What you should know quantitatively (but were afraid to ask) to become a well-prepared psychometrician!

I separate the quantitative competencies expected for an appropriately trained applied psychometrician into five general categories:

(1) Research design, research methodologies, and basic analytical procedures/statistical analyses. This includes a strong understanding of the General Linear Model and its usage (formulated in matrix terms); the special cases of analysis-of-variance; analysis-of-covariance; and common multiple regression. Also, skills are needed in dealing with repeated measures designs (split-plots, profile analyses, and longitudinal modeling), and the incorporation of categorical data analysis to the level of log-linear models and the various sub-analyses this encompasses.

(2) Principles of psychometrics with a thorough understanding of both classical test theory (CTT) and item-response theory (IRT). Necessary knowledge includes a complete mastery of how test reliability and validity are approached with both CTT and IRT; test equating; differential item functioning; generalizability theory; adaptive testing; cognitive diagnosis; test fairness and bias.

(3) Strong competencies in Applied Multivariate Analysis, including a thorough understanding for the place of factor analysis/structural equation modeling in psychometric applications, along with the matrix analysis skills needed to deal competently with the Singular-Value-Decomposition of a matrix. Additional skills are necessary

in cluster analysis; multidimensional scaling; biplot representations; canonical correlation analysis; correspondence analysis; principal component representations; discrimination and classification; path analysis.

(4) Computational skills and background, including competencies in using all the common commercial software packages (SAS, SPSS, SYSTAT); the usual spreadsheet and database applications (e.g., EXCEL and ACCESS), plus some strong experiences in higher level programming languages such as MATLAB and R. In addition, ability should be present for dealing with graphics (though Adobe ILLUSTRATOR, for example), and to write one's material in the quantitatively-oriented document processing program of LaTeX (and TeX).

(5) An understanding of all phases of testing — construction of tests; administration of tests; and interpretation and use of test results — in their social, cultural, and historical contexts. This issue applies across the range of types of testing contexts, including personality assessment; personnel testing and selection; clinical (psychiatric) assessment; intellective measurement; the setting of standards; instructional and student performance evaluation; neuropsychological evaluations; legal and criminal psychological assessment; child competency evaluation, among many others.