICS
Number of Items = 35
Number of Examinees = 1559
Min = 6.0000
Max = 34.0000
Mean = 21.0936
Median = 21.0000
Standard Deviation = 5.0846
Interquartile Range = 7.0000
Skewness = -0.1993
Kurtosis = -0.1518
KR21 = 0.6957
These are the overall statistics about the test scores. KR21 is a reliability coefficient.
These are some other types of reliability coefficients. "Coefficient alpha" is the most commonly used one for CTT analyses.
RELIABILITY ANALYSIS
Method Estimate 95% Conf. Int. SEM
Guttman's L2 0.7602 (0.7428, 0.7770) 2.4985
Coefficient Alpha 0.7557 (0.7380, 0.7728) 2.5137
Feldt-Gilmer 0.7590 (0.7415, 0.7759) 2.4968
Feldt-Brennan 0.7581 (0.7406, 0.7750) 2.5014
Raju's Beta 0.7557 (0.7380, 0.7728) 2.5137
RELIABILITY IF ITEM DELETED
Item L2 Alpha F-G F-B Raju
r01 0.7561 0.7514 0.7549 0.7540 0.7514
r02 0.7522 0.7474 0.7509 0.7500 0.7474
r03 0.7534 0.7487 0.7522 0.7512 0.7487
r04 0.7570 0.7524 0.7558 0.7549 0.7524
r05 0.7610 0.7565 0.7599 0.7590 0.7565
r06 0.7578 0.7536 0.7566 0.7557 0.7536
r07 0.7520 0.7472 0.7507 0.7497 0.7472
r08 0.7542 0.7495 0.7530 0.7520 0.7495
r09 0.7576 0.7532 0.7563 0.7554
r10 0.7579 0.7533 0.7567 0.7557
r11 0.7559 0.7513 0.7547 0.7538
r12 0.7522 0.7475 0.7510 0.7500
r13 0.7536 0.7489 0.7524 0.7514
r14 0.7570 0.7526 0.7558 0.7548
r15 0.7574 0.7528 0.7562 0.7553
r16 0.7567 0.7522 0.7554 0.7545
r17 0.7522 0.7474 0.7509 0.7499
r18 0.7582 0.7536 0.7570 0.7561
r19 0.7507 0.7460 0.7495 0.7485
r20 0.7519 0.7473 0.7507 0.7497
r21 0.7520 0.7475 0.7508 0.7499 0.7475
r22 0.7505 0.7458 0.7492 0.7483 0.7458
r23 0.7517 0.7470 0.7504 0.7495 0.7470
r24 0.7511 0.7465 0.7498 0.7489 0.7465
r25 0.7565 0.7518 0.7553 0.7543 0.7518
r26 0.7576 0.7531 0.7564 0.7555 0.7531
r27 0.7557 0.7511 0.7545 0.7536 0.7511
r28 0.7595 0.7550 0.7583 0.7574 0.7550
This table shows you what the reliability would be if a particular item were not in the test. If you see that the reliability would be higher if any of the items were removed, you might want to consider taking that item out and running the analysis again, because it's a very bad item!
Data Variables Reading Score File.txt item4
Done: 0 secs, 152 msecs
norwaytest

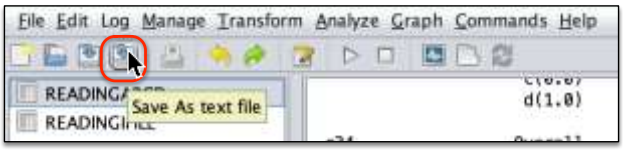
4. Exporting the results

We often want to use the results in other programs, or just save them so they are easy to send to others. This section shows you how to do that both as a text file and as a CSV that you can open in Excel.

Exporting as text

Exporting the output as text preserves all the headings, etc. of the main output window. If you don't need to do anything with the data but look at it, this is usually the best option.

1. Click the "Save as text file" button in the jMetrik toolbar (4th from the left).

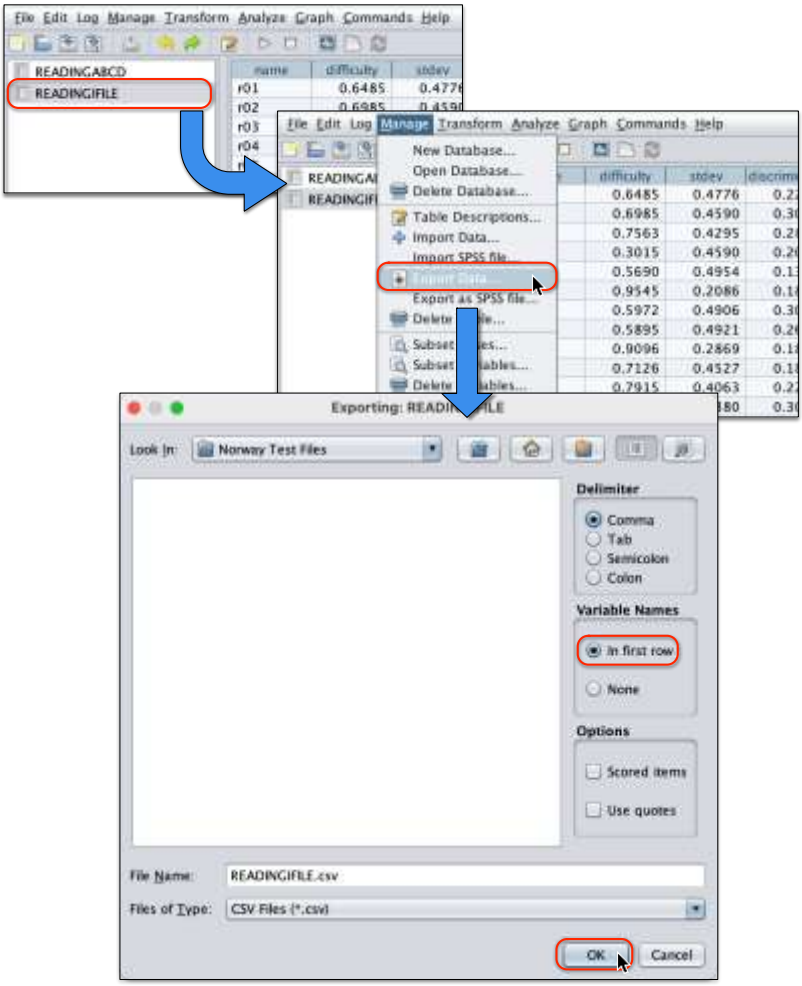


2. Choose a location, give it a name (I like to call these "IFILE") and save like any other file.

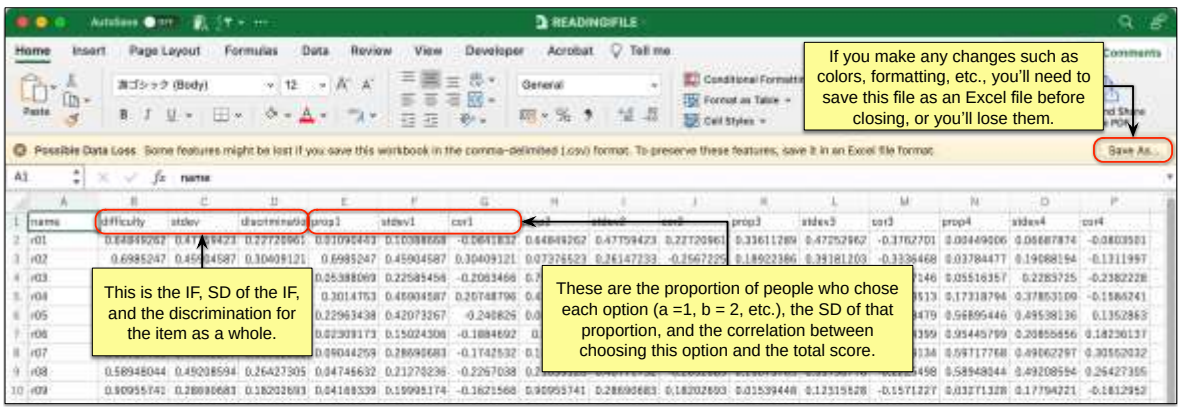
Exporting as a CSV

"CSV" means "comma-separated values," and it's a kind of table that will open in just about anything. It will probably open in Excel by default on your computer. This is the best option if you want to do things like sort the list of items by various metrics. ***NOTE:*** **For you to be able to do this, you had to have clicked the "Save" button when you set up the item analysis. If you didn't, you can re-do the analysis and click the "Save" button. It won't hurt anything.**

1. Click on the name of the item analysis table in the list on the left side of the main jMetrik window.
2. Go to the Manage menu and select "Export Data…"
3. Make sure that the "Variable Names" section has "In first row" selected. (Default)
4. Select where you'd like to save the file, give it a name, and click OK!



5. You can now open the file in Excel. ***NOTE:*** **You will need to save it as an Excel file (.xlsx) if you make any formatting changes, or they will be lost.** Here is how you read the file in Excel:



Conclusion

That's the basics. The program does much, much more, and it's astonishing that it's free. If you continue on the tester's path, I hope you find it useful. I have!