6/1/2013

NORTH SMITHFIELD SCHOOL DEPARTMENT

MATHEMATICS CURRICULUM GRADE 6

North Smithfield Middle School
Curriculum Writers: Catherine Jalbert and Diane Turcotte

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This curriculum was developed based on the Common Core State Standards utilizing examples and strategies from various websites including Tucson, Arizona, Ohio, and New Jersey.

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The North Smithfield Mathematics Curriculum for grades K-12 was completed in June 2013 by a K-12 team of teachers. The team, identified as the Mathematics Task Force and Mathematics Curriculum Writers referenced extensive resources to design the document that included:

- *Common Core State Standards for Mathematics*
- *Common Core State Standards for Mathematics, Appendix A*
- *Best Practice, New Standards for Teaching and Learning in America's Schools*
- *Classroom Instruction That Works,* Marzano
- Differentiated Instructional Strategies
- Goals for the district
- High School Traditional Plus Model Course Sequence, Achieve, Inc.
- Khan Academy
- Numerous state curriculum Common Core frameworks, e.g. Ohio Department of Education (ODE), Tucson Unified School District, Arizona (TUSD), New Jersey and Connecticut
- PARCC Model Content Frameworks
- The Illustrative Mathematics Project
- Third International Mathematics and Science TIMSS)
- *Understanding Common Core State Standards, Kendall*

Mission Statement

To foster the success of all students, our mission is to engage them in a challenging mathematics curriculum, driven by standards-based instruction and focused on mathematical practices, skills, concepts, and problem solving.

The North Smithfield Mathematics Curriculum identifies what students should know and be able to do in mathematics. Each grade or course includes Common Core State Standards (CCSS), grade level Assessment problems, teacher notes, best practice instructional strategies, resources, a map (or suggested timeline), rubrics, checklists, and common formative and summative assessments.

COMMON CORE STATE STANDARDS

The **Common Core State Standards** (**CCSS):**

- Are fewer, higher, deeper, and clearer.
- Are aligned with college and workforce expectations.
- Include rigorous content and applications of knowledge through high-order skills.
- Build upon strengths and lessons of current state standards (GLEs and GSEs).
- Are internationally benchmarked, so that all students are prepared for succeeding in our global economy and society.
- Are research and evidence-based.

Common Core State Standards components include:

- Standards for **Mathematical Practice** (K-12)
- Standards **for Mathematical Content:**
  - Categories (high school only): e.g. numbers, algebra, functions, data
  - Domains: larger groups of related standards
  - Clusters: groups of related standards
  - Standards**:** define what students should understand and are able to do

The **North Smithfield Common Core Mathematics Curriculum** provides all students with a sequential comprehensive education in mathematics through the study of:

- Standards **for Mathematical Practice (K-12)**
  - Make sense of problems and persevere in solving them
  - Reason abstractly and quantitatively
  - Construct viable Argument and critique the reasoning of others
  - Model with mathematics*
  - Use appropriate tools strategically
  - Attend to precision
  - Look for and make use of structure
  - Look for and express regularity in repeated reasoning

- Standards **for <u>Mathematical Content</u>:**
  - **K – 5 Grade Level Domains of**
    - Counting and Cardinality
    - Operations and Algebraic Thinking
    - Number and Operations in Base Ten
    - Number and Operations – Fractions
    - Measurement and Data
    - Geometry
  - **6-8 Grade Level Domains of**
    - Ratios and Proportional Relationships
    - The Number System
    - Expressions and Equations
    - Functions
    - Geometry
  - **9-12 Grade Level Conceptual Categories of**
    - Number and Quantity
    - Algebra
    - Functions
    - Modeling
    - Geometry
    - Statistics and Probability

RESEARCH-BASED INSTRUCTIONAL STRATEGIES

The North Smithfield Common Core Mathematics Curriculum provides a list of research-based **best practice instructional strategies** that the teacher may model and/or facilitate. It is suggested the teacher:

- Use **formative assessment to** guide instruction
- Use ***Classroom Instruction That Works*** (Marzano)
  - Setting objectives and providing feedback
  - Reinforcing effort and providing recognition
  - Cooperative learning
  - Cues, questions, and advance organizers
  - Nonlinguistic representations
  - Summarizing and note taking
  - Assigning homework and providing practice
  - Identifying similarities and differences
  - Generating and testing hypotheses
- Provide opportunities for **independent, partner** and **collaborative group work**
- Differentiate **instruction** by varying the **content, process, and product** and providing opportunities for:
  - anchoring
  - cubing
  - jig-sawing
  - pre/post assessments
  - tiered assignments
- Address **multiple intelligences** instructional strategies, e.g. visual, bodily kinesthetic, interpersonal
- Provide opportunities for **higher level thinking: Webb's Depth of Knowledge, 2,3,4,** skill/conceptual understanding, strategic reasoning, extended reasoning
- Facilitate the integration of **Mathematical Practices** in all content areas of mathematics
- Provide **rubrics** and **models**

- Facilitate integration of the **Applied Learning Standards (SCANS):**
  - communication
  - critical thinking
  - problem solving
  - reflection/evaluation
  - research
- Employ strategies of "best practice" (student-centered, experiential, holistic, authentic, expressive, reflective, social, collaborative, democratic, cognitive, developmental, constructivist/heuristic, and challenging)
- Address **multiple intelligences** and brain dominance (spatial, bodily kinesthetic, musical, linguistic, intrapersonal, interpersonal, mathematical/logical, and naturalist)
- Employ **mathematics best practice strategies** e.g.
  - using manipulatives
  - facilitating cooperative group work
  - discussing mathematics
  - questioning and making conjectures
  - justifying of thinking
  - writing about mathematics
  - facilitating problem solving approach to instruction
  - integrating content
  - using calculators and computers
  - facilitating learning
  - using assessment to modify instruction

COMMON ASSESSMENTS

The North Smithfield Common Core Mathematics Curriculum includes common assessments. Required (red ink) indicates the assessment is required of all students e.g. common tasks/units**,** standardized mid-term exam, standardized final exam.

- **REQUIRED** COMMON ASSESSMENTS
  - MID-TERM EXAM
  - FINAL EXAM
  - COMMON PROBLEMS/UNITS
- **Common Instructional Assessments (I)** - used by teachers and students during the instruction of CCSS.
- **Common Formative Assessments (F)** - used to measure how well students are mastering the content standards **before** taking state assessments
  - teacher and student use to make decisions about what actions to take to promote further learning
  - on-going, dynamic process that involves far more frequent testing
  - serves as a practice for students
- **Common Summative Assessment (S**) - used to measure the level of student, school, or program success
  - make some sort of judgment, e.g. what grade
  - program effectiveness
  - e.g. state assessments (AYP), mid-year and final exams
- Additional suggested assessments include:
  - Anecdotal records
  - Conferencing
  - Exhibits
  - Interviews
  - Graphic organizers
  - Journals
  - Mathematical Practices
  - Modeling
  - Multiple Intelligences assessments, e.g.
    - Role playing - bodily kinesthetic
    - Graphic organizing - visual
    - Collaboration - interpersonal
  - Oral presentations
  - Problem/Performance based/common tasks
  - Rubrics/checklists (mathematical practice, modeling)
  - Tests and quizzes
  - Technology
  - Think-alouds
  - Writing genres
    - Argument
    - Informative
    - Research

RESOURCES FOR Grade 6 Mathematics

Textbooks

Exploration in Core Math , Holt Mc Dougal
Holt Grade 6 Mathematics

Supplementary

Technology

- Calculators
- Computer lab
- Computers
- Document camera
- Graphing calculator
- Interactive boards
- LCD projectors
- Overhead graphing scientific
- Student response systems

Websites

- http://curriculum.northsmithfieldschools.com
- http://www.achieve.org/http://my.hrw.com
- http://www.illustrativemathematics.org/standards/practice
- http://www.ixl.com/standards/common-core/math/grade-8
- http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1
- http://www.ode.state.or.us/search/page/?id=3747
- http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S
- http://www.schools.utah.gov/CURR/mathsec/Core.aspx
- http://www.tusd1.org/contents/distinfo/curriculum/index.asp
- www.commoncore.org/maps
- www.corestandards.org
- www.khanacademy.com
- www.ride.ri.gov

Materials

- 100 grids (10 x 10) for modeling percents
- Algebra tiles
- Assorted fraction models
- Bar Models – for example, 4 red bars to 6 blue bars as a visual representation of a ratio and then expand the number of bars to show other equivalent ratios
- Base 10 blocks
- Conversion charts
- Decimal charts
- Decimal flip chart
- Equivalent fraction charts
- Fraction bars
- Graph paper
- Graphic organizers as tools for connecting various representations
- Isometric graph paper
- Meter/yard stick
- Models for Multiplying and Dividing Fractions
- Number lines (deimals, modeling of multiplication)
- Online algebra tiles that can be used to represent expressions and equations.
- Paper 3-D figures
- Protractors
- Ratio tables – to use for proportional reasoning
- Rulers
- Solid 3-D figures
- Tangram
- Tape measures
- Two color counters

MATHEMATICS CURRICULUM Grade 6

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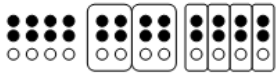
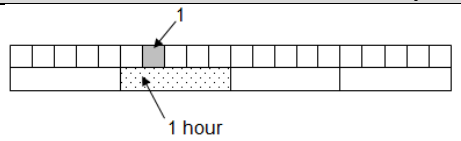
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

RATIOS AND PROPORTIONAL RELATIONSHIPS (6.RP)
 	
Understand ratio concepts and use ratio reasoning to solve problems.
 	
Use **Mathematical Practices** to
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable Argument and critique the reasoning of others
4. Model with mathematics ★
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning
	M	Students
		
		6.RP.1 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. Major content
		• *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*
		
		Essential questions
		• *What are the 3 different notations to represent a ratio?*
		• *What is the difference between a fraction and a ratio?*
		
		Essential knowledge and skills
		• A ratio is a comparison of two quantities, which can be written using three different notations; a to b, $\frac{a}{b}$, or a:b.
		• A ratio is a comparison of two quantities (by division) and usually represents a part-to-part comparison.
		• A fraction is usually a part to whole comparison or represents a division problem.
		• A rate is a comparison of two quantities measured in two different units
		
		Teaching Examples:
		• A ratio is a comparison of two quantities which can be written as a to b, $\frac{a}{b}$, or a:b.
		• A rate is a ratio where two measurements are related to each other. When discussing measurement of different units, the word rate is used rather than ratio. Understanding rate, however, is complicated and there is no universally accepted definition. When using the term rate, contextual understanding is critical. Students need many opportunities to use models to demonstrate the relationships between quantities before they are expected to work with rates numerically.
		• A comparison of 8 black circles to 4 white circles can be written as the ratio of 8:4 and can be regrouped into 4 black circles to 2 white circles (4:2) and 2 black circles to 1 white circle (2:1).
		
		Academic vocabulary
		• Fraction
		• Denominator
		• Numerator
		• Quantity
		• Rate
		• Ratio
		
		Mathematical Practices
		• Reason abstractly and quantitatively
		• Attend to precision
			TEACHER NOTES
			
			See instructional strategies in the introduction
			
			• *Expectations for unit rates in this grade are limited to non-complex fractions*
			
			• *Proportional reasoning is a process that requires instruction and practice. It does not develop over time on its own. Grade 6 is the first of several years in which students develop this multiplicative thinking. Examples with ratio and proportion must involve measurements, prices and geometric contexts, as well as rates of miles per hour or portions per person within contexts that are relevant to sixth graders. Experience with proportional and nonproportional relationships, comparing and predicting ratios, and relating unit rates to previously learned unit fractions will facilitate the development of proportional reasoning. Although algorithms provide efficient means for finding solutions, the cross-product algorithm commonly used for solving proportions will not aid in the development of proportional reasoning. Delaying the introduction of rules and algorithms will encourage thinking about multiplicative situations instead of indiscriminately*
				RESOURCE NOTES
				
				See resources in the introduction
				
				Textbooks
				• *Exploration in Core Math* , Holt Mc Dougal
				• *Holt Grade 6 Mathematics*
				
				Supplementary Books, Teacher (T) Student (S)
				•
				
				Technology
				• Computers
				• LCD projectors
				• Interactive boards
				
				Websites
				• http://curriculum.northsmithfieldschools.com
				• http://www.achieve.org/http://my.hrw.com
				• http://www.illustrativemathematics.org/standards/practice
				• http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1
				• http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S
				• http://www.tusd1.org/contents/distinfo/curriculum/index.asp
				• www.commoncore.org/maps
				• www.corestandards.org
				• www.khanacademy.com
				• www.ride.ri.gov
				
				Materials
				• 100 grids (10 x 10) for modeling percents
				• Ratio tables – to use for proportional
					ASSESSMENT NOTES
					
					See assessments in the introduction
					
					REQUIRED COMMON ASSESSMENTS
					• MID-TERM EXAM
					• FINAL EXAM
					• COMMON PROBLEMS/UNITS
					
					SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS
					
					• Anecdotal records
					• Conferencing
					• Exhibits
					• Interviews
					• Graphic organizers
					• Journals
					• Mathematical Practices
					• Modeling ★
					• Multiple Intelligences assessments, e.g.
					  ▫ Role playing - bodily kinesthetic
					  ▫ Graphic organizing - visual
					  ▫ Collaboration - interpersonal

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

	M	 (TUSD)
		
		6.RP.2 Understand the concept of a unit rate a/b associated with a ratio a:b with b ≠ 0, and use rate language in the context of a ratio relationship.
		• *For example, "This recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is 3/4 cup of flour for each cup of sugar." "We paid $75 for 15 hamburgers, which is a rate of $5 per hamburger."* Major content
		
		Essential question
		• *How do you compute a unit rate given a comparison of two quantities?*
		Essential knowledge and skills
		• Unit rate is the quotient of a ratio in terms of "per item" or "for each".
		Teaching Examples:
		• A unit rate compares a quantity in terms of one unit of another quantity. Students will often use unit rates to solve missing value problems.
		• In Grade 6, students are not expected to work with unit rates expressed as complex fractions. Both the numerator and denominator of the original ratio will be whole numbers.
		Examples
		• On a bicycle you can travel 20 miles in 4 hours. What are the unit rates in this situation, (the distance you can travel in 1 hour and the amount of time required to travel 1 mile)?
		• Solution: You can travel 5 miles in 1 hour written as $\frac{5\,mi}{1\,hr}$ and it takes $\frac{1}{5}$ of a hour to travel each mile written as $\frac{\frac{1}{5}\,hr}{1\,mi}$. Students can represent the relationship between 20 miles and 4 hours.
		
		Academic vocabulary
		• Unit rate
		
		Mathematical Practices
		• Reason abstractly and quantitatively
		• Attend to precision
			applying rules.
			• *Students develop the understanding that ratio is a comparison of two numbers or quantities. Ratios that are written as part-to-whole are comparing a specific part to the whole. Fractions and percents are examples of part-to-whole ratios. Fractions are written as the part being identified compared to the whole amount. A percent is the part identified compared to the whole (100). Provide students with multiple examples of ratios, fractions and percents of this type. For example, the number of girls in the class (12) to the number of students in the class (28) is the ratio 12 to 28.*
			Percents are often taught in relationship to learning fractions and decimals. This cluster indicates that percents are to be taught as a special type of rate. Provide students with opportunities to find percents in the same ways they would solve rates and proportions. ((ODE)
				reasoning
				• Bar Models – for example, 4 red bars to 6 blue bars as a visual representation of a ratio and then expand the number of bars to show other equivalent ratios
					• Oral presentations
					• Problem/Performance based/common tasks
					• Rubrics/checklists (mathematical practice)
					• Tests and quizzes
					• Technology
					• Think-alouds
					• Writing genres
					  Argument
					  Informative
					  Research

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		 • A simple modeling clay recipe calls for 1 cup corn starch, 2 cups salt, and 2 cups boiling water. How many cups of corn starch are needed to mix with each cup of salt? (TUSD)			
	M	6.RP.3 Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations. Major content a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios. 6.RP.3a b. Solve unit rate problems including those involving unit pricing and constant speed. ○ *For example, if it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?* 6.RP.3b c. Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent. 6.RP.3c d. Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities. 6.RP.3d . Essential questions • *Why would you want to form an equivalent ratio?* • *How do you use unit rates to solve real-world problems?* • *How can tables, graphs and equations be used to represent and solve ratio and rate problems?* Essential knowledge and skills • Unit rate is the quotient of a ratio in terms of "per item" or "for each". Academic vocabulary • Equivalent rate • Proportion • Cross product property • Percent Mathematical Practices			

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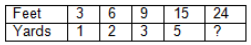
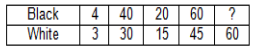
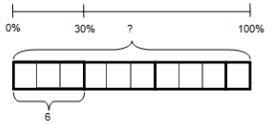
		• Visuals models, graphs, tables and equations are used to represent and solve real-world problems involving rates and ratios. • A percent is a rate per 100, thus percent problems can be solved using ratios and rates. <u>Teaching Examples:</u> Examples: • If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed? • Using the information in the table, find the number of yards in 24 feet.  There are several strategies that students could use to determine the solution to this problem. ○ Add quantities from the table to total 24 feet (9 feet and 15 feet); therefore the number of yards must be 8 yards (3 yards and 5 yards). ○ Use multiplication to find 24 feet: 1) 3 feet x 8 = 24 feet; therefore 1 yard x 8 = 8 yards, or 2) 6 feet x 4 = 24 feet; therefore 2 yards x 4 = 8 yards. • Compare the number of black to white circles. If the ratio remains the same, how many black circles will you have if you have 60 white circles? ●●●●○○○  • If 6 is 30% of a value, what is that value? (Solution: 20)  • A credit card company charges 17% interest on any charges not paid at the end of the month. Make a ratio table to show how much the interest would be for several amounts. If your bill totals $450 for this month, how much interest	• Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Look for and make use of structure			

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		would you have to pay if you let the balance carry to the next month? Show the relationship on a graph and use the graph to predict the interest charges for a $300 balance. Charges | $1 | $50 | $100 | $200 | $450 Interest | $0.17 | $8.50 | $17 | $34 | ? (TUSD) ASSESSMENT PROBLEMS 6.RP.1 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/076/original/illustrative_mathematics_76.pdf?1343857006 6.RP.1 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/181/original/illustrative_mathematics_1181.pdf?1363815748 6.RP.2 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/549/original/illustrative_mathematics_549.pdf?1343857011 6.RP.2 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/175/original/illustrative_mathematics_1175.pdf?1363815755 6.RP.3 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/135/original/illustrative_mathematics_135.pdf?1343856950 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/135/original/illustrative_mathematics_135.pdf?1343856950			
THE NUMBER SYSTEM (6NS) Apply and extend previous understandings of multiplication and division to divide fractions by fractions. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others	**M**	Students 6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. Major content • *For example, create a story context for (2/3) ÷ (3/4) and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*	TEACHER NOTES See instructional strategies in the introduction • *Computation with fractions is best understood when it builds upon the familiar understandings of whole numbers and is paired with visual representations. Solve a simpler problem with whole numbers, and then use the same steps to solve a fraction divided by a fraction. Looking at the*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) •	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE

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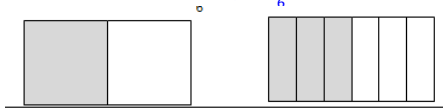
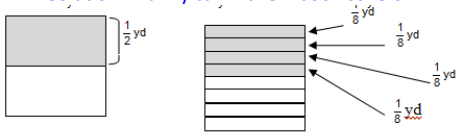
4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning		Essential question • *How can a visual model demonstrate that division by a fraction is the same as multiplying by the reciprocal of the fraction?* • *What is a real-world problem involving dividing by a fraction, and what is the visual model and equation you could use to help solve it?* Essential knowledge and skills • Operations perform the same function on fractions and decimals as they do on whole numbers. • Context and visual models help make the connection between dividing by a fraction and multiplying by the reciprocal of that fraction. Teaching Examples: • How much chocolate will each person get if 3 people share $\frac{1}{2}$ lb of chocolate equally? 3 people share $\frac{1}{2}$ pound of chocolate. How much of a pound of chocolate does each person get? • solution: Each person gets $\frac{1}{6}$lb of chocolate.  • Manny has $\frac{1}{2}$ yard of fabric to make book covers. Each book is made from $\frac{1}{8}$ yard of fabric. How many book covers can Manny make? Solution: Manny can make 4 book covers.  • Represent $\frac{1}{2} \div \frac{2}{3}$ in a problem context and draw a model to show your solution. (TUSD)	Academic vocabulary • Fraction • Numerator • Denominator • Reciprocal • Operation(s) Mathematical Practices • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Look for and make use of structure • Look for and express regularity in repeated reasoning	*problem through the lens of "How many groups?" or "How many in each group?" helps visualize what is being sought.* (ODE)	Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials • Models for Multiplying and Dividing Fractions	ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals • Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. ▫ Role playing - bodily kinesthetic ▫ Graphic organizing - visual ▫ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling)

MATHEMATICS CURRICULUM Grade 6

Curriculum Writers: Catherine Jalbert and Diane Turcotte

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

		ASSESSMENT PROBLEMS
		6.NS.1 Basic
		• http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/050/original/illustrative_mathematics_50.pdf?1364320802
		• http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/410/original/illustrative_mathematics_410.pdf?1343856991
		• http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/267/original/illustrative_mathematics_267.pdf?1343856995
		6.NS.1 Advanced
		• http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/413/original/illustrative_mathematics_413.pdf?1343856965
					• Tests and quizzes
					• Technology
					• Think-alouds
					• Writing genres
					  ▫ Argument
					  ▫ Informative
					  ▫ Research

THE NUMBER SYSTEM (6NS) Compute fluently with multi-digit numbers and find common factors and multiples. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**A**	**Students** 6.NS.2 Fluently divide multi-digit numbers using the standard algorithm. **Additional content** **Essential question** • *How do the standard algorithms improve fluency of the basic operations on multi-digit numbers and decimals?* • *How does the standard algorithm for division connect to place value?* **Essential knowledge and skills** • Standard algorithms improve fluency of addition, subtraction, multiplication and division with multi-digit numbers and decimals. **Teaching Examples:** • Students are expected to fluently and accurately divide multi-digit whole numbers. Divisors can be any number of digits at this grade level. • As students divide they should continue to use their understanding of place value to describe what they are doing. When using the standard algorithm, students' language should reference place value. ○ For example, when dividing 32 into 8456, as they write a 2 in the quotient they should say, "there are 200 thirty-twos in 8456 " and could write 6400 beneath the 8456 rather than only writing 64. **Academic vocabulary** • Algorithm • Estimation • Place value **Mathematical Practices** • Reason abstractly and quantitatively • Look for and make use of structure • Look for and express regularity in repeated reasoning	TEACHER NOTES See instructional strategies in the introduction • *As students study whole numbers in the elementary grades, a foundation is laid in the conceptual understanding of each operation. Discovering and applying multiple strategies for computing creates connections which evolve into the proficient use of standard algorithms. Fluency with an algorithm denotes an ability that is efficient, accurate, appropriate and flexible. Division was introduced in Grade 3 conceptually, as the inverse of multiplication. In Grade 4, division continues using place-value strategies, properties of operations, the relationship with multiplication, area models, and rectangular arrays to solve problems with one*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• There are 200 thirty twos in 8456. $32\overline{)8456}$ (2) • 200 times 32 is 6400. 8456 minus 6400 is 2056 $32\overline{)8456}$ (2) -6400 2056 • There are 60 thirty twos in 2056 $32\overline{)8456}$ (26) -6400 2056 • 60 times 32 is 1920 2056 minus 1920 is 136 $32\overline{)8456}$ (26) -6400 2056 -1920 136 • There are 4 thirty twos in 136. 4 times 32 is 128. $32\overline{)8456}$ (264) -6400 2056 -1920 136 -128 • The remainder is 8. There is not a full thirty two in 8; there is only part of a thirty two in 8.	*digit divisors. In Grade 6, fluency with the algorithms for division and all operations with decimals is developed.* • *Fluency is something that develops over time; practice should be given over the course of the year as students solve problems related to other mathematical studies. Opportunities to determine when to use paper pencil algorithms, mental math or a computing tool is also a necessary skill and should be provided in problem solving situations.* *Greatest common factor and least common multiple are usually taught as a means of combining fractions with unlike denominators. This cluster builds upon the previous learning of the multiplicative structure of whole numbers, as well as prime and composite numbers in Grade 4. Although the process is the same, the point is to become aware of the relationships between numbers and their multiples. For example, consider answering the question: "If two numbers are multiples of four, will the sum of the two numbers also be a multiple of four?" Being able to see and write the relationships between numbers will be beneficial as further algebraic understandings are developed. Another focus is*	1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials	• Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. □ Role playing - bodily kinesthetic □ Graphic organizing - visual □ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres □ Argument □ Informative □ Research

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		264 32)8456 −6400 2056 −1920 136 −128 8 • This can also be written as $\frac{8}{32}$ or $\frac{1}{4}$. There is ¼ of a thirty two in 8. • 8456 = 264 * 32 + 8 (TUSD)	*to be able to see how the GCF is useful in expressing the numbers using the distributive property, (36 + 24) = 12(3+2), where 12 is the GCF of 36 and 24. This concept will be extended in Expressions and Equations as work progresses from understanding the number system and solving equations to simplifying and solving algebraic equations in Grade 7.* (ODE)		
	A	6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation. **Additional content** **Essential questions** • *How can mathematical reasoning be used to determine if an answer is logical?* • *How can estimation and place value be used when solving problems involving decimals?* **Essential knowledge and skills** • Properties of operations are used to simplify and fluently compute problems with multi-digit numbers and decimals. **Teaching Examples:** The use of estimation strategies supports student understanding of operating on decimals. Example: • First, students estimate the sum and then find the exact sum of 14.4 and 8.75. An estimate of the sum might be 14 + 9 or 23. Students may also state if their estimate is low or high. They would expect their answer to be greater than 23. They can use their estimates to self-correct. Answers of 10.19 or 101.9 indicate that students are not considering the concept of place value when adding (adding tenths to tenths or hundredths to hundredths) whereas answers like 22.125 or 22.79 indicate that students are having **Academic vocabulary** • Decimals **Mathematical Practices** • Reason abstractly and quantitatively • Look for and make use of structure • Look for and express regularity in repeated reasoning		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		difficulty understanding how the four-tenths and seventy-five hundredths fit together to make one whole and 25 hundredths. • Students use the understanding they developed in 5th grade related to the patterns involved when multiplying and dividing by powers of ten to develop fluency with operations with multi-digit decimals. (TUSD)			
	A	6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1–100 with a common factor as a multiple of a sum of two whole numbers with no common factor. **Additional content** • *For example, express 36 + 8 as 4 (9 + 2).* **Essential questions** • *How can the distributive property be used to rewrite large multi-digit addition problems?* • *How can prime factorization be used to find a greatest common factor or least common multiple of two given numbers?* **Essential knowledge and skills** • Prime factorization is a method for finding greatest common factors (GCF) and least common multiples (LCM). **Teaching Examples:** • Rewrite 84 + 28 by using the distributive property. Have you divided by the largest common factor? How do you know? Solution: 7(12+4) • Express 36 + 8 as 4(9+2). • Given various pairs of addends using whole numbers from 1-100, students should be able to identify if the two numbers have a common factor. If they do, they identify the common factor and use the distributive property to rewrite the expression. They prove that they are correct by simplifying both expressions. ○ 27 + 36 = 9 (3 + 4) 63 = 9 x 7 63 = 63 • 31 + 80 **Academic vocabulary** • Distributive property • Factors • Greatest common factor • Least common multiple • Numerical expression • Prime factorization • Simplify **Mathematical Practices** • Look for and make use of structure		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		○ There are no common factors. I know that because 31 is a prime number, it only has 2 factors, 1 and 31. I know that 31 is not a factor of 80 because 2 x 31 is 62 and 3 x 31 is 93. (TUSD) ASSESSMENT PROBLEMS 6.NS.2 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/270/original/illustrative_mathematics_270.pdf?1343856975 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/300/original/illustrative_mathematics_1300.pdf?1364569848 6.NS.3 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/274/original/illustrative_mathematics_274.pdf?1343856959 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/374/original/illustrative_mathematics_374.pdf?1355762188 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/273/original/illustrative_mathematics_273.pdf?1343856977 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/275/original/illustrative_mathematics_275.pdf?1343856990 6.NS.3 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/299/original/illustrative_mathematics_1299.pdf?1355950720 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/272/original/illustrative_mathematics_272.pdf?1343856988 6.NS.4 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/257/original/illustrative_mathematics_257.pdf?1343856955 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/255/original/illustrative_mathematics_255.pdf?1343856966 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/256/original/illustrative_mathematics_256.pdf?1343856987 6.NS.4 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/258/original/illustrative_mathematics_258.pdf?1343856956 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/259/original/illustrative_mathematics_259.pdf?1343856993			

MATHEMATICS CURRICULUM Grade 6

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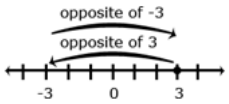
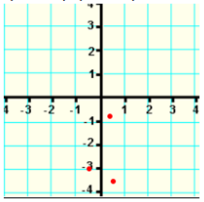
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

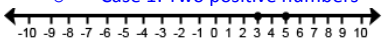
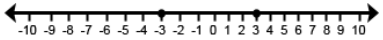
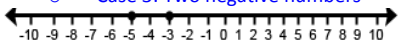
THE NUMBER SYSTEM (6NS)
 	
Apply and extend previous understandings of numbers to the system of rational numbers.
 	
Use **Mathematical Practices** to
1. Make sense of problems and persevere in solving them
2. Reason abstractly and quantitatively
3. Construct viable Argument and critique the reasoning of others
4. Model with mathematics ★
5. Use appropriate tools strategically
6. Attend to precision
7. Look for and make use of structure
8. Look for and express regularity in repeated reasoning
	M	**Students**
		
		6.NS.5 Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation.
		Major content
		
		Essential questions
		• *What is a real-world situation that can be modeled using positive and negative rational numbers?*
		• *What is the absolute value of a number and when do we use it?*
		• *How does the number line extend in order to incorporate negative numbers?*
		Essential knowledge and skills
		• Positive and negative numbers are used to represent quantities in real- world contexts in relationship to the zero value for that context.
		• A negative symbol represents the opposite value of a quantity (or the opposite direction on a number line from zero.)
		• A number line extends infinitely to the left of zero to incorporate negative numbers. (TUSD)
		Teaching Examples:
		
		Academic vocabulary
		• Absolute value
		• Opposite value
		• Negative number
		• Positive number
		
		Mathematical Practices
		• Make sense of problems and persevere in solving them
		• Reason abstractly and quantitatively
		• Model with mathematics ★
			TEACHER NOTES
			
			See instructional strategies in the introduction
			• *The purpose of this cluster is to begin study of the existence of negative numbers, their relationship to positive numbers, and the meaning and uses of absolute value. Starting with examples of having/owing and above/below zero sets the stage for understanding that there is a mathematical way to describe opposites. Students should already be familiar with the counting numbers (positive whole numbers and zero), as well as with fractions and decimals (also positive). They are now ready to understand that all numbers have an opposite. These special numbers can be shown on vertical or horizontal number lines, which then can be used to solve simple problems. Demonstration of understanding of positives and negatives involves translating among words, numbers and models: given the words "7 degrees below zero," showing it on a thermometer and writing -7; given -4 on a number line, writing a real-life example and mathematically -4. Number lines also give the opportunity to model absolute value as the distance from zero.*
			• *Simple comparisons can be*
				RESOURCE NOTES
				
				See resources in the introduction
				
				Textbooks
				• *Exploration in Core Math* , Holt Mc Dougal
				• *Holt Grade 6 Mathematics*
				
				Supplementary Books, Teacher (T) Student (S)
				•
				
				Technology
				• Computers
				• LCD projectors
				• Interactive boards
				
				Websites
				• http://curriculum.northsmithfieldschools.com
				• http://www.achieve.org/http://my.hrw.com
				• http://www.illustrativemathematics.org/standards/practice
				• http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1
				• http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S
				• http://www.tusd1.org/contents/distinfo/curriculum/index.asp
				• www.commoncore.org/maps
				• www.corestandards.org
				• www.khanacademy.com
				• www.ride.ri.gov
				
				Materials
					ASSESSMENT NOTES
					
					See assessments in the introduction
					
					REQUIRED COMMON ASSESSMENTS
					• MID-TERM EXAM
					• FINAL EXAM
					• COMMON PROBLEMS/UNITS
					
					SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS
					• Anecdotal records
					• Conferencing
					• Exhibits
					• Interviews
					• Graphic organizers
					• Journals
					• Mathematical Practices
					• Modeling ★
					• Multiple Intelligences assessments, e.g.
					  ▫ Role playing - bodily kinesthetic
					  ▫ Graphic organizing - visual

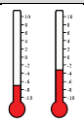
	M	6.NS.6 Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **Major content** a. Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself, e.g., –(–3) = 3, and that 0 is its own opposite. 6.NS.6a b. Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. 6.NS.6b			

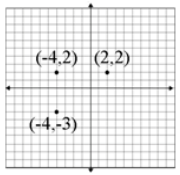
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		c. Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. 6.NS.6c **Essential questions** • *How does the coordinate plane extend in order to incorporate negative numbers?* • *How do you know which quadrant a coordinate pair will be in?* • *How do you decide which of two numbers is greater when* *a. both numbers are positive?* *b. both numbers are negative?* *c. one number is positive and one number is negative?* • *How does the coordinate plane extend in order to incorporate negative numbers?* • *How do you know which quadrant a coordinate pair will be in?* **Essential knowledge and skills** • The coordinate plane extends both to the left and down, thus giving four quadrants and incorporating negative numbers. • A point on either a horizontal or vertical number line can represent any rational number. • The signs of the numbers in a coordinate pair identify what quadrant the point will be located in on a coordinate plane. **Teaching Examples:** • Number lines can be used to show numbers and their opposites. Both 3 and -3 are 3 units from zero on the number line. Graphing points and reflecting across zero on a number line extends to graphing and reflecting points across axes on a coordinate grid. The use of both horizontal and vertical number line models facilitates the movement from number lines to coordinate grids.  • The opposite of an opposite is the number itself. ○ For example: -(-4) = 4 **Academic vocabulary** • Axis (x,y) • Coordinate plane • Horizontal • Vertical • Ordered pairs • Origin • Point • Quadrants • Reflections **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★	*made and order determined. Order can also be established and written mathematically: -3° C > -5° C or -5° C < -3° C. Finally, absolute values should be used to relate contextual problems to their meanings and solutions.* *Using number lines to model negative numbers, prove the distance between opposites, and understand the meaning of absolute value easily transfers to the creation and usage of four-quadrant coordinate grids. Points can now be plotted in all four quadrants of a coordinate grid. Differences between numbers can be found by counting the distance between numbers on the grid. Actual computation with negatives and positives is handled in Grade 7.* (ODE)		▫ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ▫ Argument ▫ Informative ▫ Research

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Example: • Graph the following points in the correct quadrant of the coordinate plane. If you reflected each point across the x-axis, what are the coordinates of the reflected points? What similarities do you notice between coordinates of the original point and the reflected point? $\left(\frac{1}{2}, -3\frac{1}{2}\right)\left(-\frac{1}{2}, -3\right)$ $(0.25, -0.75)$  (TUSD)			
	M	6.NS.7 Understand ordering and absolute value of rational numbers. **Major content** a. Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. ○ *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 ona number line oriented from left to right.* 6.NS.7a b. Write, interpret, and explain statements of order for rational numbers in real-world contexts. ○ *For example, write –3 ^{o}C > –7 ^{o}C to express the fact that –3 ^{o}C is warmer than –7 ^{o}C.* 6.NS.7b c. Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. ○ *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* 6.NS.7c d. Distinguish comparisons of absolute value from statements about order. ○ *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* 6.NS.7d			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Essential questions • *How can a number line be used to show absolute value"* • How *can a number line be used to solve real-world problems on a coordinate plane?* **Essential knowledge and skills** • Absolute value is the distance that number is away from zero on a number line, also referred to as the magnitude of a number in real-world contexts. • When comparing rational numbers on a number line, the largest number will be furthest to the right and the smallest will be furthest to the left. • Absolute value is used to find the distance between two numbers on a number line • Absolute value is used to find the distance between two points on coordinate plane that have either the same first or same second coordinate. • Points on a coordinate plane can be used to graph real world problems to find solutions. **Teaching Examples:** • Common models to represent and compare integers include number line models, temperature models, and the profit-loss models • The number line can also be viewed as a thermometer where each point on the number line is a specific temperature. In the profit-loss model, a positive number corresponds to profit and negative number corresponds to a loss. Each of these models is useful for examining values, but can also be used in later grades when students begin to perform operations on integers. • In working with number line models, students internalize the order of the numbers; larger numbers on the right or top of the number line and smaller numbers to the left or bottom of the number line. They use the order to correctly locate integers and other rational numbers on the number line. By placing two numbers on the same number line, they are able to write inequalities and make statements about the relationships between the numbers. **Academic vocabulary** • Inequality • Integers • Quantity • Rational numbers • Magnitude **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		○ Case 1: Two positive numbers  5 > 3 5 is greater than 3 ○ Case 2: One positive and one negative number  3 > -3 positive 3 is greater than negative 3 negative 3 is less than positive 3 ○ Case 3: Two negative numbers  -3 > -5 negative 3 is greater than negative 5 negative 5 is less than negative 3 ○ Interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right. ○ For an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars. ○ Recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars. • Comparative statements generate informal experience with operations and lay the foundation for formal work with operations on integers in grade 7. Example: • One of the thermometers shows -3°C and the other shows -7°C. Which thermometer shows which temperature? Which is the colder temperature? How much colder? Write an inequality to show the relationship between the temperatures and explain how the model shows this relationship.			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		 • Students recognize the distance from zero as the absolute value or magnitude of a rational number. Students need multiple experiences to understand the relationships between numbers, absolute value, and statements about order. (TUSD)			
	M	6.NS.8 Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate. **Major content** **Essential questions** • *How does the coordinate plane extend in order to incorporate negative numbers?* • *How do you know which quadrant a coordinate pair will be in?* • *How do you decide which of two numbers is greater when* *a. both numbers are positive?* *b. both numbers are negative?* *c. one number is positive and one number is negative?* **Essential knowledge and skills** • A point on either a horizontal or vertical number line can represent any rational number. • The signs of the numbers in a coordinate pair identify what quadrant the point will be located in on a coordinate plane. • Absolute value is the distance that number is away from zero on a number line, also referred to as the magnitude of a number in real-world contexts. • When comparing rational numbers on a number line, the largest number will be furthest to the right and the smallest will be furthest to the left. • Absolute value is used to find the distance between two numbers on a number line • Absolute value is used to find the distance between two points on coordinate plane that have either the same first or same second coordinate. **Academic vocabulary** • Inequality • integers • Quantity • Rational numbers • Magnitude **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Look for and make use of structure		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• Points on a coordinate plane can be used to graph real world problems to find solutions. **Teaching Examples:** Example: • If the points on the coordinate plane below are the three vertices of a rectangle, what are the coordinates of the fourth vertex? How do you know? What are the length and width of the rectangle?  To determine the distance along the x-axis between the point (-4, 2) and (2, 2) a student must recognize that -4 is −4 or 4 units to the left of 0 and 2 is 2 or 2 units to the right of zero, so the two points are total of 6 units apart along the x-axis. Students should represent this on the coordinate grid and numerically with an absolute value expression, −4 + 2. (TUSD) ASSESSMENT PROBLEMS 6.NS.5 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/277/original/illustrative_mathematics_277.pdf?1352436008 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/278/original/illustrative_mathematics_278.pdf?1350276391 6.NS.6 Basic • http://www.opusmath.com/common-core-standards/6.ns.6c-find-and-position-integers-and-other-rational-numbers-on-a-horizontal-or?q=Plot%20ordered%20pairs%20on%20the%20coordinate%20plane • http://www.opusmath.com/common-core-standards/6.ns.6a-recognize-opposite-signs-of-numbers-as-indicating-locations-on-opposite 6.NS.7 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/288/original/illustrative_mathematics_288.pdf?1343856954 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/286/origin			

MATHEMATICS CURRICULUM Grade 6

Curriculum Writers: Catherine Jalbert and Diane Turcotte

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		al/illustrative_mathematics_286.pdf?1343856978 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/283/original/illustrative_mathematics_283.pdf?1343856974 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/285/original/illustrative_mathematics_285.pdf?1343856960 6.NS.7 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/284/original/illustrative_mathematics_284.pdf?1344476804 6.NS.8 Basic • http://www.opusmath.com/common-core-standards/6.ns.8-solve-real-world-and-mathematical-problems-by-graphing-points-in-all-four?q=Find%20vertical%20and%20horizontal%20distances%20on%20the%20coordinate%20plane			
EXPRESSIONS AND EQUATIONS (6.EE) Apply and extend previous understandings of arithmetic to algebraic expressions. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**M**	**Students** 6.EE.1 Write and evaluate numerical expressions involving whole-number exponents. **Major content** **Essential questions** • *How do you evaluate an expression with an exponent?* **Essential knowledge and skills** • An exponent indicates how many times the base will be used as a factor, that is how many times the base will be multiplied by itself. • To raise a number to the power of 2, is to square a number (x^2) because you are finding the area of a square with the given side length (x). • To raise a number to the power of 3, is to cube a number (x^3) because you are finding the volume of a cube with the given side length (x). **Teaching Examples:** Examples: • Write the following as a numerical expression using exponential notation. ○ The area of a square with a side length of 8 m (Solution: $8^2 m^2$) ○ The volume of a cube with a side length of 5 ft: (Solution: $5^3 ft^3$) ○ Yu-Lee has a pair of mice. The mice each have 2 babies. The babies grow up and **Academic vocabulary** • Base • Exponent • Square • Cube • Expressions • Order of operations (PEMDAS) **Mathematical Practices** • Reason abstractly and quantitatively	TEACHER NOTES See instructional strategies in the introduction • *The skills of reading, writing and evaluating expressions are essential for future work with expressions and equations, and are a Critical Area of Focus for Grade 6. In earlier grades, students added grouping symbols ( ) to reduce ambiguity when solving equations. Now the focus is on using ( ) to denote terms in an expression or equation. Students should now focus on what terms are to be solved first rather than invoking the PEMDAS rule. Likewise, the division symbol (3 ÷ 5) was used and should now be replaced with a fraction bar $\frac{3}{5}$ Less confusion will occur as students write algebraic expressions and equations if x represents*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals

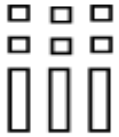
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		have two babies of their own: (Solution: 2^3 mice) • Evaluate: ○ 4^3 = 4x4x4 = (Solution: 64) ○ $5+2^4 \bullet 6$ (Solution: 101) ○ $7^2-24\div3+26$ (Solution:67) (TUSD)	*only variables and not multiplication. The use of a dot (•) or parentheses between number terms is preferred.* • *Provide opportunities for students to write expressions for numerical and real-world situations. Write multiple statements that represent a given algebraic expression. For example, the expression x – 10 could be written as "ten less than a number," "a number minus ten," "the temperature fell ten degrees,"', "I scored ten fewer points than my brother," etc. Students should also read an algebraic expression and write a statement.* • *Through modeling, encourage students to use proper mathematical vocabulary when discussing terms, factors, coefficients, etc.* • *Provide opportunities for students to write equivalent expressions, both numerically and with variables. For example, given the expression x + x + x + x + 4•2, students could write 2x + 2x + 8 or some other equivalent expression. Make the connection to the simplest form of this expression as 4x + 8. Because this is a foundational year for building the bridge between the concrete concepts of arithmetic and the abstract*	ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials • Online algebra tiles that can be used to represent expressions and equations.	• Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. ▯ Role playing - bodily kinesthetic ▯ Graphic organizing - visual ▯ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ▯ Argument ▯ Informative ▯ Research
	M	6.EE.2 Write, read, and evaluate expressions in which letters stand for numbers. **Major content** a. Write expressions that record operations with numbers and with letters standing for numbers. ○ *For example, express the calculation "subtract y from 5" as 5 – y.* 6.EE.2a b. Identify parts of an expression using mathematical terms (sum, factor, quotient, coefficient); view one or more parts of an expression as a single entity. ○ *For example, describe the expression 2 (8 + 7) as a product of two factors; view (8 + 7) as both a single entity and a sum of two terms.* 6.EE.b c. Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). ○ *For example, use the formulas $V = s^3$ and $A = 6 s^2$ to find the volume and surface area of a cube with sides of length s = 1/2.* 6.EE.c **Essential questions** • *Why would you use a variable in an expression as opposed to a specific number?* • *What key terms are used in translating mathematical statements to mathematical expressions and what mathematical operations do they relate to?* **Essential knowledge and skills** • A variable is a letter that can represent various numbers. These numbers can be substituted into an expression for multiple reasons. **Academic vocabulary** • Algebraic expression • Coefficient • Constant • Formula • Solution • Substitution • Sum, difference, product, and quotient			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

		• Mathematical statements are translated into mathematical expressions.
		Teaching Examples:
		• It is important for students to read algebraic expressions in a manner that reinforces that the variable represents a number.
		• r + 21 as "some number plus 21 "as well as "r plus 21"
		• $\frac{s}{6}$ and s ÷ 6 as "as some number divided by 6" as well as "s divided by 6"
		• Twice the difference between a number and 5 (Solution: 2(z-5)
		• Students should identify the parts of an algebraic expression including variables, coefficients, constants, and the answers of operations (sum, difference, product, and quotient). Development of this common language helps students to understand the structure of expressions and explain their process for simplifying expressions.
		• Terms are the parts of a sum. When the term is an explicit number, it is called a constant. When the term is a product of a number and a variable, the number is called the coefficient of the variable.
		• Variables are letters that represent numbers. There are various possibilities for the numbers they can represent; students can substitute these possible numbers for the letters in the expression for various different purposes.
		Examples:
		• Consider the following expression: $X^2+5y+3x+6$
		  ○ The variables are x and y.
		  ○ There are 4 terms, x^2, 5y, 3x, and 6.
		  ○ There are 3 variable terms, x^2, 5y, 3x. They have coefficients of 1, 5, and 3 respectively. The coefficient of x^2 is 1, since $x^2 = 1\ x^2$. The term 5y represent 5 y's or 5 * y.
		  ○ There is one constant term, 6.
		  ○ The expression shows a sum of all four terms
		• Describe the expression 2(8+7) as a product of two factors; view (8+7) as both a single entity and a sum of two terms
		• Students should be able to evaluate an expression for a specific value given for the variable.
		• Terms
		• Variable
		
		Mathematical Practices
		• Make sense of problems and persevere in solving them
		• Reason abstractly and quantitatively
		• Construct viable Argument and critique the reasoning of others
		• Model with mathematics ★
		• Attend to precision
			thinking of algebra, using hands-on materials (such as algebra tiles, counters, unifix cubes, "Hands on Algebra") to help students translate between concrete numerical representations and abstract symbolic representations is critical. (ODE)		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Examples: • Use the formulas $v=s^3$ and $A=6s^2$ to find the volume and surface area of a cube with sides of length s=1/2. • Evaluate $5(n + 3) – 7n$, when $n = \frac{1}{2}$ • The expression c + 0.07c can be used to find the total cost of an item with 7% sales tax, where c is the pre-tax cost of the item. Use the expression to find the total cost of an item that cost $25. • The perimeter of a parallelogram is found using the formula p = 2l + 2w. What is the perimeter of a rectangular picture frame with dimensions of 8.5 inches by 11 inches? (TUSD)			
	M	6.EE.3 Apply the properties of operations to generate equivalent expressions. **Major content** • *For example, apply the distributive property to the expression 3 (2 + x) to produce the equivalent expression 6 + 3x; apply the distributive property to the expression 24x + 18y to produce the equivalent expression 6 (4x + 3y); apply properties of operations to y + y + y to produce the equivalent expression 3y.* **Essential question:** • *How do you use the properties of operations to make and identify equivalent expression?* **Essential knowledge and skills** • Mathematical statements are translated into mathematical expressions. • Properties of operations such as the commutative, associative and distributive are used to make and identify equivalent expressions. **Teaching Examples:** • Students use their understanding of multiplication to interpret 3 (2 + x). ○ 3 groups of (2 + x). They use a model to represent x, and make an array to show the meaning of 3(2 + x). They can explain why it makes sense that 3(2 + x) is equal to 6 + 3x. • An array with 3 columns and x + 2 in each column: **Academic vocabulary** • Associative property • Commutative property • Distributive property • Multiplicative identity property of 1 • Equivalent expression **Mathematical Practices** • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS



- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure

- Students interpret y as referring to one y. Thus, they can reason that one y plus one y plus one y must be 3y. They also can use the distributive property, the multiplicative identity property of 1, and the commutative property for multiplication to prove that y + y + y = 3y:

$$y + y + y = y \times 1 + y \times 1 + y \times 1 = y \times (1 + 1 + 1) = y \times 3 = 3y$$

(TUSD)

Associative property of addition	$(a + b) + c = a + (b + c)$
Commutative property of addition	$a + b = b + a$
Additive identity property of 0	$a + 0 = 0 + a = a$
Existence of additive inverses	For every a there exists $-a$ so that $a + (-a) = (-a) + a = 0$
Associative property of multiplication	$(a \times b) \times c = a \times (b \times c)$
Commutative property of multiplication	$a \times b = b \times a$
Multiplicative identity property of 1	$a \times 1 = 1 \times a = a$
Existence of multiplicative inverses	For every $a \neq 0$ there exists $1/a$ so that $a \times 1/a = 1/a \times a = 1$
Distributive property of multiplication over addition	$a \times (b + c) = a \times b + a \times c$

M

6.EE.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them).

Major content

- *For example, the expressions y + y + y and 3y are equivalent because they name the same number regardless of which number y stands for.*

Essential question

- *How can you show that two expressions are equivalent?*

Essential knowledge and skills

- Properties of operations such as the commutative, associative, and distributive are used to make and identify equivalent expressions.

Academic vocabulary

- Like terms
- Simplifying

Mathematical Practices

- Reason abstractly

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS

Teaching Examples

- Students connect their experiences with finding and identifying equivalent forms of whole numbers and can write expressions in various forms. Students generate equivalent expressions using the associative, commutative, and distributive properties. They can prove that the expressions are equivalent by simplifying each expression into the same form.
- Are the expressions equivalent? How do you know?

4m + 8 , 4(m+2), 3m + 8 + m , 2 + 2m + m + 6 + m

- and quantitatively
- Construct viable Argument and critique the reasoning of others
- Model with mathematics ★ strategically
- Attend to precision
- Look for and make use of structure

Solution:

Expression	Simplifying the Expression	Explanation
4m + 8	*4m + 8*	Already in simplest form
4(m+2)	*4(m+2)* *4m + 8*	*Distributive property*
3m + 8 + m	*3m + 8 + m* *3m + m + 8* *(3m + m) + 8* *4m + 8*	*Combined like terms*
2 + 2m + m + 6 + m	*2 + 2m + m + 6 + m* *2 + 6 + 2m + m + m* *(2 + 6) + (2m + m + m)* *8 + 4m* *4m + 8*	*Combined like terms*

(TUSD)

ASSESSMENT PROBLEMS

6.EE.1 Basic

- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/532/original/illustrative_mathematics_532.pdf?1343856934

6.EE.2 Basic

- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/540/original/illustrative_mathematics_540.pdf?1343856924
- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/421/original/illustrative_mathematics_421.pdf?1343856931

6.EE.3 Basic/Advanced

- http://www.opusmath.com/common-core-standards/6.ee.3-apply-the-properties-of-operations-to-generate-equivalent-expressions-for

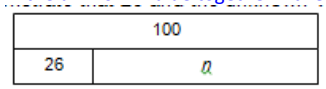
6.EE.4 Basic

- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/542/original/illustrative_mathematics_542.pdf?1343856926
- http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/461/original/illustrative_mathematics_461.pdf?1343856932

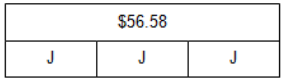
MATHEMATICS CURRICULUM Grade 6

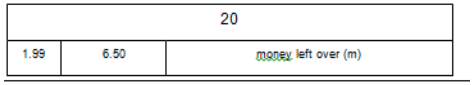
Curriculum Writers: Catherine Jalbert and Diane Turcotte

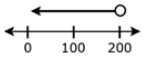
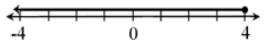
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
EQUATIONS 6.EE) Reason about and solve one-variable equations and inequalities. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**M**	**Students** 6.EE.5 Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **Major content** **Essential question** • *How do you determine if a given value is a solution to an equation or inequality?* **Essential knowledge and skills** • Mathematical sentences are translated into mathematical equations or inequalities. • A variable is a letter that can represent various values in a given situation. • A solution to an equation or inequality is an answer to a specific question. **Teaching Examples** • Beginning experiences in solving equations should require students to understand the meaning of the equation as well as the question being asked. Solving equations using reasoning and prior knowledge should be required of students to allow them to develop effective strategies such as using reasoning, fact families, and inverse operations. Students may use balance models in representing and solving equations and inequalities. Example: • Consider the following situation: Joey had 26 papers in his desk. His teacher gave him some more and now he has 100. How many papers did his teacher give him? • This situation can be represented by the equation 26 + n = 100 where n is the number of papers the teacher gives to Joey. This equation can be stated as "some number was added to 26 and the result was 100". Students ask themselves "What number was added to 26 to get 100?" to help them determine the value of the variable that makes the equation true. Students could use several different strategies to find a solution to the problem. ○ Reasoning: 26 + 70 is 96. 96 + 4 is 100, so the number added to 26 to get 100 is 74. **Academic vocabulary** • Variable • Inverse • Scale model • Bar model **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Look for and make use of structure	TEACHER NOTES See instructional strategies in the introduction • *Students should be thinking about what numbers could possibly be a solution to the equation before solving the equation. For example, in the equation x + 21 = 32 students know that 21 + 9 = 30 therefore the solution must be 2 more than 9 or 11, so x = 11.* • *Provide multiple situations in which students must determine if a single value is required as a solution, or if the situation allows for multiple solutions. This creates the need for both types of equations (single solution for the situation) and inequalities (multiple solutions for the situation). Solutions to equations should not require using the rules for operations with negative numbers since the conceptual understanding of negatives and positives is being introduced in Grade 6. When working with inequalities, provide situations in which the solution is not limited to the set of positive whole numbers but includes rational numbers. This is a good way to practice fractional numbers and introduce negative numbers. Students need to be aware that numbers less than zero could be part of a solution*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals • Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. □ Role playing - bodily kinesthetic □ Graphic organizing - visual

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		○ Use knowledge of fact families to write related equations: ○ n + 26 = 100, 100 - n = 26, 100 - 26 = n. Select the equation that helps you find n easily. ○ Use knowledge of inverse operations: Since subtraction "undoes" addition then subtract 26 from 100 to get the numerical value of n ○ Scale model: There are 26 blocks on the left side of the scale and 100 blocks on the right side of the scale. All the blocks are the same size. 74 blocks need to be added to the left side of the scale to make the scale balance. ○ Bar Model: Each bar represents one of the values. Students use this visual representation to demonstrate that 26 and the unknown value together make 100.  Examples: • The equation where s represents the number of stamps in a booklet. The booklet of stamps costs 11 dollars and each stamp costs 44 cents. How many stamps are in the booklet? Explain the strategies you used to determine your answer. Show that your solution is correct using substitution. • Twelve is less than 3 times another number can be shown by the inequality. What numbers could possibly make this a true statement? (TUSD) ○ 12<3x Solution: x>4 or 4<x	*set for a situation. As an extension to this concept, certain situations may require a solution between two numbers. For example, a problem situation may have a solution that requires more than 10 but not greater than 25. Therefore, the exploration with students as to what this would look like both on a number line and symbolically is a reasonable extension.* • *The process of translating between mathematical phrases and symbolic notation will also assist students in the writing of equations/inequalities for a situation. This process should go both ways; Students should be able to write a mathematical phrase for an equation. Additionally, the writing of equations from a situation or story does not come naturally for many students. A strategy for assisting with this is to give students an equation and ask them to come up with the situation/story that the equation could be referencing.* (ODE)		○ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ○ Argument ○ Informative ○ Research
	M	6.EE.6 Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **Major content** **Essential questions** • How *do you determine if a real-world situation will be represented by an equation or inequality?* • *Why would you want to use a variable as opposed to specific value to model a real- world situation?* **Academic vocabulary** • Algebraic expression • Equation			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Essential knowledge and skills • Real world situations can be represented and solved using linear equations with rational numbers . **Teaching Examples** • Connecting writing expressions with story problems and/or drawing pictures will give students a context for this work. It is important for students to read algebraic expressions in a manner that reinforces that the variable represents a number. Examples: • Maria has three more than twice as many crayons as Elizabeth. Write an algebraic expression to represent the number of crayons that Maria has. (Solution: 2c + 3 where c represents the number of crayons that Elizabeth has.) • An amusement park charges $28 to enter and $0.35 per ticket. Write an algebraic expression to represent the total amount spent. (Solution: 28 + 0.35t where t represents the number of tickets purchased) • Andrew has a summer job doing yard work. He is paid $15 per hour and a $20 bonus when he completes the yard. He was paid $85 for completing one yard. Write an equation to represent the amount of money he earned. (Solution: 15h + 20 = 85 where h is the number of hours worked) • Describe a problem situation that can be solved using the equation 2c + 3 = 15; where c represents the cost of an item. • Bill earned $5.00 mowing the lawn on Saturday. He earned more money on Sunday. Write an expression that shows the amount of money Bill has earned. (Solution: $5.00 + n) (TUSD) • Solution **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Look for and make use of structure			
	M	6.EE.7 Solve real-world and mathematical problems by writing and solving equations of the form $x + p = q$ and $px = q$ for cases in which p, q and x are all nonnegative rational numbers. **Major content**			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Essential question • How do you solve a linear equation of the form x+p = q and px = q? **Essential knowledge and skills** • Substitution is a method of checking whether a given value is a solution to an equations or inequality. • Real world situations can be represented and solved using linear equations with rational numbers of the form x+p = q and px =q. **Teaching Examples** • Students create and solve equations that are based on real world situations. It may be beneficial for students to draw pictures that illustrate the equation in problem situations. Solving equations using reasoning and prior knowledge should be required of students to allow them to develop effective strategies. Example: • Meagan spent $56.58 on three pairs of jeans. If each pair of jeans costs the same amount, write an algebraic equation that represents this situation and solve to determine how much one pair of jeans cost.  • Sample Solution: Students might say: "I created the bar model to show the cost of the three pairs of jeans. Each bar labeled J is the same size because each pair of jeans costs the same amount of money. The bar model represents the equation 3J = $56.58. To solve the problem, I need to divide the total cost of 56.58 between the three pairs of jeans. I know that it will be more than $10 each because 10 x 3 is only 30 but less than $20 each because 20 x 3 is 60. If I start with $15 each, I am up to $45. I have $11.58 left. I then give each pair of jeans $3. That's $9 more dollars. I only have $2.58 left. I continue until all the money is divided. I ended up giving each pair of jeans another $0.86. Each pair of jeans costs $18.86 (15+3+0.86). I double check that the jeans cost $18.86 each because $18.86 x 3 is $56.58."	**Academic vocabulary** • Substitute **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Look for and make use of structure		

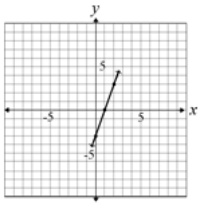
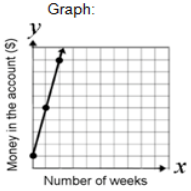
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• Julio gets paid $20 for babysitting. He spends $1.99 on a package of trading cards and $6.50 on lunch. Write and solve an equation to show how much money Julio has left. (Solution: 20 = 1.99 + 6.50 + x, x = $11.51)  (TUSD)			
	M	6.EE.8 Write an inequality of the form $x > c$ or $x < c$ to represent a constraint or condition in a real-world or mathematical problem. Recognize that inequalities of the form $x > c$ or $x < c$ have infinitely many solutions; represent solutions of such inequalities on number line diagrams. **Major content** **Essential questions** • How *do you determine if a real-world situation will be represented by an equation or inequality?* • How do you represent the solution set of a linear inequality of the form x<c or x>c? • How do know whether to use an open or closed circle *when graphing inequalities on a number?* **Essential knowledge and skills** • Substitution is a method of checking whether a given value is a solution to an equations or inequality. • Real-world situations can be represented and solved using linear inequalities with rational numbers of the form x < c and x > c. • Inequalities have an infinite amount of solutions that can be represented using a number line. • Solutions sets for inequalities are graphed on number lines using arrows with closed or open circles **Teaching Examples** Examples: • Jonas spent more than $50 at an amusement park. Write an inequality to represent the amount of money Jonas spent. What are some possible amounts of money Jonas could have spent? Represent the situation on a number line. **Academic vocabulary** • Closed circle • Open circle • Inequalities **Mathematical Practices** • Make sense of problems and persevere in solving them • Model with mathematics ★ • Look for and make use of structure		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		(solution: m >50) • Less than $200.00 was spent by the Flores family on groceries last month. Write an inequality to represent this amount and graph this inequality on a number line. Solution: 200 > x  • Graph x ≤ 4  (TUSD) ASSESSMENT PROBLEMS 6.EE.5 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/673/original/illustrative_mathematics_673.pdf?1353977620 6.EE.6 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/425/original/illustrative_mathematics_425.pdf?1343856927 6.EE.7 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/107/original/illustrative_mathematics_1107.pdf?1346088511 6.EE.8 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/642/original/illustrative_mathematics_642.pdf?1343856929			
EQUATIONS 6.EE) Represent and analyze quantitative relationships between dependent and independent variables. Use **Mathematical Practices** to 1. Make sense of problems and	M	**Students** 6.EE.9 Use variables to represent two quantities in a real-world problem that change in relationship to one another; write an equation to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation. **Major content** ○ *For example, in a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time.*	TEACHER NOTES See instructional strategies in the introduction • *The goal is to help students connect the pieces together. This can be done by having students use multiple representations for the mathematical relationship. Students need to be able to translate freely among the*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics*	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS

MATHEMATICS CURRICULUM Grade 6

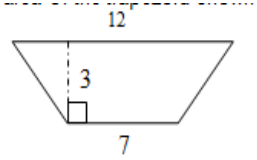
Curriculum Writers: Catherine Jalbert and Diane Turcotte

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others **4.** Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning		**Essential questions** • Given a real-world situation, how do you determine which is the independent variable and which is the dependent variable in order to create tables, graphs, and equations? • How do you use a table, graph, or equation to determine the relationship between an independent and dependent variable? **Essential knowledge and skills** • An equation represents two mathematical expressions/ statements that change in relationship to one another. • Every equation has an independent and dependent variable that change in relationship to one another. • Graphs, tables, and equations are used to represent and show the relationship between the independent and dependent variables. **Teaching Examples** • Students can use many forms to represent relationships between quantities. Multiple representations include describing the relationship using language, a table, an equation, or a graph. Translating between multiple representations helps students understand that each form represents the same relationship and provides a different perspective on the function. Examples: • What is the relationship between the two variables? Write an equation that illustrates the relationship. x | 1 | 2 | 3 | 4 y | 2.5 | 5 | 7.5 | 10 As x increases by 1, the y value increases by 2.5: y = 2.5x • In a problem involving motion at constant speed, list and graph ordered pairs of distances and times, and write the equation d = 65t to represent the relationship between distance and time. • Use the graph below to describe the change in y as x increases by 1. **Academic vocabulary** • Constant • Dependent variable • Independent variable • Function • Graph • Linear equation • Table **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Attend to precision • Look for and make use of structure • Look for and express regularity in repeated reasoning	*story, words (mathematical phrases), models, tables, graphs and equations. They also need to be able to start with any of the representations and develop the others.* • *Provide multiple situations for the student to analyze and determine what unknown is dependent on the other components. For example, how far I travel is dependent on the time and rate that I am traveling.* • *Throughout the expressions and equations domain in Grade 6, students need to have an understanding of how the expressions or equations relate to situations presented, as well as the process of solving them.* • *The use of technology, including computer apps, CBLs, and other hand-held technology allows the collection of real-time data or the use of actual data to create tables and charts. It is valuable for students to realize that although real-world data often is not linear, a line sometimes can model the data .* (ODE)	Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials • .	SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals • Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. ▫ Role playing - bodily kinesthetic ▫ Graphic organizing - visual ▫ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical

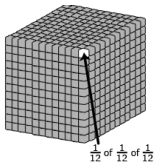
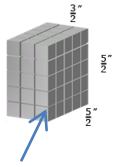
DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		 x | y 0 | 1 | 2 | 3 | • Susan started with $1 in her savings. She plans to add $4 per week to her savings. Use an equation, table and graph to demonstrate the relationship between the number of weeks that pass and the amount in her savings account. ○ Language: Susan has $1 in her savings account. She is going to save $4 each week. ○ Equation: y = 4x + 1 Table: x | y 0 | 1 1 | 5 2 | 9 Graph:  (TUSD) ASSESSMENT PROBLEMS 6.EE.9 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/806/original/illustrative_mathematics_806.pdf?1344434399			practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ○ Argument ○ Informative ○ Research
GEOMETRY (7.G) Solve real-world and mathematical problems involving area, surface area, and volume.	**S**	**Students** 6.G.1 Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into solving triangles and other shapes; apply these techniques in the context of real-world and mathematical problems. **Supporting content**	TEACHER NOTES See instructional strategies in the introduction • *It is very important for students to continue to*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core*	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS

MATHEMATICS CURRICULUM Grade 6

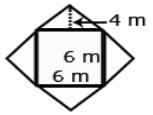
Curriculum Writers: Catherine Jalbert and Diane Turcotte

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning		**Essential questions** • How can you find the area of any polygon? **Essential knowledge and skills** • All polygons can be decomposed into triangles and rectangles in order to determine the area. **Teaching Examples** • Special quadrilaterals include rectangles, squares, parallelograms, trapezoids, rhombi, and kites. Students can use tools such as the Isometric Drawing Tool on NCTM's Illuminations site to shift, rotate, color, decompose and view figures in 2D or 3D (http://illuminations.nctm.org/ActivityDetail.aspx?ID=125) Examples: • Find the area of a triangle ($A = \frac{1}{2}(b \bullet h)$) with a base length of three units and a height of four units. Solution: $A=6$ units^2 • Find the area of the trapezoid shown below using the formulas for rectangles, $A= L \bullet W$, and triangles.  Solution: $A = 28.5$ units^2 • A rectangle measures 3 inches by 4 inches. If the lengths of each side double, what is the effect on the area? Solution: it will be 4 times larger • The area of the rectangular school garden is 24 square units. The length of the garden is 8 units. What is the length of the fence needed to enclose the entire garden? Solution: perimeter = 22 units • The sixth grade class at Hernandez School is building a giant wooden H for their school. The H will be 10 feet tall and 10 feet wide and the thickness of the block letter will be 2.5 feet. ○ How large will the H be if measured in square feet? Solution: 62.5 feet^2 **Academic vocabulary** • Polygons ○ Triangles – right, equilateral, scalene, isosceles, acute, obtuse ○ Quadrilateral – rectangles. Squares, parallelograms, trapezoids, rhombus • Kite • Proportions • Composing • Decomposing • Perimeter • Area **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure • Look for and express regularity in repeated reasoning	*physically manipulate materials and make connections to the symbolic andmore abstract aspects of geometry. Exploring possible nets should be done by taking apart (unfolding) three-dimensional objects. This process is also foundational for the study of surface area of prisms. Building upon the understanding that a net is the two-dimensional representation of the object, students can apply the concept of area to find surface area. The surface area of a prism is the sum of the areas for each face.* • *Multiple strategies can be used to aid in the skill of determining the area of simple two-dimensional composite shapes. A beginning strategy should be to use rectangles and triangles, building upon shapes for which they can already determine area to create composite shapes. This process will reinforce the concept that composite shapes are created by joining together other shapes, and that the total area of the two-dimensional composite shape is the sum of the areas of all the parts.* (ODE)	*Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials	• MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals • Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. □ Role playing - bodily kinesthetic □ Graphic organizing - visual □ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		○ The truck that will be used to bring the wood from the lumber yard to the school can only hold a piece of wood that is 60 inches by 60 inches. What pieces of wood (how many pieces and what dimensions) are needed to complete the project? Solution: 2 pieces  The use of floor plans and composite shapes is a foundational concept for scale drawing and determining the actual area based on a scale drawing Grade 7 (Geometry and Ratio and Proportional Relationships). (TUSD)			tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ▫ Argument ▫ Informative ▫ Research
	S	6.G.2 Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = l\ w\ h$ and $V = b\ h$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems. **Supporting content** **Essential questions** • *What are two ways to find the volume of a rectangular prism?* **Essential knowledge and skills** • Appropriate unit cubes are used to find the volume of rectangular prisms with fractional side lengths and to show that the formula for finding volume (V = l x w x h) can be used with any given side lengths. **Teaching Examples** • Students need multiple opportunities to measure volume by filling rectangular prisms with blocks and looking at the relationship between the total volume and the area of the base. Through these experiences, students derive the volume formula (volume equals the area of the base times the height). Students can explore the connection between filling a box with unit cubes and the volume formula using interactive applets such as the Cubes Tool on **Academic vocabulary** • Volume • Capacity • Unit cube • Fractional cubic unit • Fractional edge lengths • Polyhedron ○ (right) rectangular prism ○ Triangle prism ○ Cube ○ (right) rectangular pyramid ○ Triangle pyramid • Rectangular prism • Right rectangular prism		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		(http://illuminations.nctm.org/ActivityDetail.aspx?ID=6) . • In addition to filling boxes, students can draw diagrams to represent fractional side lengths, connecting with multiplication of fractions. This process is similar to composing and decomposing two-dimensional shapes. Examples: • The model shows a cubic foot filled with cubic inches. The cubic inches can also be labeled as a fractional cubic unit with dimensions of $\frac{1}{12}$ ft^3.  $\frac{1}{12}$ of $\frac{1}{12}$ of $\frac{1}{12}$ • The models show a rectangular prism with dimensions 3/2 inches, 5/2 inches, and 5/2 inches. Each of the cubic units in the model is $\frac{1}{2}$ in^3. Students work with the model to illustrate 3/2 x 5/2 x 5/2 = (3 x 5 x 5) x 1/8. Students reason that a small cube has volume 1/8 because 8 of them fit in a unit cube.  (TUSD) $\frac{1}{2}$ of $\frac{1}{2}$ of $\frac{1}{2}$ = $\frac{1}{8}$	**Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure • Look for and express regularity in repeated reasoning		
	S	6.G.3 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving real-world and mathematical problems. **Supporting content** **Essential questions** • How can a coordinate plane be used to find the distance/ length between two points that create a	**Academic vocabulary** • Coordinate plane • Vertices/vertex		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		side of a polygon? • How can a coordinate plane be used to find the area of a polygon? • How would you use a coordinate plane to help solve problems that involve mapping? **Essential knowledge and skills** • Appropriate unit cubes are used to find the volume of rectangular prisms with fractional side lengths and to show that the formula for finding volume (V = l x w x h) can be used with any given side lengths. • The vertices of a polygon can be plotted on a coordinate plane to find the length of each side and compute the area. **Teaching Examples** Example: • On a map, the library is located at (-2, 2), the city hall building is located at (0,2), and the high school is located at (0,0). Represent the locations as points on a coordinate grid with a unit of 1 mile. ○ What is the distance from the library to the city hall building? The distance from the city hall building to the high school? How do you know? ○ What shape is formed by connecting the three locations? The city council is planning to place a city park in this area. How large is the area of the planned park? (TUSD) • Point • Coordinate (ordered) pair **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure • Look for and express regularity in repeated reasoning			
	S	6.G.4 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures. Apply these techniques in the context of solving real-world and mathematical problems. **Supporting content** **Essential questions** • *How is a net related to a three-dimensional figure?* • *How can a net be used to find the surface area of a pyramid, rectangular or triangular prism?* **Essential knowledge and skills** • Three-dimensional figures can be depicted as two-dimensional nets to show all the faces at once. • Nets can be used to determine the surface area of prisms, pyramids, and cones. **Academic vocabulary** • Surface area • Net • 3D figure **Mathematical Practices** • Make sense of problems and persevere in solving			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Teaching Examples • Students construct models and nets of three-dimensional figures, describing them by the number of edges, vertices, and faces. Solids include rectangular and triangular prisms. Students are expected to use the net to calculate the surface area. • Students can create nets of 3D figures with specified dimensions using the Dynamic Paper Tool on NCTM's Illuminations (http://illuminations.nctm.org/ActivityDetail.aspx?ID=205). • Students also describe the types of faces needed to create a three-dimensional figure. Students make and test conjectures by determining what is needed to create a specific three-dimensional figure. Examples: • Describe the shapes of the faces needed to construct a rectangular pyramid. Cut out the shapes and create a model. Did your faces work? Why or why not? • Create the net for a given prism or pyramid, and then use the net to calculate the surface area.   (TUSD) • Solution: $84m^2$ ASSESSMENT PROBLEMS 6.G.1 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/656/original/illustrative_mathematics_656.pdf?1343856939 (2 only) 6.G.2 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/657/original/illustrative_mathematics_657.pdf?1343856937 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/534/original/illustrative_mathematics_534.pdf?1343856945 • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/535/original/illustrative_mathematics_535.pdf?1343856946	them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure • Look for and express regularity in repeated reasoning		

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		6.G.2 Advanced • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/000/537/original/illustrative_mathematics_537.pdf?1343856948 6.G.3 Basic • http://www.opusmath.com/common-core-standards/6.g.3-draw-polygons-in-the-coordinate-plane-given-coordinates-for-the-vertices 6.G.4 Basic • http://www.opusmath.com/common-core-standards/6.g.4-represent-three-dimensional-figures-using-nets-made-up-of-rectangles-and			
STATISTICS AND PROBABILITY (6.SP) Develop understanding of statistical variability. . Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**A**	**Students** 6.SP.1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. **Additional content** • *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* **Essential questions** • What makes a question a statistical question? **Essential knowledge and skills** • Statistical questions that anticipate variability are questions in which students are expecting a range of values for answers. **Teaching Examples** • Statistics are numerical data relating to an aggregate of individuals; statistics is also the name for the science of collecting, analyzing and interpreting such data. A statistical question anticipates an answer that varies from one individual to the next and is written to account for the variability in the data. Data are the numbers produced in response to a statistical question. Data are frequently collected from surveys or other sources (i.e. documents). • Questions can result in a narrow or wide range of numerical values. • Students might want to know about the fitness of the students at their school. Specifically, they want to know about the exercise habits of the students. **Academic vocabulary** • Data • Statistics • Statistical question • Variability **Mathematical Practices** • Make sense of problems and persevere in solving them • Construct viable Argument and critique the reasoning of others • Attend to precision	TEACHER NOTES See instructional strategies in the introduction • *Grade 6 is the introduction to the formal study of statistics for students. Students need multiple opportunities to look at data to determine and word statistical questions. Data should be analyzed from many sources, such as organized lists, box-plots, bar graphs and stem-and-leaf plots. This will help students begin to understand that responses to a statistical question will vary, and that this variability is described in terms of spread and overall shape. At the same time, students should begin to relate their informal knowledge of mean, mode and median to understand that data can also be described by single numbers. The single value for each of the measures of center (mean, median or*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com • http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits • Interviews • Graphic organizers • Journals • Mathematical

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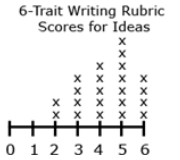
		○ So rather than asking "Do you exercise?" they should ask about the amount of exercise the students at their school get per week. A statistical question for this study could be: "How many hours per week on average do students at Jefferson Middle School exercise?" • To collect this information, students might design a survey question that anticipates variability by providing a variety of possible anticipated responses that have numerical answers, such as: 3 hours per week, 4 hours per week, and so on. Be sure that students ask questions that have specific numerical answers. (TUSD)	*mode) and measures of spread (range, interquartile range, mean absolute deviation) is used to summarize the data. Given measures of center for a set of data, students should use the value to describe the data in words. The important purpose of the number is not the value itself, but the interpretation it provides for the variation of the data. Interpreting different measures of center for the same data develops the understanding of how each measure sheds a different light on the data. The use of a similarity and difference matrix to compare mean, median, mode and range may facilitate understanding the distinctions of purpose between and among the measures of center and spread.* • *Include activities that require students to match graphs and explanations, or measures of center and explanations prior to interpreting graphs based upon the computation measures of center or spread. The determination of the measures of center and the process for developing graphical representation is the focus of the cluster "Summarize and describe distributions" in the Statistics and Probability domain for Grade 6. Classroom*	/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials	Practices • Modeling ★ • Multiple Intelligences assessments, e.g. □ Role playing - bodily kinesthetic □ Graphic organizing - visual □ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres □ Argument □ Informative □ Research
	A	6.SP.2 Understand that a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. **Additional content** **Essential questions** • *What are the measures of center and what does each tell you about the data?* • *Why would you want to graph a set of data to see the overall shape?* **Essential knowledge and skills** • A set of data can be described by its center, spread and overall shape. **Teaching Examples** • The two line/ dot plots show the 6-trait writing scores for a group of students on two different traits, organization and ideas. The center, spread and overall shape can be used to compare the data sets. Students consider the context in which the data were collected and identify clusters, peaks, gaps, and symmetry. Showing the two graphs vertically rather than side by side helps students make comparisons. Example: • Students would be able to see from the display of the two graphs that the ideas scores are generally higher than the organization scores. One observation students might make is that the scores for organization are clustered around a score of 3 whereas the scores for ideas are clustered around a score of 5. **Academic vocabulary** • Center • Clusters • Distribution • Gap • Line plot • Peak • Spread • Symmetry **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure			

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		  • (TUSD)	*instruction should integrate the two clusters.* (ODE)		
	A	6.SP.3 Recognize that a measure of center for a numerical data set summarizes all of its values with a single number, while a measure of variation describes how its values vary with a single number. **Additional content** **Essential questions** • *What information does the range tell you about a data set?* **Essential knowledge and skills** • Measures of center (mean, median, and mode) and range, give one number that represents the data in different ways. **Teaching Examples** • When using measures of center (mean, median, and mode) and range, students are describing a data set in a single number. The range provides a single number that describes how the values vary across the data set. The range can also be expressed by stating the minimum and maximum values. Example: • Consider the data shown in the line/ dot plot of the six trait scores for organization for a group of students. ○ How many students are represented in the data set? ○ What are the mean, median, and mode of the data set? What do these values mean? How do they compare? ○ What is the range of the data? What does **Academic vocabulary** • Measures of center • Measures of variation • Mean • Median • Mode • Maximum • Minimum • Range **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure		

MATHEMATICS CURRICULUM Grade 6

Curriculum Writers: Catherine Jalbert and Diane Turcotte

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		this value mean?  (TUSD) ASSESSMENT PROBLEMS 6.SP.1 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/040/original/illustrative_mathematics_1040.pdf?1364609125 6.SP.2 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/199/original/illustrative_mathematics_1199.pdf?1358652973 6.SP.3 Basic/Advanced • http://www.opusmath.com/common-core-standards/6.sp.3-recognize-that-a-measure-of-center-for-a-numerical-data-set-summarizes-all?q=Understand%20measures%20of%20center%20and%20variability%20as%20summary%20statistics			
STATISTICS AND PROBABILITY (6.SP) Summarize and describe distributions. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable Argument and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**A**	**Students** 6.SP.4 Display numerical data in plots on a number line, including dot plots, histograms, and box plots. **Additional content** **Essential questions** • *Which measure of center or variability best describes the data and why?* **Essential knowledge and skills** • One way to display data sets is to use number lines to create dot plots, histograms and box plots. • Summary statistics include quantitative measures of center, spread, and variability including extreme values (minimum and maximum), mean, median, mode, range, quartiles, interquartile ranges, and mean absolute deviation. ○ **Mean measures center** is the value that each data point would take on if the total of the data values were redistributed equally. ○ **Mean absolute deviation** is the mean of the absolute values of the distances the data points are away from the mean. **Academic vocabulary** • Box And Whisker Plot • Dot Plot • Frequency Table • Histogram • Outliers • Skew **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable	TEACHER NOTES See instructional strategies in the introduction • *This cluster builds on the understandings developed in the Grade 6 cluster "Develop understanding of statistical variability." Students have analyzed data displayed in various ways to see how data can be described in terms of variability. Additionally, in Grades 3-5 students have created scaled picture and bar graphs, as well as line plots. Now students learn to organize data in appropriate representations such as box plots (box-and-whisker plots), dot plots, and stem-and-leaf plots. Students need to display the same*	RESOURCE NOTES See resources in the introduction Textbooks • *Exploration in Core Math* , Holt Mc Dougal • *Holt Grade 6 Mathematics* Supplementary Books, Teacher (T) Student (S) • Technology • Computers • LCD projectors • Interactive boards Websites • http://curriculum.northsmithfieldschools.com	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON PROBLEMS/UNITS SUGGESTED FORMATIVE/ SUMMATIVE ASSESSMENTS • Anecdotal records • Conferencing • Exhibits

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		○ **Median** – the number in the middle of the data set when the data is arranged in order from least to greatest. ○ **Mode** – is the most common data point. ○ **Minimum** – the smallest data point. ○ **Maximum** – the largest data point. ○ **Range-** the difference between the minimum and maximum. ○ **Quartile** – the median of the either the first half of second half of the data set. **Teaching Examples** • In order to display numerical data in dot plots, histograms or box plots, students need to make decisions and perform calculations. Students are expected to display data graphically in a format appropriate for that data set as well as reading data from graphs generated by others students or contained in reference materials. Students can use applets to create data displays. Examples of applets include the Box Plot Tool and Histogram Tool on NCTM's Illuminations. ○ Box Plot Tool - http://illuminations.nctm.org/ActivityDetail.aspx?ID=77 ○ Histogram Tool -- http://illuminations.nctm.org/ActivityDetail.aspx?ID=78 • Dot plots are simple plots on a number line where each dot represents a piece of data in the data set. Dot plots are suitable for small to moderate size data sets and are useful for highlighting the distribution of the data including clusters, gaps, and outliers. • In most real data sets, there is a large amount of data and many numbers will be unique. A graph (such as a dot plot) that shows how many ones, how many twos, etc. would not be meaningful; however, a histogram can be used. Students organize the data into convenient ranges and use these intervals to generate a frequency table and histogram. Note that changing the size of the range changes the appearance of the graph and the conclusions you may draw from it. • Box plots are another useful way to display data and are plotted horizontally or vertically on a	Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure	*data using different representations. By comparing the different graphs of the same data, students develop understanding of the benefits of each type of representation.* • *Further interpretation of the variability comes from the range and center-of-measure numbers. Prior to learning the computation procedures for finding mean and median, students will benefit from concrete experiences.* • *To find the median visually and kinesthetically, students should reorder the data in ascending or descending order, then place a finger on each end of the data and continue to move toward the center by the same increments until the fingers touch. This number is the median.* • *The concept of mean (concept of fair shares) can be demonstrated visually and kinesthetically by using stacks of linking cubes. The blocks are redistributed among the towers so that all towers have the same number of blocks. Students should not only determine the range and centers of measure, but also use these numbers to describe the variation of the data collected from the statistical question asked. The data should be described in terms of its shape, center, spread*	• http://www.achieve.org/http://my.hrw.com • http://www.illustrativemathematics.org/standards/practice • http://www.ode.state.oh.us/GD/Templates/Pages/ODE/ODEDefaultPage.aspx?page=1 • http://www.parcconline.org/sites/parcc/files/PARCC%20Math%20S • http://www.tusd1.org/contents/distinfo/curriculum/index.asp • www.commoncore.org/maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials	• Interviews • Graphic organizers • Journals • Mathematical Practices • Modeling ★ • Multiple Intelligences assessments, e.g. □ Role playing - bodily kinesthetic □ Graphic organizing - visual □ Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres □ Argument

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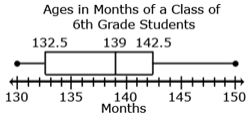
		number line. Box plots are generated from the five number summary of a data set consisting of the minimum, maximum, median, and two quartile values. Students can readily compare two sets of data if they are displayed with side by side box plots on the same scale. Box plots display the degree of spread of the data and the skewness of the data. Examples: • Nineteen students completed a writing sample that was scored using the six traits rubric. The scores for the trait of organization were 0, 1, 2, 2, 3, 3, 3, 3, 3, 3, 4, 4, 4, 4, 5, 5, 5, 6, 6. Create a data display. What are some observations that can be made from the data display?  • Grade 6 students were collecting data for a math class project. They decided they would survey the other two grade 6 classes to determine how many DVDs each student owns. A total of 48 students were surveyed. The data are shown in the table below in no specific order. Create a data display. What are some observations that can be made from the data display? • A histogram using 5 ranges (0-9, 10-19, …30-39) to organize the data is displayed below.  • Ms. Wheeler asked each student in her class to write their age in months on a sticky note. The 28 students in the class brought their sticky note to	*(range) and interquartile range or mean absolute deviation (the absolute value of each data point from the mean of the data set). Providing activities that require students to sketch a representation based upon given measures of center and spread and a context will help create connections between the measures and real-life situations*(ODE) (ODE)		☐ Informative ☐ Research

11	21	5	12	10	31	19	13	23	33
10	11	25	14	34	15	14	29	8	5
22	26	23	12	27	4	25	15	7	
2	19	12	39	17	16	15	28	16	

DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		the front of the room and posted them in order on the white board. The data set is listed below in order from least to greatest. Create a data display. What are some observations that can be made from the data display? 130 130 131 131 132 132 132 133 134 136 137 137 138 139 139 139 140 141 142 142 142 143 143 144 145 147 149 150 **Five number summary** Minimum – 130 months Quartile 1 (Q1) – (132 + 133) ÷ 2 = 132.5 months Median (Q2) – 139 months Quartile 3 (Q3) – (142 + 143) ÷ 2 = 142.5 months Maximum – 150 months  • This box plot shows that ○ ¼ of the students in the class are from 130 to 132.5 months old ○ ¼ of the students in the class are from 142.5 months to 150 months old ○ ½ of the class are from 132.5 to 142.5 months old ○ the median class age is 139 months. (TUSD)			
	A	6.SP.5 Summarize numerical data sets in relation to their context, such as by: **Additional content** a. Reporting the number of observations. 6.SP.5a b. Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. 6.SP.5b c. Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. 6.SP.5c			

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		d. Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. 6.SP.5d **Essential questions** • What is the difference between the measure of center and the measure of variance, and for what is each used? **Essential knowledge and skills** • One way to display data sets is to use number lines to create dot plots, histograms and box plots. **Teaching Examples** • The measure of center that a student chooses to describe a data set will depend upon the shape of the data distribution and context of data collection. The mode is the value in the data set that occurs most frequently. The mode is least frequently used as a measure of center because data sets may not have a mode, may have more than one mode, or the mode may not be descriptive of the data set. The mean is a very common measure of center computed by adding all the numbers in the set and dividing by the number of values. The mean can be affected greatly by a few data points that are very low or very high. In this case, the median or middle value of the data set might be more descriptive. In data sets that are symmetrically distributed, the mean and median will be very close to the same. In data sets that are skewed, the mean and median will be different, with the median frequently providing a better overall description of the data set. Understanding the Mean • The mean measures center in the sense that it is the value that each data point would take on if the total of the data values were redistributed equally, and also in the sense that it is a balance point. Students develop understanding of what the mean represents by redistributing data sets to be level or fair. The leveling process can be connected to and used to develop understanding of the computation of the mean. • For example, students could generate a data set by measuring the number of jumping jacks they can perform in 5 seconds, the length of their feet to the nearest inch, or the number of letters in **Academic vocabulary** • Interquartile range • Mean absolute deviation • Mean measure of center • Measures of spread **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable Argument and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure •			

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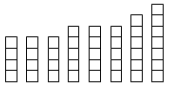
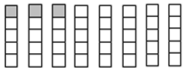
		their names. It is best if the data generated for this activity are 5 to 10 data points, which are whole numbers between 1 and 10 that are easy to model with counters or stacking cubes. Students generate a data set by drawing eight student names at random from the popsicle stick cup. The number of letters in each of the names is used to create the data set. If the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen there would be 3 names with 4 letters each, 3 names with 5 letters each, 1 name with 6 letters and 1 name with 7 letters. This data set could be represented with stacking cubes.  • Students can model the mean by "leveling" the stacks or distributing the blocks so the stacks are "fair". Students are seeking to answer the question "If all of the students had the same number of letters in their name, how many letters would each person have?" • One block from the stack of six and two blocks from the stack of 7 can be moved down to the stacks of 4 and then all the stacks have five blocks. If all students had the same number of letters in their name, they would have five letters. The mean number of letters in a name in this data set is 5.  • If it was not possible to make the stacks exactly even, students could begin to consider what part of the extra blocks each stack would have. Understanding Mean Absolute Deviation • The use of mean absolute deviation in 6th grade is mainly exploratory. The intent is to build a deeper understanding of variability. Students would understand the mean distance between the pieces of data and the mean of the data set expresses the			

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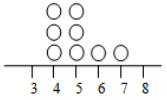
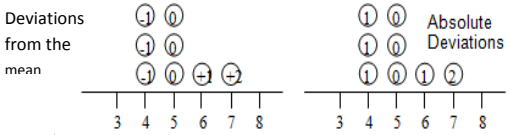
spread of the data set. Students can see that the larger the mean distance, the greater the variability. Comparisons can be made between different data sets.

- In the previous data set, the names drawn were Carol, Mike, Maria, Luis, Monique, Sierra, John, and Karen. There were 3 names with 4 letters each, 3 names with 5 letters each, 1 name with 6 letters and 1 name with 7 letters. This data can be represented on a dot plot. The mean of the data set is 5.



- To find the mean absolute deviation, students examine each of the data points and its difference from the mean. This analysis can be represented on the dot plot itself or in a table. Each of the names with 4 letters has one fewer letter than the mean, each of the names with 5 letters has zero difference in letters as compared to the mean, each of the names with 6 letters has one more letter than the mean, and each of the names with 7 letters has two more letters than the mean. The absolute deviations are the absolute value of each difference.



Name	Number of letters in a name	Deviation from the Mean	Absolute Deviation from the Mean
John	4	-1	1
Luis	4	-1	1
Mike	4	-1	1
Carol	5	0	0
Maria	5	0	0
Karen	5	0	0
Sierra	6	+1	1
Monique	7	+2	2
Total	40	0	6

- The mean of the absolute deviations is found by adding the absolute deviations and dividing by the number of data points. In this case, the mean absolute deviation would be 6 ÷ 8 or ¾ or 0.75.

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		The mean absolute deviation is a small number, indicating that there is little variability in the data set. • Consider a different data set also containing 8 names. If the names were Sue, Joe, Jim, Amy, Sabrina, Monique, Timothy, and Adelita. Summarize the data set and its variability. How does this compare to the first data set? (TUSD) ASSESSMENT PROBLEMS 6.SP.4 Basic • http://s3.amazonaws.com/illustrativemathematics/illustration_pdfs/000/001/026/original/illustrative_mathematics_1026.pdf?1354664528 6.SP.5 Basic/Advanced • http://www.opusmath.com/common-core-standards/6.sp.5d-relating-the-choice-of-measures-of-center-and-variability-to-the-shape-of?q=Select%20an%20appropriate%20measure%20of%20center			