PARCC

Partnership for Assessment of Readiness for College and Careers

Implementation of New Illinois Learning Standards – Mathematics with an Eye Toward PARCC utilizing the PLDs.

January 2014

Background on PARCC Mathematics Development

- PARCC states developed Claims for Mathematics based on the Common Core State Standards for Mathematics (CCSSM)
- PARCC states developed the Model Content Frameworks to provide guidance on key elements of excellent instruction aligned with the Standards
- The blueprints for the PARCC Mathematics Assessments were developed using the CCSS, Claims, and Model Content Frameworks
- Cognitive Complexity Framework was developed in partnership with item development contractors
- Phase 1 of item development began in June 2012
- Performance Level Descriptors are drafted

Building on Work to Date

- College-and Career-Ready Determination Policy and Content- & Policy-Level PLDs were adopted in October 2012

Content- and Policy-Level PLDs

- Describe knowledge, skills, and practices students performing at a given performance level are able to demonstrate at any grade level
- Describe educational implications PARCC states would ascribe to students who attain a particular performance level on the PARCC assessments

Subject- and Grade-Specific PLDs

- Describe what students at each performance level know and can do relative to grade-level or course content standards assessed

Building on Work to Date

In October 2012 PARCC established 5 performance levels

- **Level 5**: Students performing at this level demonstrate a **distinguished** command of the knowledge, skills, and practices embodied by the Common Core State Standards assessed at their grade level.
- **Level 4**: Students performing at this level demonstrate a **strong** command…
- **Level 3**: Students performing at this level demonstrate a **moderate** command…
- **Level 2**: Students performing at this level demonstrate a **partial** command…
- **Level 1**: Students performing at this level demonstrate a **minimal** command…

Evidence-Centered Design for the PARCC Assessments

Claims

Design begins with the inferences (claims) we want to make about students.

Evidence

In order to support claims, we must gather evidence.

Tasks

Tasks are designed to elicit specific evidence from students in support of claims.

Evidence-centered design is a deliberate and systematic approach to assessment development that will help to **establish the validity** of the assessments, **increase the comparability** of year-to year results, and **increase efficiencies and reduce costs.**

Claims Driving Design: Mathematics

Master Claim: Students are on-track or ready for college and careers

Sub-claim A: Students **solve problems involving the major content** for their grade level with connections to practices

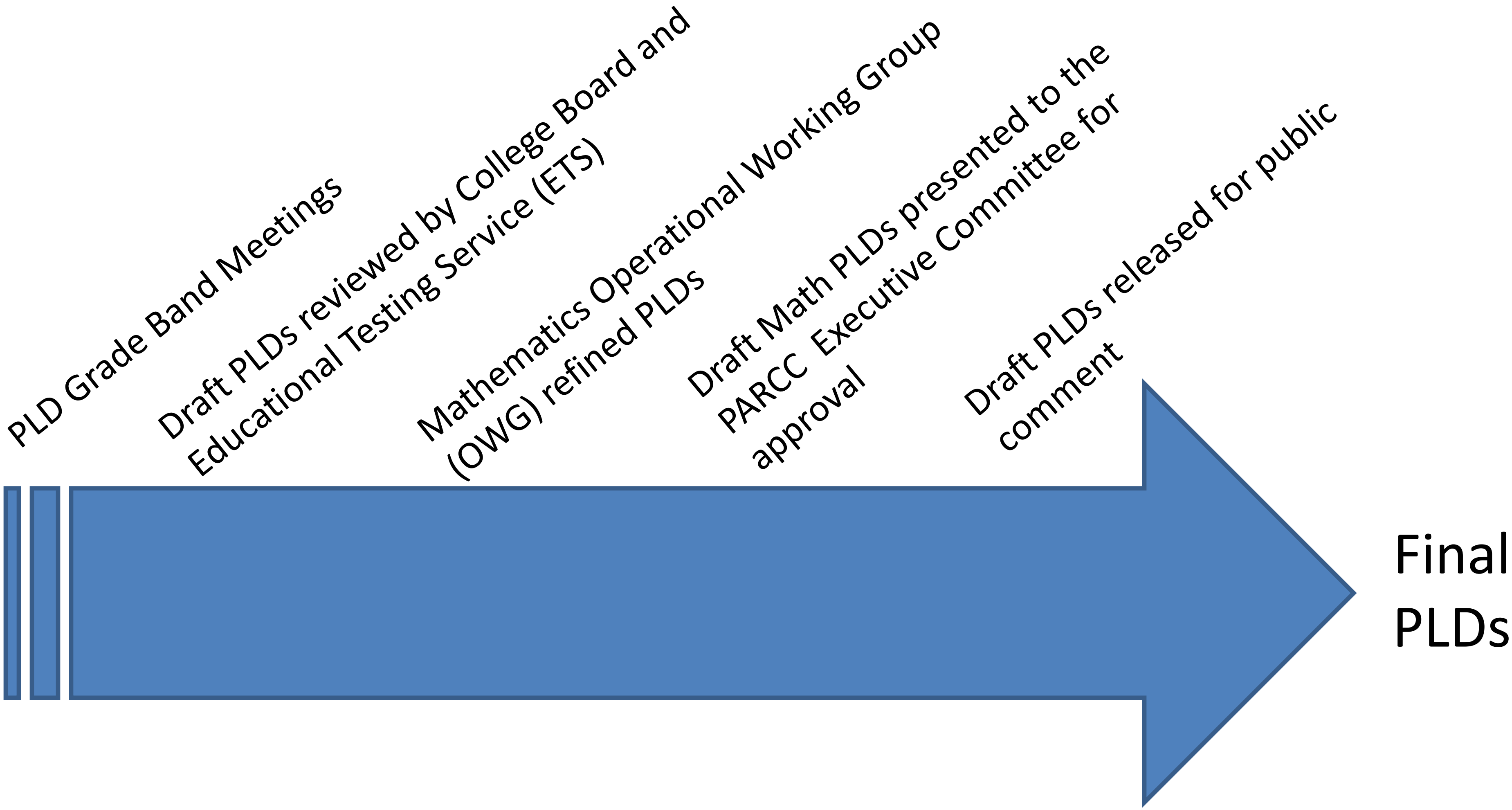
Sub-Claim B: Students **solve problems involving the additional and supporting content** for their grade level with connections to practices

Sub-claim C: Students **express mathematical reasoning** by constructing mathematical arguments and critiques

Sub-Claim D: Students solve real world problems engaging particularly in the **modeling practice**

Sub-Claim E: Student **demonstrate fluency** in areas set forth in the Standards for Content in grades 3-6

PARCC's Process in Developing Performance Level Descriptors



Looking at the PLDs

Gives the PLD by performance level ranging from 2-5. Level 1 indicates a range from no work shown to Minimal command

Gives the Sub-Claim that the PLD is written for (A-Major Content)

Gives the Conceptual Concept the PLD is based on

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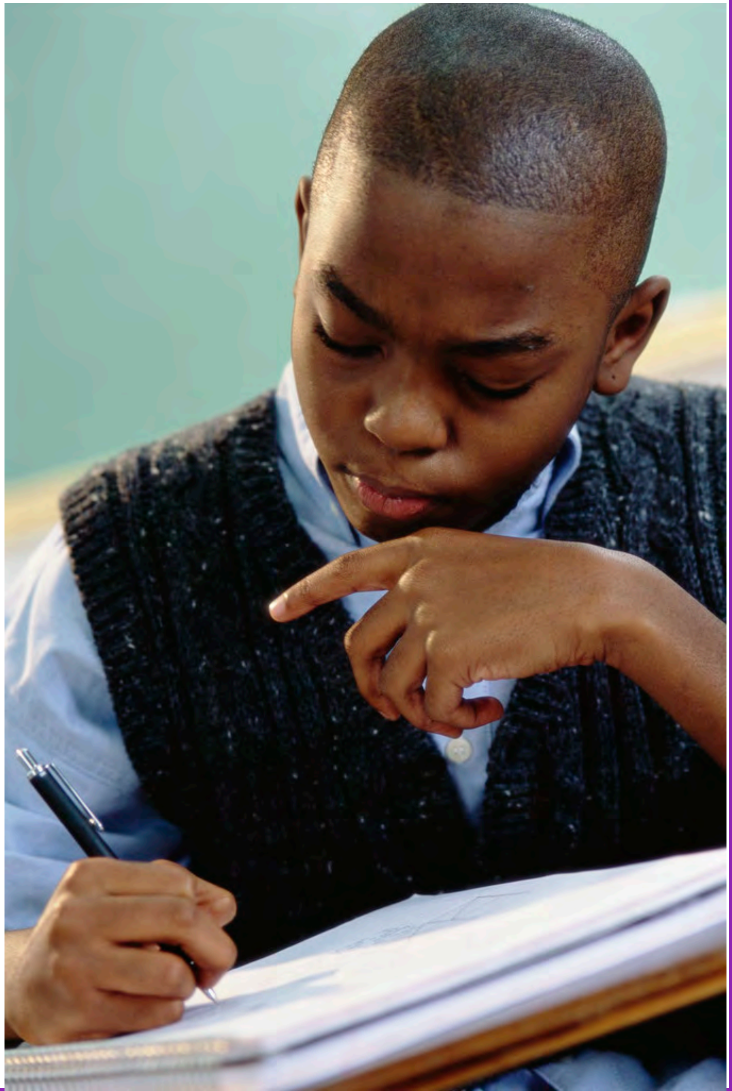
Performance Level Descriptors – Grade 4 Mathematics

	Grade 4 Math : Sub-Claim A The student solves problems involving the Major Content for the grade/course with connections to the Standards for Mathematical Practice.			
	Level 5: Distinguished Command	**Level 4: Strong Command**	**Level 3: Moderate Command**	**Level 2: Partial Command**
Fractions and Decimals 4.NF.1-2 4.NF.2-1 4.NF.A.Int.1 4.NF.5 4.NF.6 4.NF.7	Compares decimals to hundredths; uses decimal notations for fractions (tenths and hundredths); compares fractions, with like or unlike numerators and denominators, by creating equivalent fractions with common denominators, comparing to a benchmark fraction and generating equivalent fractions. Recognizes that decimals and fractions must refer to the same whole in order to compare. Shows results using symbols. Demonstrates the use of conceptual understanding of fractional equivalence and ordering when solving simple word problems requiring fraction	Compares decimals to hundredths; uses decimal notations for fractions (tenths and hundredths); compares fractions, with like or unlike numerators and denominators, by creating equivalent fractions with common denominators, comparing to a benchmark fraction and **generating equivalent fractions.** Recognizes that decimals and fractions must refer to the same whole in order to compare. Shows results using symbols. **Demonstrates the use of conceptual understanding of fractional equivalence and ordering when solving** simple word problems requiring fraction	Given a visual model and/or manipulatives, compares decimals to hundredths; uses decimal notations for fractions (tenths and hundredths); compares fractions, with like or unlike numerators and denominators, by creating **equivalent fractions with common denominators and** comparing to a benchmark fraction. Recognizes that decimals and fractions must refer to the same whole in order to compare. Shows results using symbols. **Solves simple word problems requiring fraction comparison.**	Given a visual model and/or manipulatives, compares decimals to hundredths; uses decimal notations for fractions (tenths and hundredths); compares fractions, with like or unlike numerators and denominators by comparing to a benchmark fraction. Recognizes that decimals and fractions must refer to the same whole in order to compare. Shows results using symbols. Solves simple word problems requiring fraction comparison with scaffolding.

Staying True to the Common Core State Standards

PLD writers wanted to stay true to the CCSS and therefore the PLDs are representative of this effort



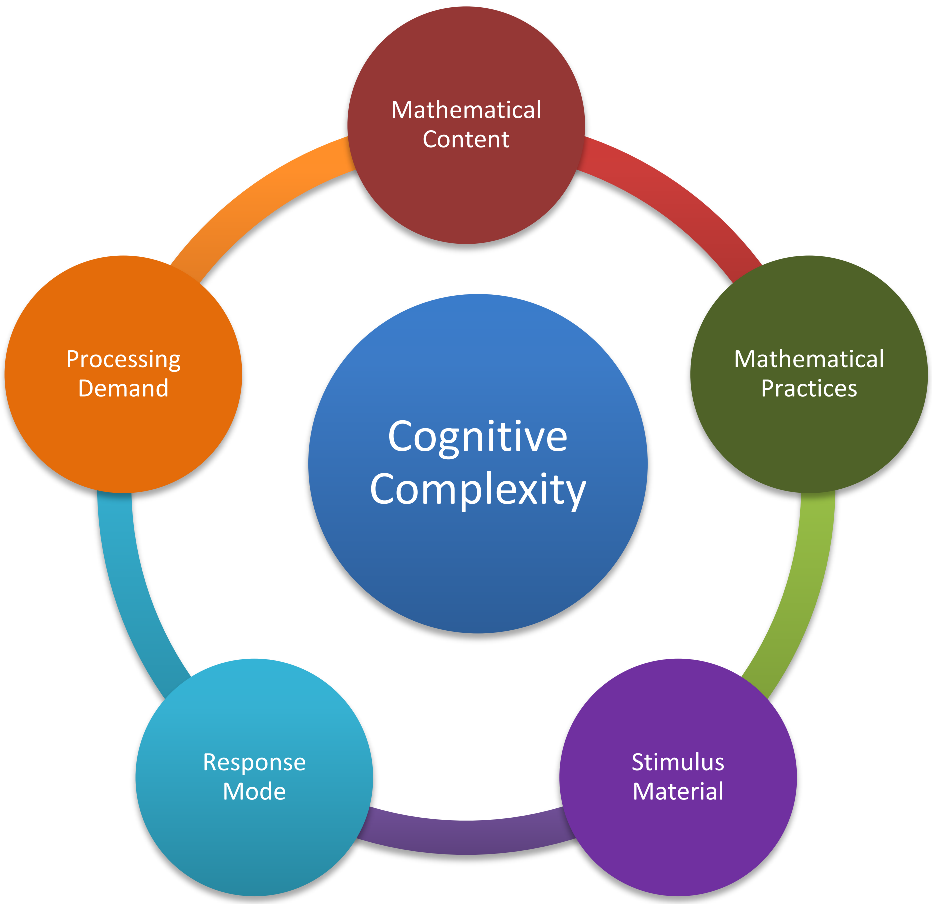
Capturing What Students Can Do

PARCC PLDs

- capture how **all** students perform
- show understandings and skill development across the spectrum of standards and complexity levels assessed

Factors that determine the performance levels (Cognitive Complexity)

1. Mathematical Content
2. Mathematical Practices
3. Stimulus Material
4. Response Mode
5. Processing Demand



For further reading on the PARCC Cognitive Complexity Framework see, " **Proposed Sources of Cognitive Complexity in PARCC Items and Tasks: Mathematics** " Aug. 31, 2012

Lin's Bike Ride

- Take a moment to answer these questions mathematically:

Lin rode a bike 20 miles in 150 minutes. If she rode at a constant speed,

- a. How far did she ride in 15 minutes?
- b. How long did it take her to ride 6 miles?
- c. How fast did she ride in miles per hour?
- d. What was her pace in minutes per mile?

Lin’s Bike Ride

- Now, we are going to look at this problem through the cognitive complexity framework

Lin rode a bike 20 miles in 150 minutes. If she rode at a constant speed,

- a. How far did she ride in 15 minutes?
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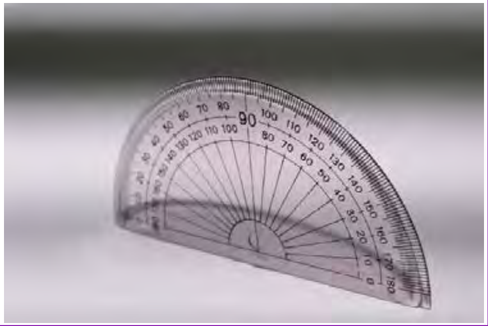
1. Mathematical Content

At each grade level, there is a range in the level of demand in the content standards--from low to moderate to high complexity. Within Mathematical Content, complexity is affected by:

- Numbers: Whole numbers vs. fractions
- Expressions and Equations: The types of numbers or operations in an expression or equation (3/7, √)
- Diagrams, graphs, or other concrete representations: may contribute to greater overall complexity than simpler graphs such as scatterplots.
- Problem structures: Word problems with underlying algebraic structures vs. word problems with underlying arithmetic structures.



2. Mathematical Practices

MPs involve what students are asked to do with mathematical content, such as engage in application and analysis of the content. The actions that students perform on mathematical objects also contribute to Mathematical Practices complexity.

Low Complexity

- Items at this level primarily involve recalling or recognizing concepts or procedures specified in the Standards.

High Complexity

- High complexity items make heavy demands on students, because students are expected to use reasoning, planning, synthesis, analysis, judgment, and creative thought. They may be expected to justify mathematical statements or construct a formal mathematical argument.

3. Stimulus Material

This dimension of cognitive complexity accounts for the number of different pieces of stimulus material in an item, as well as the role of technology tools in the item.

Low Complexity

- Low complexity involves a single piece of (or no) stimulus material (e.g., table, graph, figure, etc.) OR single online tool (generally, incremental technology)

High Complexity

- High complexity involves two pieces of stimulus material with online tool(s) OR three pieces of stimulus material with or without online tools.

4. Response Mode

The way in which examinees are required to complete assessment activities influences an item's cognitive complexity.

- **Low cognitive complexity** response modes in mathematics involve primarily selecting responses and producing short responses, rather than generating more extended responses.

- **High Complexity** response modes require students to construct extended written responses that may also incorporate the use of online tools such as an equation editor, graphing tool, or other online feature that is essential to responding.

5. Processing Demand

Reading load and linguistic demands in item stems, instructions for responding to an item, and response options contribute to the cognitive complexity of items.

Ty's Escalator

- Do it on your own.
- Go through and decide the complexity level for each of the five dimensions.

Look at Student Work

- Decide where each student falls on the PLDs
- What are the limitations of the item in determining student performance levels?

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