Proposed Sources of Cognitive Complexity in Items and Tasks: Mathematics (Summary)

The goals and uses of cognitive complexity are:

- Provide a systematic, replicable method of determining item cognitive complexity
- Provide measurement precision at all levels of the test score scales

Content Complexity

(30% of score)

- Based on typical grade level expectations
- Larger shifts from previously learned content is more complex than small shifts
- Presence of certain mathematical objects and problem structures contribute

Processing Complexity

(30% of score)

Combines these sources in equally weighted

- Stimulus Material
- Response Mode
- Processing Demands

Practices Complexity

(40% of score)

- Based on what students are asked to do with the math content
- Influenced by prompting, level of integration, modeling, and explanations

Stimulus Material

- Low single piece or no stimulus
- Moderate two stimulus pieces or single stimulus and an online tool
- High three stimulus pieces or two stimulus pieces and an online tool

Response Mode

- Low selected response, drag and drop, hot spot, single numeric entry
- Moderate multiple response modes in a single item, graphing tool, equation editor
- High extended responses

Processing Demands

- Determined by linguistic demands and reading load
- Longer items create a higher reading load
- Linguistic demands should be construct relevant

Sources of Cognitive Complexity