MATHEMATICS

PENNSYLVANIA Standards

DECONSTRUCTED for CLASSROOM IMPACT

SAMPLER

7 SEVENTH GRADE

Collaborative, Inc.
Supporting Today's Educators, Shaping Tomorrow's Leaders

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Introduction

C2 Collaborative is pleased to offer this grade-level tool for educators who are teaching with the Pennsylvania Common Core Standards.

The Pennsylvania Common Core Standards Deconstructed for Classroom Impact is designed for educators by educators as a two-pronged resource and tool 1) to help educators increase their depth of understanding of the Pennsylvania Common Core Standards and 2) to enable teachers to plan College & Career Ready curriculum and classroom instruction that promotes inquiry and higher levels of cognitive demand.

What we have done is not all new. This work is a purposeful and thoughtful compilation of preexisting materials in the public domain, state department of education websites, and original work by the C2 Collaborative. Among the works that have been compiled and/or referenced are the following: Pennsylvania Common Core Standards, Common Core State Standards for Mathematics and the Appendix from the Common Core State Standards Initiative; Learning Progressions from The University of Arizona's Institute for Mathematics and Education, chaired by Dr. William McCallum; the Arizona Academic Content Standards; the North Carolina Instructional Support Tools; and numerous math practitioners currently in the classroom.

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We hope you will find the concentrated and consolidated resource of value in your own planning. We also hope you will use this resource to facilitate discussion with your colleagues and, perhaps, as a lever to help assess targeted professional learning opportunities.

Understanding the Organization

The Overview acts as a quick-reference table of contents as it shows you each of the domains and related clusters covered in this specific grade-level booklet. This can help serve as a reminder of what clusters are part of which domains and can reinforce the specific domains for each grade level.

Key Changes identifies what has been moved to and what has been moved from this particular grade level, as appropriate. This section also includes **Critical Areas of Focus**, which is designed to help you begin to approach how to examine your curriculum, resources, and instructional practices. A review of the **Critical Areas of Focus** might enable you to target specific areas of professional learning to refresh, as needed.

Math Fluency Standards	
K	Add/subtract within 5
1	Add/subtract within 10
2	Add/subtract within 20 Add/subtract within 100 (pencil & paper)
3	Multiply/divide within 100 Add/subtract within 1000
4	Add/subtract within 1,000,000
5	Multi-digit multiplication
6	Multi-digit division Multi-digit decimal operations
7	Solve $px + q = r$, $p(x + q) = r$
8	Solve simple 2 x 2 systems by inspection

For each domain is the domain itself and the associated clusters. Within each domain are sections for each of the associated clusters. The cluster-specific content can take you to a deeper level of understanding. Perhaps most importantly, we include here the **Learning Progressions.** The **Learning Progressions** provide context for the current domain and its related standards. For any grade except Kindergarten, you will see the domain-specific standards for the current grade in the center column. To the left are the domain-specific standards for the preceding grade and to the right are the domain-specific standards for the following grade. Combined with the **Critical Areas of Focus,** these Learning Progressions can assist you in focusing your planning.

For each cluster, we have included four key sections: Description, Big Idea, Academic Vocabulary, and Deconstructed Standard.

The cluster **Description** offers clarifying information, but also points to the **Big Idea** that can help you focus on that which is most important for this cluster within this domain. The **Academic Vocabulary** is derived from the cluster description and serves to remind you of potential challenges or barriers for your students.

Each standard specific to that cluster has been deconstructed. There **Deconstructed Standard** for each standard specific to that cluster and each **Deconstructed Standard** has its own subsections, which can provide you with additional guidance and insight as you plan. Note the deconstruction drills down to the sub-standards when appropriate. These subsections are:

- Standard Statement
- Standard Description
- Essential Question(s)
- Mathematical Practice(s)
- DOK Range Target for Learning and Assessment
- Learning Expectations
- Explanations and Examples

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As noted, first are the **Standard Statement** and **Standard Description**, which are followed by the **Essential Question(s)** and the associated **Mathematical Practices**. The **Essential Question(s)** amplify the **Big Idea**, with the intent of taking you to a deeper level of understanding; they may also provide additional context for the **Academic Vocabulary**.

The **DOK Range Target for Learning and Assessment** remind you of the targeted level of cognitive demand. The **Learning Expectations** correlate to the DOK and express the student learning targets for student proficiency for KNOW, THINK, and DO, as appropriate. In some instances, there may be no learning targets for student proficiency for one or more of KNOW, THINK or DO. The learning targets are expressions of the deconstruction of the Standard as well as the alignment of the DOK with appropriate consideration of the Essential Questions.

The last subsection of the **Deconstructed Standard** includes **Explanations and Examples**. This subsection might be quite lengthy as it can include additional context for the standard itself as well as examples of what student work and student learning could look like. **Explanations and Examples** may offer ideas for instructional practice and lesson plans.

SEVENTH GRADE

LEXILE GRADE LEVEL BANDS: 970L TO 1120L

OVERVIEW

2.1 Numbers and Operations

D. Ratios ad Proportional Relationships

- Understand ratio concepts and use ratio reasoning to solve problems.

2.1 Numbers and Operations

E. The Number System

- Apply and extend previous understandings of multiplication and division to divide fractions by fractions.
- Compute fluently with multi-digit numbers and find common factors and multiples.
- Apply and extend previous understandings of numbers to the system of rational numbers

2.2 Algebraic Concepts

B. Expressions and Equations

- Apply and extend previous understandings of arithmetic to algebraic expressions.
- Reason about and solve one-variable equations and inequalities.
- Represent and analyze quantitative relationships between dependent and independent variables

2.3 Geometry

A. Geometry

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

2.4 Measurement, Data and Probability

B. Statistics and Probability

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use, and evaluate probability models.

Mathematical Practices (MP)

MP 1. Make sense of problems and persevere in solving them.

MP 2. Reason abstractly and quantitatively.

MP 3. Construct viable arguments and critique the reasoning of others.

MP 4. Model with mathematics.

MP 5. Use appropriate tools strategically.

MP 6. Attend to precision.

MP 7. Look for and make use of structure.

MP 8. Look for and express regularity in repeated reasoning.

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D. RATIOS AND PROPORTIONAL RELATIONSHIPS

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CC.2.1.7.D.1	**Analyze proportional relationships and use them to solve real-world and mathematical problems.**
BIG IDEA	• Numbers are compared by their relative value.
ACADEMIC VOCABULARY	unit rates, ratios, proportional relationships, proportions, constant of proportionality, complex fractions

STANDARD AND DECONSTRUCTION

CC.2.1.7.D.1	**Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction 1/2 / 1/4 miles per hour, equivalently 2 miles per hour.**
DESCRIPTION	Students continue to work with unit rates from 6th grade; however, the comparison now includes fractions compared to fractions. The comparison can be with like or different units. Fractions may be proper or improper. Example 1: If $\frac{1}{2}$ gallon of paint covers $\frac{1}{6}$ of a wall, then how much paint is needed for the entire wall? *Solution:* $\frac{1}{2}$ gal / $\frac{1}{6}$ wall. 3 gallons per 1 wall

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ESSENTIAL QUESTION(S)	How can ratio and rate reasoning be used to efficiently solve real world problems?		
MATHEMATICAL PRACTICE(S)	7.MP.2. Reason abstractly and quantitatively. 7.MP.6. Attend to precision.		
DOK Range Target for Instruction & Assessment	☒ 1 ☒ 2 ☐ 3 ☐ 4		
Instructional Targets	**Know: Concepts/Skills**	**Think**	**Do**
Assessment Types	Tasks assessing concepts, skills, and procedures.	Tasks assessing expressing mathematical reasoning.	Tasks assessing modeling/applications.
Students should be able to:	Compute unit rates associated with ratios of fractions in like or different units.	Evaluate expressions using the order of operations (including using parentheses, brackets, or braces).	

EXPLANATIONS AND EXAMPLES

The really nice thing about this standard is that students won't be as tempted to ask, "Why do I need to know this?" The standard is all about real world situations: taxes, tips, sports, cooking, shopping, building, scientific principles, other mathematical principles... and much, much more. The following examples will demonstrate how those real world problems should look as you provide students opportunities to explore concepts related to the content standard using the mathematical process standards.

A variety of visual tools will help your students understand the relationship between ratios and proportional rates in multistep problems. Examples of visuals include tables, double number lines, graphs, and tape diagrams.

Table:

(Consider also using a function table.)

Consider the following problems (MP4,5,7,8):

"If a recipe for a dozen cookies calls for $\frac{1}{4}$ cup of brown sugar and $\frac{1}{2}$ cup of white sugar, how much brown sugar will you need for 5 dozen cookies?"

***The table allows students to see that for 5 dozen cookies, you will need $1\frac{1}{4}$ cups of brown sugar in order to bake 5 dozen cookies. This answer demonstrates the idea of equivalency within rates.**

"What is the equivalent unit rate of $\frac{1/4}{1/2}$ of cup of white sugar?"

***The table shows that $\frac{1}{2}$ cup of brown sugar is needed per cup of white sugar.**

Tables: Ratio of Amount of Brown Sugar to Amount of White Sugar Per Dozen as a Proportional Rate

Dozens	1 dozen	2 dozen	3 dozen	4 dozen	5 dozen
Cups Brown Sugar	$\frac{1}{4}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{4}{4}$ (1)	$\frac{5}{4}$
Cups White Sugar	$\frac{1}{2}$	$\frac{2}{2}$ (1)	$\frac{3}{2}$	$\frac{4}{2}$ (2)	$\frac{5}{2}$

Dozens	Cups of Brown Sugar	Cups of White Sugar
1	$\frac{1}{4}$	$\frac{1}{2}$
2	$\frac{1}{2}$	$\frac{2}{2}$
3	$\frac{3}{4}$	$\frac{3}{3}$
4	$\frac{4}{4}$	$\frac{4}{3}$
5	$\frac{5}{4}$	$\frac{5}{3}$

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B. EXPRESSIONS AND EQUATIONS

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CC.2.2.7.B.1	**Apply properties of operations to generate equivalent expressions.**
BIG IDEA	**There are infinite ways to express a number or expression.**
ACADEMIC VOCABULARY	coefficients, like terms, distributive property, factor

STANDARD AND DECONSTRUCTION

CC.2.2.7.B.1	**Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.**
DESCRIPTION	This is a continuation of work from 6th grade using properties of operations and combining like terms. Students apply properties of operations and work with rational numbers (integers and positive / negative fractions and decimals) to write equivalent expressions.

Example 1:

What is the length and width of the rectangle below?

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Solution:

The Greatest Common Factor (GCF) is 2, which will be the width because the width is in common to both rectangles. To get the area 2a multiply by a, which is the length of the first rectangles. To get the area of 4b, multiply by 2b, which will be the length of the second rectangle. The final answer will be 2(a + 2b).

Example 2:

Write an equivalent expression for 3(x + 5) – 2.

Solution:

3x + 15 – 2 Distribute the 3

3x + 13 Combine like terms

ESSENTIAL QUESTION(S)	What strategies can be applied to add, subtract, factor and expand linear equations?
MATHEMATICAL PRACTICE(S)	7.MP.2. Reason abstractly and quantitatively. 7.MP.6. Attend to precision. 7.MP.7. Look for and make use of structure.
DOK Range Target for Instruction & Assessment	☒ 1 ☒ 2 ☐ 3 ☐ 4

Instructional Targets	**Know: Concepts/Skills**	**Think**	**Do**
Assessment Types	Tasks assessing concepts, skills, and procedures.	Tasks assessing expressing mathematical reasoning.	Tasks assessing modeling/applications.
Students should be able to:	Combine like terms with rational coefficients. Factor and expand linear expressions with rational coefficients using the distributive property.	Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.	

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EXPLANATIONS AND EXAMPLES

Examples:

- Write an equivalent expression for $3(x + 5) - 2$.
- Suzanne thinks the two expressions $2(3a - 2) + 4a$ and $10a - 2$ are equivalent? Is she correct? Explain why or why not?
- Write equivalent expressions for: $3a + 12$.

Possible solutions might include factoring as in $3(a + 4)$, or other expressions such as $a + 2a + 7 + 5$.

A rectangle is twice as long as wide. One way to write an expression to find the perimeter would be $w + w + 2w + 2w$. Write the expression in two other ways.

Solution: $6w$ or $2(w) + 2(2w)$.

- An equilateral triangle has a perimeter of $6x + 15$. What is the length of each of the sides of the triangle?

Solution: $3(2x + 5)$, therefore each side is $2x + 5$units long.

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