

# Glossary

**1PL.** See *one-parameter logistic model*.

**2PL.** See *two-parameter logistic model*.

**3PL.** See *three-parameter logistic model*.

**ability.** See *latent trait*.

**BCC.** See *boundary characteristic curve*.

**binary item.** A binary item is an item that is scored as either 0 or 1.

**boundary characteristic curve.** A boundary characteristic curve (BCC) expresses the probability of transitioning across a given boundary threshold that separates the ordered item categories into two groups as a function of the latent trait.

**calibration.** The procedure of estimating parameters of an IRT model.

**categorical item.** A categorical item is an item that is either ordinal or nominal.

**category boundary curve.** See *boundary characteristic curve*.

**category boundary location.** See *difficulty*.

**category characteristic curve.** A category characteristic curve (CCC) expresses the probability of a response in a given item category as a function of the latent trait.

**category response function.** See *category characteristic curve*.

**CCC.** See *category characteristic curve*.

**conditional independence.** The assumption that responses are not correlated after controlling for the latent trait.

**dichotomous item.** See *binary item*.

**DIF.** See *differential item functioning*.

**differential item functioning.** Differential item functioning involves evaluating whether a test item behaves differently between groups, after the groups have been matched on the latent trait.

**difficulty.** A level of the latent trait needed to pass an item or an item category.

**discrimination.** A measure of how well an item can distinguish between contiguous latent trait levels near the inflection point of an item characteristic curve.

**empirical Bayes.** In IRT models, empirical Bayes refers to the method of prediction of the latent trait after the model parameters have been estimated. The empirical Bayes method uses Bayesian principles to obtain the posterior distribution of the latent trait. However, instead of assuming a prior distribution for the model parameters, one treats the parameters as given.

**Gauss–Hermite quadrature.** In the context of IRT models, Gauss–Hermite quadrature (GHQ) is a method of approximating the integral used in the calculation of the log likelihood. The quadrature locations and weights for individuals are fixed during the optimization process.

**generalized partial credit model.** The generalized partial credit model (GPCM) is an IRT model for ordinal responses. The categories within each item vary in their difficulty and share the same discrimination parameter.

**GHQ.** See *Gauss–Hermite quadrature*.

**GPCM.** See *generalized partial credit model*.

**graded response model.** The graded response model (GRM) is an extension of the two-parameter logistic model to ordinal responses. The categories within each item vary in their difficulty and share the same discrimination parameter.

**GRM.** See *graded response model*.

**guessing.** The guessing parameter incorporates the impact of chance on an observed response. The parameter lifts the lower asymptote of the item characteristic curve above zero.

**hybrid model.** A hybrid IRT model is a model that performs a single calibration of an instrument consisting of different response formats.

**ICC.** See *item characteristic curve*.

**IIF.** See *item information function*.

**information.** Precision with which an item or an instrument measures the latent trait; also see *item information function* and *test information function*.

**instrument.** A collection of items, usually called a test, a survey, or a questionnaire.

**invariance.** When an IRT model fits the data exactly in the population, then the estimated item parameters should be the same, within sampling error, regardless of what sample the data were derived from, and the estimated person latent traits should be the same regardless of what items they are based on.

**IRT.** See *item response theory*.

**item.** An item is a single question or task on a test or an instrument.

**item characteristic curve.** An item characteristic curve (ICC) expresses the probability for a given response to a binary item as a function of the latent trait.

**item information function.** An item information function (IIF) indicates the precision of an item along the latent trait continuum.

**item location.** Location of an item on the difficulty scale.

**item response function.** See *item characteristic curve*.

**item response theory.** Item response theory (IRT) is a theoretical framework organized around the concept of the latent trait. IRT encompasses a set of models and associated statistical procedures that relate observed responses on an instrument to a person's level of the latent trait.

**latent space.** Number of latent traits that are measured by an instrument. All IRT models described in this manual assume a unidimensional latent space or, in other words, that a single latent trait explains the response pattern.

**latent trait.** A variable or construct that cannot be directly observed.

**local independence.** See *conditional independence*.

**lower asymptote.** See *guessing*.

**MCAGHQ.** See *mode-curvature adaptive Gauss–Hermite quadrature*.

**mean–variance adaptive Gauss–Hermite quadrature.** In the context of IRT models, mean–variance adaptive Gauss–Hermite quadrature (MVAGHQ) is a method of approximating the integral used in the calculation of the log likelihood. The quadrature locations and weights for individuals are updated during the optimization process by using the posterior mean and the posterior standard deviation.

**mode-curvature adaptive Gauss–Hermite quadrature.** In the context of IRT models, mode-curvature adaptive Gauss–Hermite quadrature (MCAGHQ) is a method of approximating the integral used in the calculation of the log likelihood. The quadrature locations and weights for individuals are updated during the optimization process by using the posterior mode and the standard deviation of the normal density that approximates the log posterior at the mode.

**MVAGHQ.** See *mean–variance adaptive Gauss–Hermite quadrature*.

**nominal item.** A nominal *item* is an item scored in categories that have no natural ordering.

**nominal response model.** The nominal response model (NRM) is an IRT model for nominal responses. The categories within each item vary in their difficulty and discrimination.

**NRM.** See *nominal response model*.

**one-parameter logistic model.** The one-parameter logistic (1PL) model is an IRT model for binary responses where items vary in their difficulty but share the same discrimination parameter.

**operating characteristic curve.** See *category characteristic curve*.

**ordinal item.** An ordinal item is an item scored on a scale where a higher score indicates a “higher” outcome.

**partial credit model.** The partial credit model (PCM) is an IRT model for ordinal responses. The categories across all items vary in their difficulty and share the same discrimination parameter.

**PCM.** See *partial credit model*.

**person location.** Location of a person on the latent trait scale.

**polytomous item.** See *categorical item*.

**posterior mean.** In IRT models, posterior mean refers to the predictions of the latent trait based on the mean of the posterior distribution.

**posterior mode.** In IRT models, posterior mode refers to the predictions of the latent trait based on the mode of the posterior distribution.

**quadrature.** Quadrature is a set of numerical methods to evaluate a definite integral.

**rating scale model.** The rating scale model (RSM) is an IRT model for ordinal responses. The categories within each item vary in their difficulty; however, the distances between adjacent difficulty parameters are constrained to be the same across the items. The categories across all items share the same discrimination parameter.

**RSM.** See *rating scale model*.

**slope.** See *discrimination*.

**TCC.** See *test characteristic curve*.

**test characteristic curve.** A test characteristic curve (TCC) is the sum of item characteristic curves and represents the expected score on the instrument.

**test information function** A test information function (TIF) is the sum of item information functions and indicates the precision of the entire instrument along the latent trait continuum.

**three-parameter logistic model.** The three-parameter logistic (3PL) model is an IRT model for binary responses where items vary in their difficulty and discrimination and can share or have their own guessing parameter.

**TIF.** See *test information function*.

**total characteristic curve.** See *test characteristic curve*.

**total information function.** See *test information function*.

**two-parameter logistic model.** The two-parameter logistic (2PL) model is an IRT model for binary responses where items vary in their difficulty and discrimination.

**unidimensionality.** See *latent space*.