6/1/2013

NORTH SMITHFIELD SCHOOL DEPARTMENT

MATHEMATICS CURRICULUM GRADE 8

North Smithfield Middle School
Curriculum Writers: Amanda Bednarczyk and Deborah Downes

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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 arguments 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

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.

- 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

- 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)
- Provide **rubrics** and **models**
- 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

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RESOURCES FOR Grade 8 Mathematics

Textbooks

- *Holt Course 3*
- *McDougal –Littell Algebra 1*
- *Teaching the Common Core Math Standards,* Muschla et. al
- *Exploration in Core Math* , Holt McDougal

Supplementary

Technology

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

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

- Algebra tiles
- Assorted fraction models
- Compasses
- Dice/number cubes or blocks
- Geometry solids
- Graph paper
- Isometric graph paper
- Number lines
- Protractors
- Road maps
- Rulers
- Tape measures
- Two color counters

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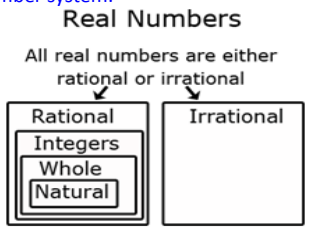
CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
THE NUMBER SYSTEM **The Real Number System (N-RN)** Know that there are numbers that are not rational, and approximate them by rational numbers Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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	**S**	**Students** 8.NS.1 Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number. **Supporting content** **Essential knowledge and skills** • The real numbers system contains both rational and irrational numbers. The set of rational numbers contain subsets of numbers that build on each other. • Every rational number can be written as a ratio of two quantities $\frac{a}{b}$ and as a decimal. • Every real number has a decimal expansion; rational numbers have a decimal expansion that will either terminate or repeat, where as irrational numbers have a decimal expansion that will not terminate or repeat. • Square roots of perfect squares are rational numbers; where as square roots of non-perfect squares are irrational numbers. **Teaching Examples** • Students can use graphic organizers to show the relationship between the subsets of the real number system.  • Students convert the fraction $\frac{2}{3}$ to a decimal and determine if the number is rational or irrational $\frac{2}{3} = 3\overline{)2.00} = 0.\overline{66}$ s So this is rational because it repeats itself (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Attend to precision • Look for and make use of structure	TEACHER NOTES See instructional strategies in the introduction • *The distinction between rational and irrational numbers is an abstract distinction, originally based on ideal assumptions of perfect construction and measurement. In the real world, however, all measurements and constructions are approximate. Nonetheless, it is possible to see the distinction between rational and irrational numbers in their decimal representations.* • *A rational number is of the form a/b, where a and b are both integers, and b is not 0. In the elementary grades, students learned processes that can be used to locate any rational number on the number line: Divide the interval from 0 to 1 into b equal parts; then, beginning at 0, count out a of those parts. The surprising fact, now, is that there are numbers on the number line that cannot be expressed as a/b, with a and b both integers, and these are called irrational numbers.* (ODE)	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* • *McDougal –Littell Algebra 1* • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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/	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 • Oral presentations

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	S	8.NS.2 Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). **Supporting content** • For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$, is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. **Essential knowledge and skills** • Irrational numbers (such as π *or* $\sqrt{2}$) are estimated using truncated decimal expansions, in order to be able to compare and place them on a number line in order from least to greatest. **Teaching Examples** • Students approximate square roots by iterative processes. *Examples*: • Approximate the value of to the nearest hundredth. Solution: Students start with a rough estimate based upon perfect squares. $\sqrt{5}$ falls between 2 and 3 because 5 falls between $2^2 = 4$ and $3^2 = 9$. The value will be closer to 2 than to 3. Students continue the iterative process with the tenths place value. $\sqrt{5}$ falls between 2.22 and 2.3 because 5 falls between $2.2^2 = 4.84$ and $2.3^2 = 5.29$. The value is closer to 2.2. Further iteration shows that the value of $\sqrt{5}$ is between 2.23 and 2.24 since 2.23^2 is 4.9729 and 2.242 is 5.0176. • By truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations. • Compare $\sqrt{2}$and $\sqrt{3}$by estimating their values, plotting them on a number line, and making comparative statements. (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Look for and make use of structure • Look for and express regularity in repeated reasoning **Academic vocabulary** • Decimal expansion • Estimate • Fraction • Integer • Irrational number • Iterative process • Natural Number • Number line • Perfect Square • Ratio • Rational number • Real Number • Repeating decimal • Square (x^2) • Subset • Terminating decimal • Whole Number		maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials • Calculator • Number lines	• Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres Arguments Information Research

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		ASSESSMENT PROBLEMS 8.NS.1 Basic • Rational numbers: Identify rational and irrational numbers (Eighth grade - D.1) • Rational numbers: Convert between decimals and fractions or mixed numbers (Eighth grade - D.6) 8.NS.1 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-NS-1.aspx • http://www.illustrativemathematics.org/illustrations/334 8.NS.2 Basic • Exponents and roots: Estimate positive and negative square roots (Eighth grade - F.15) • Exponents and roots: Estimate cube roots (Eighth grade - F.19) 8.NS.2 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-NS-1.aspx • http://www.illustrativemathematics.org/illustrations/337 • http://www.illustrativemathematics.org/illustrations/336			
EXPRESSIONS AND EQUATIONS (8.EE) Work with radicals and integer exponents. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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** **M**	**Students** 8.EE.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. **Major content** • *For example,* $3^2 \times 3^{-5} = 3^{-3} = \frac{1}{3^3} = \frac{1}{27}$. **Essential knowledge and skills** • Properties of integer exponents are used to simplify and create equivalent forms of numerical expressions. **Teaching Examples** • $\frac{4^3}{5^2} = \frac{64}{25}$ • $\frac{4^3}{4^7} = 4^{3-7} = 4^{-4} = \frac{1}{4^4} = \frac{1}{256}$ • $\frac{4^{-3}}{5^2} = 4^{-3} \times \frac{1}{5^2} = \frac{1}{4^3} \times \frac{1}{5^2} = \frac{1}{64} \times \frac{1}{25} = \frac{1}{16,000}$ (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Construct viable arguments and critique the reasoning of others • Use appropriate tools strategically • Attend to precision • Look for and make use of structure 8.EE.2 Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. **Major content**	TEACHER NOTES See instructional strategies in the introduction • *Although students begin using whole-number exponents in Grades 5 and 6, it is in Grade 8 when students are first expected to know and use the properties of exponents and to extend the meaning beyond counting-number exponents. It is no accident that these expectations are simultaneous, because it is the properties of counting-number exponents that provide the rationale for the properties of integer exponents. In other words, students should not be told these properties but rather*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* • *McDougal –Littell Algebra 1* • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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.asp	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

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$is irrational **Essential knowledge and skills** • The inverse operation of squaring a number is finding the square root. • The inverse operation of cubing a number is finding the cube root. **Teaching Examples** Examples: • $3^2 = 9$ and $\sqrt{9} = \pm 3$ • $\left(\frac{1}{3}\right)^3 = \left(\frac{1^3}{3^3}\right) = \frac{1}{27}$ and $\sqrt[3]{\frac{1}{27}} = \frac{\sqrt[3]{1}}{\sqrt[3]{27}} = \frac{1}{3}$ • Solve $x^2 = 9$ Solution: $x^2 = 9$ $\sqrt{x^2} = \pm\sqrt{9}$ $x = \pm 3$ • Solve $x^3 = 8$ Solution: $x^3 = 8$ $\sqrt[3]{x^3} = \sqrt[3]{8}$ $x = 2$ Know that $\sqrt{2}$ is a rational (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Construct viable arguments and critique the reasoning of others • Use appropriate tools strategically • Attend to precision • Look for and make use of structure			
	M	8.EE.3 Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. **Major content** • *For example, estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.* **Essential knowledge and skills** • Very large and very small numbers are represented using a single digit times an integer power of 10 (scientific notation). • Decimal form can be converted to scientific notation and vice-versa. **Teaching Examples** • Students have previously worked with powers of 10 and decimal placement in 5th grade. For example in 5th grade they look at the patterns on placement of the decimal points when a decimal is multiplied or divided by a positive power of ten. **Mathematical Practices** • Reason abstractly and quantitatively • Use appropriate tools strategically • Attend to precision	*should derive them through experience and reason.* • *For counting-number exponents (and for nonzero bases), the following properties follow directly from the meaning of exponents.* $a^m a^n = a^{m+n}$ $(a^m)n = a^{m+n}$ $a^m b^m = (ab)^m$ *Students should have experience simplifying numerical expressions with exponents so that these properties become natural and obvious. For example,* $2^3 \cdot 2^5 = (2 \cdot 2 \cdot 2)(2 \cdot 2 \cdot 2 \cdot 2 \cdot 2) = 2^8$ $(5^3)^4 = (5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5)(5 \cdot 5 \cdot 5) = 5^{12}$ $(3 \cdot 7)^4 = (3 \cdot 7)(3 \cdot 7)(3 \cdot 7)(3 \cdot 7) = (3 \cdot 3 \cdot 3 \cdot 3)(7 \cdot 7 \cdot 7) = 3^4 \cdot 7^4$ • *If students reason about these examples with a sense of generality about the numbers, they begin to articulate the properties. For example, "I see that 3 twos is being multiplied by 5 twos, and the results is 8 twos being multiplied together, where the 8 is the sum of 3 and 5, the number of twos in each of the original factors. That would work for a base other than two (as*	x?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 • Calculators to verify and explore patterns • Number lines • Place value charts to connect the digit value to the exponent (negative and positive) • Square tiles and cubes to develop understanding of squared and cubed numbers	• 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 ▫ Arguments ▫ Information ▫ Research

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		○ Example from 5th grade document page 7 "Students should be able to use the same type of reasoning as above to explain why the following multiplication and division problem by powers of 10 make sense. • $523 \times 10^3 = 523{,}000$ The place value of 523 is increased by 3 places. • $5.223 \times 10^2 = 522.3$ The place value of 5.223 is increased by 2 places. • $52.3 \div 10^1 = 5.23$ The place value of 52.3 is decreased by one place." (TUSD)	*long as the bases are the same)."* (ODE)		
	M	8.EE.4 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **Major content** **Essential knowledge and skills** • Operations and rules for exponents are used to determine the value and/or compare numbers in both decimal and scientific notation. • Calculators and computers display scientific notation in different formats. **Teaching Examples** • Students can convert decimal forms to scientific notation and apply rules of exponents to simplify expressions. • In working with calculators or spreadsheets, it is important that students recognize scientific notation. Students should recognize that the output of 2.45E+23 is 2.45 x 1023 and 3.5E-4 is 3.5 x 10-4. Students enter scientific notation using E or EE (scientific notation), * (multiplication), and ^ (exponent) symbols. (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Use appropriate tools strategically • Attend to precision ASSESSMENT S 8.EE.1 Basic • Exponents and roots: Understanding exponents (Eighth grade - F.1) • Exponents and roots: Evaluate exponents (Eighth grade - F.2) • Exponents and roots: Exponents: solve for the variable (Eighth grade - F.3)			

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		• Exponents and roots: Exponents with negative bases (Eighth grade - F.4) • Exponents and roots: Exponents with decimal and fractional bases (Eighth grade - F.5) • Exponents and roots: Understanding negative exponents (Eighth grade - F.6) • Exponents and roots: Evaluate negative exponents (Eighth grade - F.7) • Exponents and roots: Multiplication with exponents (Eighth grade - F.8) • Exponents and roots: Division with exponents (Eighth grade - F.9) • Exponents and roots: Multiplication and division with exponents (Eighth grade - F.10) • Exponents and roots: Power rule (Eighth grade - F.11) • Exponents and roots: Simplify expressions involving exponents (Eighth grade - F.12) • Monomials and polynomials: Multiply monomials (Eighth grade - Z.6) • Monomials and polynomials: Divide monomials (Eighth grade - Z.7) • Monomials and polynomials: Multiply and divide monomials (Eighth grade - Z.8) • Monomials and polynomials: Powers of monomials (Eighth grade - Z.9) 8.EE.1 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-1.aspx • http://www.illustrativemathematics.org/illustrations/823 • http://www.illustrativemathematics.org/illustrations/395 8.EE.2 Basic • Rational numbers: Identify rational and irrational numbers (Eighth grade - D.1) • Exponents and roots: Square roots of perfect squares (Eighth grade - F.13) • Exponents and roots: Positive and negative square roots (Eighth grade - F.14) • Exponents and roots: Relationship between squares and square roots (Eighth grade - F.16) • Exponents and roots: Evaluate variable expressions involving squares and square roots (Eighth grade - F.17) • Exponents and roots: Cube roots of perfect cubes (Eighth grade - F.18) 8.EE.2 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-1.aspx 8.EE.3 Basic • Scientific notation: Convert between standard and scientific notation (Eighth grade - G.1) • Scientific notation: Compare numbers written in scientific notation (Eighth grade - G.2) 8.EE.3 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-1.aspx • http://www.illustrativemathematics.org/illustrations/476 8.EE.4 Basic • Scientific notation: Convert between standard and scientific notation (Eighth grade - G.1) • Scientific notation: Multiply numbers written in scientific notation (Eighth grade - G.3) • Scientific notation: Divide numbers written in scientific notation (Eighth grade - G.4) 8.EE.4 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-1.aspx • http://www.illustrativemathematics.org/illustrations/823 • http://www.illustrativemathematics.org/illustrations/113			

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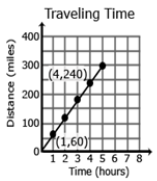
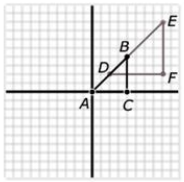
CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
EQUATIONS (8.EE) Understand the connections between proportional relationships, lines, and linear equations. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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** **M**	**Students** 8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. **Major content** Compare two different proportional relationships represented in different ways. • *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.* **Essential knowledge and skills** • A proportional relationship has a constant rate of change (or unit rate), known as the slope. • Equations for proportional relationships are linear equations of the form y=mx, where m is the unit rate or slope. • Linear equations when graphed are straight lines. • Proportional relationships can be compared using graphs, tables, and equations by analyzing the slopes (unit rates). **Teaching Examples** • Using graphs of experiences that are familiar to students' increases accessibility and supports understanding and interpretation of proportional relationship. Students are expected to both sketch and interpret graphs. Example: • Compare the scenarios to determine which represents a greater speed. Include a description of each scenario including the unit rates in your explanation. Scenario 1:  Scenario 2: $y = 50x$ x is time in hours y is distance in miles (TUSD) **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable arguments 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 8.EE.6 Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at b. **Major content**	TEACHER NOTES See instructional strategies in the introduction • *This cluster focuses on extending the understanding of ratios and proportions. Unit rates have been explored in Grade 6 as the comparison of two different quantities with the second unit a unit of one, (unit rate). In seventh grade unit rates were expanded to complex fractions and percents through solving multistep problems such as: discounts, interest, taxes, tips, and percent of increase or decrease. Proportional relationships were applied in scale drawings, and students should have developed an informal understanding that the steepness of the graph is the slope or unit rate. Now unit rates are addressed formally in graphical representations, algebraic equations, and geometry through similar triangles.* • *Distance time problems are notorious in mathematics. In this cluster, they serve the purpose of illustrating how the rates of two objects can be*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* • *McDougal –Littell Algebra 1* • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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/	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 • Oral presentations

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.

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Essential knowledge and skills • Proportional relationship when graphed, are straight lines that goes through the origin. • Equations for linear relationship are of the form y=mx, where m is the unit rate or slope and goes through the origin or y=mx+b for a line intercepting the vertical axis at b. • Proportional relationships are a special form of a linear relationship. • The slope m is the same between any two distinct points on a non-vertical line in the coordinate plane. (This is shown using similar triangles.) **Teaching Examples** Example: • If you take two pairs of points on the same line, and then draw the corresponding triangles, the triangles will be similar. Because the triangles are similar the ratio of side length must therefore be the same, thus showing that slope between either pair of points is the same. • Explain why ΔACB is similar to Δ DFE and deduce that AB has the same slope as BE . Express each line as an equation.  (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Construct viable arguments and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Look for and make use of structure • Look for and express regularity in repeated reasoning ASSESSMENT PROBLEMS 8.EE.5 Basic • Ratios and proportions: Unit rates (Eighth grade - H.5) • Ratios and proportions: Do the ratios form a proportion? (Eighth grade - H.6) • Ratios and proportions: Do the ratios form a proportion: word problems (Eighth grade - H.7) • Ratios and proportions: Solve proportions (Eighth grade - H.8) • Ratios and proportions: Solve proportions: word problems (Eighth grade - H.9) • Proportional relationships: Find the constant of variation: graphs (Eighth grade - I.2) • Proportional relationships: Graph a proportional relationship (Eighth grade - I.4) • Proportional relationships: Proportional relationships: word problems (Eighth grade - I.6) 8.EE.5 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-5.aspx • http://www.illustrativemathematics.org/illustrations/129	*represented, analyzed and described in different ways: graphically and algebraically. Emphasize the creation of representative graphs and the meaning of various points. Then compare the same information when represented in an equation.* • *By using coordinate grids and various sets of three similar triangles, students can prove that the slopes of the corresponding sides are equal, thus making the unit rate of change equal. After proving with multiple sets of triangles, students can be led to generalize the slope to y = mx for a line through the origin and y = mx + b for a line through the vertical axis at b.* (ODE)	maps • www.corestandards.org • www.khanacademy.com • www.ride.ri.gov Materials • Calculator • Graph paper • Rulers	• Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres Arguments Information Research

MATHEMATICS CURRICULUM Grade 8

Curriculum Writers: Amanda Bednarczyk and Deborah Downes

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• http://www.illustrativemathematics.org/illustrations/471 8.EE.6 Basic • Proportional relationships: Write an equation for a proportional relationship (Eighth grade - I.5) • Linear functions: Graph a line from an equation (Eighth grade - V.7) • Linear functions: Find the slope of a graph (Eighth grade - V.9) • Linear functions: Find slope from two points (Eighth grade - V.10) • Linear functions: Find slope from an equation (Eighth grade - V.11) • Linear functions: Graph a line using slope (Eighth grade - V.12) 8.EE.6 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-5.aspx • http://www.illustrativemathematics.org/illustrations/471			
EXPRESSIONS AND EQUATIONS (8.EE) Analyze and solve linear equations and pairs of simultaneous linear equations . Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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** 8.EE.7 Solve linear equations in one variable. **Major content** a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). (8.EE.7a) b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. (8.EE.7b) **Essential knowledge and skills** • Linear equations in one variable have one solution, infinitely many solutions or no solutions. • Linear equations can be expanded and simplified using the distributive property and combining like terms. **Teaching Examples** • As students transform linear equations in one variable into simpler forms, they discover the equations can have one solution, infinitely many solutions, or no solutions. • When the equation has one solution, the variable has one value that makes the equation true as in 12-4y=16. The only value for y that makes this equation true is -1. **Mathematical Practices** • Reason abstractly and quantitatively • Use appropriate tools strategically • Attend to precision • Look for and make use of structure	TEACHER NOTES See instructional strategies in the introduction • *Problems should be structured so that students also experience equations that represent parallel lines and equations that are equivalent. This will help them to begin to understand the relationships between different pairs of equations: When the slope of the two lines is the same, the equations are either different equations representing the same line (thus resulting in many solutions), or the equations are different equations representing two not intersecting, parallel, lines that do not have common solutions.* • *System-solving in Grade*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* • *McDougal –Littell Algebra 1* Chapters 3.1-3.6 • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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.illustrativem	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

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• When the equation has infinitely many solutions, the equation is true for all real numbers as in 7x + 14 = 7 (x+2). As this equation is simplified, the variable terms cancel leaving 14 = 14 or 0 = 0. Since the expressions are equivalent, the value for the two sides of the equation will be the same regardless which real number is used for the substitution. • When an equation has no solutions it is also called an inconsistent equation. This is the case when the two expressions are not equivalent as in 5x - 2 = 5(x+1). When simplifying this equation, students will find that the solution appears to be two numbers that are not equal or -2 = 1. In this case, regardless which real number is used for the substitution, the equation is not true and therefore has no solution. Examples: • Solve for x: o $-3(x+7)=4$ o $3x-8=4x-8$ o $3(x+1)-5=3x-2$ • Solve: o $7(m-3)=7$ o $\frac{1}{4}-\frac{2}{3}y=\frac{3}{4}-\frac{1}{3}y$ (TUSD)	*8 should include estimating solutions graphically, solving using substitution, and solving using elimination. Students again should gain experience by developing conceptual skills using models that develop into abstract skills of formal solving of equations. Provide opportunities for students to change forms of equations (from a given form to slope-intercept form) in order to compare equations* (ODE)	athematics.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 • Algebra tiles • Calculator • Graph paper • Rulers • *Holt Course 3* Chapter 11 • *McDougal –Littell Algebra 1* Chapters 7 • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal	• Modeling ★ • Multiple Intelligences assessments, e.g. o Role playing - bodily kinesthetic o Graphic organizing - visual o Collaboration - interpersonal • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres o Arguments o Information o Research
	M	8.EE.8 Analyze and solve pairs of simultaneous linear equations. **Major content** a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously. (8.EE.8a) b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. For example, 3x + 2y = 5 and 3x + 2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6. (8.EE.8b) c. Solve real-world and mathematical problems leading to two linear equations in two variables. • *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair. (8.EE.8c)*			

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

Essential knowledge and skills

- The solution to a system of linear equations in two variables is the point/ ordered pair on a graph where the two lines will intersect.
- The solution to a system of linear equations in two variables is the point/ ordered pair that satisfies both equations.
- System of linear questions can be solved algebraically to find the point of intersection and then checked graphically.

Teaching Examples:

- Sample problem @ http://www.tusd1.org/contents/distinfo/curriculum/index.asp, grade 8 mathematics pp 15-17 (TUSD)

Mathematical Practices

- Make sense of problems and persevere in solving them
- Reason abstractly and quantitatively
- Construct viable arguments 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

Academic vocabulary

- Base
- Cube
- Cube Root
- Exponent
- Exponential form
- Perfect Square
- Power
- Radical
- Scientific notation
- Square
- Square root

ASSESSMENT PROBLEMS

8.EE.7 Basic

- Single-variable equations: Identities and equations with no solutions (Eighth grade - U.9)
- Single-variable equations: Model and solve equations using algebra tiles (Eighth grade - U.2)
- Single-variable equations: Write and solve equations that represent diagrams (Eighth grade - U.3)
- Single-variable equations: Solve one-step linear equations (Eighth grade - U.4)
- Single-variable equations: Solve two-step linear equations (Eighth grade - U.5)
- Single-variable equations: Solve equations involving squares and square roots (Eighth grade - U.6)
- Single-variable equations: Solve multi-step equations (Eighth grade - U.7)
- Single-variable equations: Solve equations involving like terms (Eighth grade - U.8)
- Properties: Properties of addition and multiplication (Eighth grade - AA.1)
- Properties: Distributive property (Eighth grade - AA.2)
- Properties: Simplify variable expressions using properties (Eighth grade - AA.3

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		8.EE.7 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-7.aspx • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.sr.1.000ee.d.201-final_v1.pdf • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.sr.1.000ee.d.204-final_v1.pdf • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.cr.1.0000g.g.129_v1.pdfhttp://www.illustrativemathematics.org/illustrations/392 • http://www.illustrativemathematics.org/illustrations/553 8.EE.8 Basic • Systems of linear equations: Is (x, y) a solution to the system of equations? (Eighth grade - Y.1) • Systems of linear equations: Solve a system of equations by graphing (Eighth grade - Y.2) • Systems of linear equations: Find the number of solutions to a system of equations by graphing (Eighth grade - Y.4) • Systems of linear equations: Find the number of solutions to a system of equations (Eighth grade - Y.5) • Systems of linear equations: Classify a system of equations by graphing (Eighth grade - Y.6) • Systems of linear equations: Classify a system of equations (Eighth grade - Y.7) • Systems of linear equations: Solve a system of equations using substitution (Eighth grade - Y.8) • Systems of linear equations: Solve a system of equations using elimination (Eighth grade - Y.10) • Systems of linear equations: Solve a system of equations by graphing: word problems (Eighth grade - Y.3) • Systems of linear equations: Solve a system of equations using substitution: word problems (Eighth grade - Y.9) • Systems of linear equations: Solve a system of equations using elimination: word problems (Eighth grade - Y.11) 8.EE.8 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-EE-7.aspx • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.te.1.000ee.d.147_v1.pdf • http://www.illustrativemathematics.org/illustrations/469 • http://www.illustrativemathematics.org/illustrations/472 • http://www.illustrativemathematics.org/illustrations/553			
FUNCTIONS (8.F) Define, evaluate, and compare functions.	**M**	**Students** 8.F.1 Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. **Major content**	TEACHER NOTES See instructional strategies in the introduction • *To determine whether a relationship is a*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3*	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS

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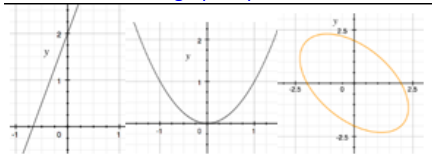
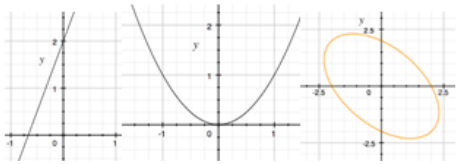
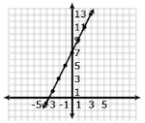
CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and 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 knowledge and skills** • A function is a rule that assigns each input exactly one output. • A graph of an equation is also the graph of that function consisting of inputs and the corresponding outputs. **Teaching Examples:** • The rule that takes x as input and gives x^2+5x+4 as output is a function. Using y to stand for the output we can represent this function with the equation $y = x^2+5x+4$, and the graph of the equation is the graph of the function. • Determine which if the following tables represent a function and explain why. Table A Input / Output 0 / 1 1 / 2 2 / 2 3 / 4 Table B Input / Output 0 / 0 1 / 2 1 / 3 4 / 5 Solution: A represents a function because for each input there is exactly one output. B does NOT represent a function because the input 1 has two outputs (2 and 3). Explanation: ▪ A vertical line test can be preformed to determine whether a graph represents a function. By definition a function, each x value (input) of a function can have only one y value (output). If a vertical line is drawn for an x value then that line can only hit the graph at one point (that is one output). **Mathematical Practices** • Reason abstractly and quantitatively • Attend to precision	*function, students should be expected to reason from a context, a graph, or a table, after first being clear which quantity is considered the input and which is the output. When a relationship is not a function, students should produce a counterexample: an "input value" with at least two "output values." If the relationship is a function, the students should explain how they verified that for each input there was exactly one output. The "vertical line test" should be not be used as the only explanation as to why an equation is a function.* (ODE)	Chapter 3 • *McDougal –Littell Algebra 1* Chapter 4 • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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	• 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 tasks • Rubrics/checklists (mathematical

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.

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• Determine if the graph represents a function:  ○ Solution  A & B are functions because the vertical line only hits the graph at one point no matter where you draw the line therefore there is exactly one output for each input. C is not a function because the vertical line hits the graph in two points therefore there is NOT exactly one output for each input. (TUSD)		Materials • Graph paper • Rulers	practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres ▫ Arguments ▫ Information ▫ Research
	M	8.F.2 Compare properties of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). **Major content** • *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.* **Essential knowledge and skills** • Functions can be represented algebraically, graphically, numerically in tables or by verbal descriptions. **Teaching Examples:** • Given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change. • Compare the two linear functions listed below and determine which equation represents a greater rate of change. **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable arguments and critique the reasoning of others			

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		 Function 2: The function whose input x and output y are related by y = 3x + 7 • Compare the two linear functions listed below and determine which has a negative slope. Function 1: Gift Card ○ Samantha starts with $20 on a gift card for the book store. She spends $3.50 per week to buy a magazine. Let y be the amount remaining as a function of the number of weeks x y 0 20 1 16.50 2 13.00 3 9.50 4 6.00 Function 2: ○ The school bookstore rents graphing calculators for $5 per month. It also collects a non-refundable fee of $10.00 for the school year. Write the rule for the total cost (c) of renting a calculator as a function of the number of months (m). Solution: ○ Function 1 is an example of a function whose graph has negative slope. Samantha starts with $20 and spends money each week. The amount of money left on the gift card decreases each week. The graph has a negative slope of -3.5, which is the amount the gift card balance decreases with Samantha's weekly magazine purchase. ○ Function 2 is an example of a function whose graph has positive slope. Students pay a yearly nonrefundable fee for renting the calculator and pay $5 for each month they rent the calculator. This function has a positive slope of 5 which is the amount of the monthly rental fee. An equation for Example 2 could be c = 5m + 10. (TUSD)	• 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		

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
	M	8.F.3 Interpret the equation y = mx + b as defining a linear function, whose graph is a straight line; give examples of functions that are not linear. **Major content** • *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1), (2,4) and (3,9), which are not on a straight line.* **Essential knowledge and skills** • Linear functions are represented by the equation y=mx+b and a straight line on a graph. **Teaching Examples:** ○ Determine which of the functions listed below are linear and which are not linear and explain your reasoning. ○ $y = -2x^2 + 3$ non linear ○ $y = 2x$ linear ○ $A = \pi r^2$ non linear ○ $y = 0.25 + 0.5(x - 2)$ linear (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure **Academic vocabulary** • Domain • Function • Input • Linear function • Nonlinear Function • Output • Point Slope Form • Range • Slope Intercept Form • Slope/Rate of Change • Vertical line test ASSESSMENT PROBLEMS 8.F.1 Basic • Linear functions: Complete a function table (Eighth grade - V.3) • Linear functions: Find points on a function graph (Eighth grade - V.5) • Linear functions: Graph a line from a function table (Eighth grade - V.6) 8.F.1 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-F-1.aspx • http://www.illustrativemathematics.org/illustrations/713 • http://www.illustrativemathematics.org/illustrations/1165 8.F.2 Basic • Linear functions: Write a rule for a function table (Eighth grade - V.4) • Linear functions: Graph a line from a function table (Eighth grade - V.6) • Linear functions: Graph a line from an equation (Eighth grade - V.7) • Nonlinear functions: Identify linear and nonlinear functions (Eighth grade - W.1) 8.F.2 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-F-1.aspx • http://www.illustrativemathematics.org/illustrations/641			

MATHEMATICS CURRICULUM Grade 8

Curriculum Writers: Amanda Bednarczyk and Deborah Downes

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		8.F.3 Basic • Linear functions: Graph a line from an equation (Eighth grade - V.7) • Nonlinear functions: Identify linear and nonlinear functions (Eighth grade - W.1) 8.F.3 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-F-1.aspx • http://www.illustrativemathematics.org/illustrations/813			
FUNCTIONS (8.F) Use functions to model relationships between quantities. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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** 8.F.4 Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two (*x*, *y*) values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values. **Major content** **Essential knowledge and skills** • Linear functions are functions that have a constant rate of change (slope) and an initial value. • The initial value of a linear function is the place where the line will intersect the vertical axis or the y-intercept. • Linear functions are represented as verbal descriptions, tables, graphs and equations that are all related by the same rate of change (slope) and initial value. **Teaching Examples:** • The table below shows the cost of renting a car. The company charges $45 a day for the car as well as charging a one-time $25 fee for the car's navigation system (GPS).Write an expression for the cost in dollars, c, as a function of the number of days, d. Days (d) / Cost (c) in dollars 1 / 70 2 / 115 3 / 160 4 / 205 **Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable arguments 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 r	TEACHER NOTES See instructional strategies in the introduction • *In Grade 8, students focus on linear equations and functions. Nonlinear functions are used for comparison.* • *Students will need many opportunities and examples to figure out the meaning of y = mx + b. What does m mean? What does b mean? They should be able to "see" m and b in graphs, tables, and formulas or equations, and they need to be able to interpret those values in contexts. For example, if a function is used to model the height of a stack of n paper cups, then the rate of change, m, which is the slope of the graph, is the height of the "lip" of the cup: the amount each cup sticks above the lower cup in the stack. The "initial value" in this*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* Chapters 3 • *McDougal –Littell Algebra 1* Chapter 4 • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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.	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

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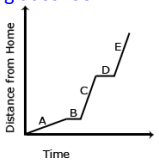
		Solution: Students might write the equation c = 45d + 25 using the verbal description or by first making a table. • When scuba divers come back to the surface of the water, they need to be careful not to ascend too quickly. Divers should not come to the surface more quickly than a rate of 0.75 ft per second. If the divers start at a depth of 100 feet, the equation d = 0.75t – 100 shows the relationship between the time of the ascent in seconds (t) and the distance from the surface in feet (d). ○ Will they be at the surface in 5 minutes? How long will it take the divers to surface from their dive? ○ Make a table of values showing several times and the corresponding distance of the divers from the surface. Explain what your table shows. How do the values in the table relate to your equation? (TUSD)	*case is not valid in the context because 0 cups would not have a height, and yet a height of 0 would not fit the equation. Nonetheless, the value of b can be interpreted in the context as the height of the "base" of the cup: the height of the whole cup minus its lip.* • *Use graphing calculators and web resources to explore linear and non-linear functions. Provide context as much as possible to build understanding of slope and y-intercept in a graph, especially for those patterns that do not start with an initial value of 0.* • *Give students opportunities to gather their own data or graphs in contexts they understand. Students need to measure, collect data, graph data, and look for patterns, then generalize and symbolically represent the patterns. They also need opportunities to draw graphs (qualitatively, based upon experience) representing real-life situations with which they are familiar. Probe*	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 • Graph paper • Rulers	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 □ Arguments □ Information □ Research
	M	8.F.5 Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). **Major content** Sketch a graph that exhibits the qualitative features of a function that has been described verbally. **Essential knowledge and skills** • Real world functional relationships between two quantities can be represented using verbal descriptions and graphs **Teaching Examples:** • The graph below shows a student's trip to school. This student walks to his friend's house and, together, they ride a bus to school. The bus stops once before arriving at school.  Describe how each part A-E of the graph **Mathematical Practices** • Reason abstractly and quantitatively • Construct viable arguments 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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		relates to the story. (TUSD) **Academic vocabulary** • Domain • Function • Input • Linear function • Nonlinear function • Output • Point Slope Form • Range • Slope Intercept Form • Slope/Rate of Change • Vertical ASSESSMENT PROBLEMS 8.F.4 Basic • Ratios and proportions: Rate of change (Eighth grade - H.11) • Ratios and proportions: Constant rate of change (Eighth grade - H.12) • Proportional relationships: Find the constant of variation: graphs (Eighth grade - I.2) • Proportional relationships: Find the constant of variation: word problems (Eighth grade - I.3) • Proportional relationships: Write an equation for a proportional relationship (Eighth grade - I.5) • Proportional relationships: Proportional relationships: word problems (Eighth grade - I.6) • Linear functions: Write a rule for a function table (Eighth grade - V.4) • Linear functions: Linear function word problems (Eighth grade - V.8) • Linear functions: Find the slope of a graph (Eighth grade - V.9) • Linear functions: Find slope from two points (Eighth grade - V.10) 8.F.4 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-F-4.aspx • http://www.illustrativemathematics.org/illustrations/477 • http://www.illustrativemathematics.org/illustrations/1206 • http://www.illustrativemathematics.org/illustrations/2478.F.5 Basic • Linear functions: Linear function word problems (Eighth grade - V.8) 8.F.5 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-F-4.aspx • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.cr.1.0000f.f.090_v1.pdf • http://www.illustrativemathematics.org/illustrations/633 • http://www.illustrativemathematics.org/illustrations/674 • http://www.illustrativemathematics.org/illustrations/628	*student thinking by asking them to determine which input values make sense in the problem situations.* (ODE)		
GEOMETRY (8.G) Understand congruence and similarity using physical models, transparencies, or geometry software.	**M**	**Students** 8.G.1 Verify experimentally the properties of rotations, reflections, and translations **Major content** a. Lines are taken to lines, and line segments to line segments of the same length (8.G.1a). b. Angles are taken to angles of the same measure (8.G.1b).	TEACHER NOTES See instructional strategies in the introduction • *A major focus in Grade 8 is to use knowledge of angles and distance to analyze two- and three-dimensional figures and*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* Chapters , 5,7 • *McDougal –Littell Algebra 1*	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON ASSESSMENTS • MID-TERM EXAM • FINAL EXAM • COMMON

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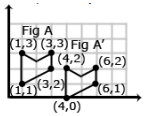
Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning	**M**	c. Parallel lines are taken to parallel lines (8.G.1c). **Essential knowledge and skills** • Translating a point, line, line segment or angle does not change any attributes of that object, it will just move the object to a new location. • When a point is reflected across a line that reflected point stays the same distance from the line of reflection as the original point. • When a line segment or angle is rotated, reflected or translated, the length of that line segment and measure of the angle will not change. **Teaching Examples:** • Students need multiple opportunities to explore the transformation of figures so that they can appreciate that points stay the same distance apart and lines stay at the same angle after they have been rotated, reflected, and/or translated. (TUSD) **Mathematical Practices** • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision 8.G.2 Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them. **Major content** **Essential knowledge and skills** • A sequence of rotations, reflections, and/or translations to a two-dimensional figure will create a congruent two-dimensional figure. **Teaching Examples:** Examples: • Is Figure A congruent to Figure A'? Explain how you know.  • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'. **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Attend to precision • Look for and make use of structure	*space in order to solve problems. This cluster interweaves the relationships of symmetry, transformations, and angle relationships to form understandings of similarity and congruence. Inductive and deductive reasoning are utilized as students forge into the world of proofs. Informal arguments are justifications based on known facts and logical reasoning. Students should be able to appropriately label figures, angles, lines, line segments, congruent parts, and images (primes or double primes). Students are expected to use logical thinking, expressed in words using correct terminology. They are NOT expected to use theorems, axioms, postulates or a formal format of proof as in two-column proofs.* • *Transformational geometry is about the effects of rigid motions, rotations, reflections and translations on figures. Initial work should be presented in such a way that students understand the concept of each type of transformation and the*	• *Teaching the Common Core Math Standards*, Muschla *et. al* • *Exploration in Core Math* Holt McDougal 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 • Grid paper • Mirrors • Virtual manipulative	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 tasks • Rubrics/checklists (mathematical practice, modeling)

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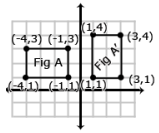
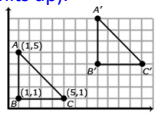
	M	 (TUSD) 8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates. **Major content** **Essential knowledge and skills** • An image is the figure created by doing a transformation on the pre-image (or original object). • A dilation of a two-dimensional figure will create an image that is a similar figure to the original by a multiplicative relationship. • A translated, reflected or rotated two-dimensional figure will create an image that is a congruent figure to the original. **Teaching Examples:** • A dilation is a transformation that moves each point along a ray emanating from a fixed center, and multiplies distances from the center by a common scale factor. In dilated figures, the dilated figure is similar to its pre-image. • Translation: A translation is a transformation of an object that moves the object so that every point of the object moves in the same direction as well as the same distance. In a translation, the translated object is congruent to its pre-image. Example: • ΔABC has been translated 7 units to the right and 3 units up. To get from A (1,5) to A' (8,8), move A 7 units to the right (from x = 1 to x = 8) and 3 units up (from y = 5 to y = 8). Points B + C also move in the same direction (7 units to the right and 3 units up).  • Reflection: A reflection is a transformation that flips an object across a line of reflection (in a **Mathematical Practices** • Construct viable arguments and critique the reasoning of others • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure	*effects that each transformation has on an object before working within the coordinate system. For example, when reflecting over a line, each vertex is the same distance from the line as its corresponding vertex. This is easier to visualize when not using regular figures. Time should be allowed for students to cut out and trace the figures for each step in a series of transformations. Discussion should include the description of the relationship between the original figure and its image(s) in regards to their corresponding parts (length of sides and measure of angles) and the description of the movement, including the attributes of transformations (line of symmetry, distance to be moved, center of rotation, angle of rotation and the amount of dilation).The case of distance – preserving transformation leads to the idea of congruence.* (ODE)		• Tests and quizzes • Technology • Think-alouds • Writing genres Arguments Information Research

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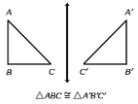
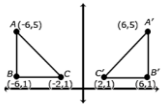
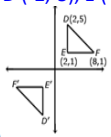
		coordinate grid the line of reflection may be the x or y axis). In a reflection, the reflected object is congruent to its pre-image.  △ABC ≅ △A'B'C' • When an object is reflected across the y axis, the reflected x coordinate is the opposite of the pre-image x coordinate.  • Rotation: A rotated figure is a figure that has been turned about a fixed point. This is called the center of rotation. A figure can be rotated up to 360˚. Rotated figures are congruent to their pre-image figures. • Consider when is rotated 180˚ clockwise about the origin. The coordinates of are D(2,5), E(2,1), and F(8,1). When rotated 180˚, has new coordinates D'(-2,-5), E'(-2,-1)  and F'(-8,-1). Each coordinate is the opposite of its pre-image. (TUSD)			
	M	8.G.4 Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them. **Major content** **Essential knowledge and skills** • Similar figures are produced by doing a sequence of rotations, reflections, translations AND dilations. The sequence of transformation must include dilation in order to produce a similar figure. **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★			

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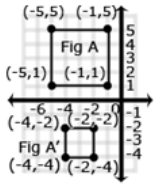
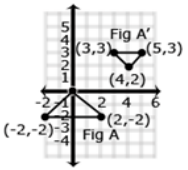
		• Similar figures are figures that have the same angles and proportional side lengths. **Teaching Examples:** • Is Figure A similar to Figure A'? Explain how you know.  • Describe the sequence of transformations that results in the transformation of Figure A to Figure A'.  (TUSD)	• Use appropriate tools strategically • Attend to precision • Look for and make use of structure		
	M	8.G.5 Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. **Major content** • *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.* **Essential knowledge and skills** • Parallel lines cut by a transversal will create pairs of angles that are either congruent or supplementary. • The relationships between the angles made by parallel lines cut by a transversal can be used to informally prove that the interior angles of a triangle will add up to 180°. **Teaching Examples:** • Angle relationships that can be explored include but are not limited to: ○ Same-side (consecutive) interior and same-side (consecutive) exterior	**Mathematical Practices** • Construct viable arguments 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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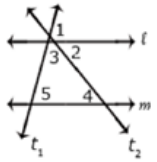
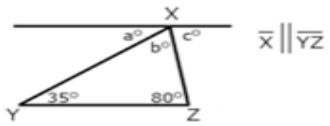
		angles are supplementary. ○ Corresponding, Alternate interior angles and alternate exterior angles. Examples: • Arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so. • Students can informally prove relationships with transversals. Show that m∠3 + m∠4 + m∠5 = 180° if l and m are parallel lin transversals. ∠1 + ∠2 + ∠3 = 180°. Angle 1 and Angle 5 are congruent be corresponding angles (∠5 ≅ ∠1). ∠1 can be substituted for ∠ ∠4 ≅ ∠2 : because alternate interior angles are congruent. ∠4 can be substituted for ∠2 Therefore m∠3 + m∠4 + m∠5 = 180°  • Students can informally conclude that the sum of a triangle is 180º (the angle-sum theorem) by applying their understanding of lines and alternate interior angles. In the figure below, line x is parallel to line yz:  $\overline{x} \parallel \overline{yz}$ • Angle a is 35º because it alternates with the angle inside the triangle that measures 35º. Angle c is 80º because it alternates with the angle inside the triangle that measures 80º. Because lines have a measure of 180º, and angles a + b + c form a straight line, then angle b must be 65 º (180 – 35 + 80 = 65). Therefore, the sum of the angles of the triangle are 35º + 65 º +			

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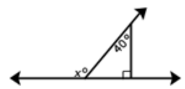
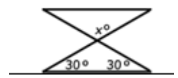
80 º

Examples:

- Write and solve an equation to find the measure of angle x.



- Write and solve an equation to find the measure of angle x.



(TUSD)

<u>Academic vocabulary</u>

Adjacent angles	Interior angles	Skew lines
Alternate interior angles	Parallel Lines	Sphere
Cone	Perpendicular lines	Transformation
Congruent	Prism	Translation
Corresponding angles	Pythagorean Theorem	Transversal
Cylinder	Reflection	Triangle Sum Theorem
Dilation	Right angle	Vertical angles
Exterior angles	Rotation	Volume
Hypotenuse	Similar	

ASSESSMENT PROBLEMS

8.G.1 Basic

- Transformations: Identify reflections, rotations, and translations (Eighth grade - R.1)
- Transformations: Translations: graph the image (Eighth grade - R.2)
- Transformations: Reflections: graph the image (Eighth grade - R.4)
- Transformations: Rotations: graph the image (Eighth grade - R.6)
- Transformations: Identify reflections, rotations, and translations (Eighth grade - R.1)
- Transformations: Translations: graph the image (Eighth grade - R.2)
- Transformations: Reflections: graph the image (Eighth grade - R.4)
- Transformations: Rotations: graph the image (Eighth grade - R.6)
- Transformations: Identify reflections, rotations, and translations (Eighth grade - R.1)
- Transformations: Translations: graph the image (Eighth grade - R.2)
- Transformations: Reflections: graph the image (Eighth grade - R.4)
- Transformations: Rotations: graph the image (Eighth grade - R.6)

8.G.1 Advanced

- http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-1.aspx

8.G.2 Basic

- Geometry: Similar and congruent figures (Eighth grade - Q.9)

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• Geometry: Congruent figures: side lengths and angle measures (Eighth grade - Q.11) • Geometry: Congruence statements and corresponding parts (Eighth grade - Q.12) 8.G.2 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-1.aspx • http://www.illustrativemathematics.org/illustrations/1231 • http://www.illustrativemathematics.org/illustrations/1230 8.G.3 Basic • Transformations: Translations: find the coordinates (Eighth grade - R.3) • Transformations: Reflections: find the coordinates (Eighth grade - R.5) • Transformations: Rotations: find the coordinates (Eighth grade - R.7) • Transformations: Dilations: graph the image (Eighth grade - R.8) • Transformations: Dilations: find the coordinates (Eighth grade - R.9) 8.G.3 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-1.aspx • http://www.illustrativemathematics.org/illustrations/1243 • http://www.illustrativemathematics.org/illustrations/995 8.G.4 Basic • Geometry: Similar and congruent figures (Eighth grade - Q.9) • Geometry: Similar figures: side lengths and angle measures (Eighth grade - Q.10) • Geometry: Similar solids (Eighth grade - Q.30) 8.G.4 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-1.aspx 8.G.5 Basic • Geometry: Identify complementary, supplementary, vertical, adjacent, and congruent angles (Eighth grade - Q.1) • Geometry: Find measures of complementary, supplementary, vertical, and adjacent angles (Eighth grade - Q.2) • Geometry: Transversal of parallel lines (Eighth grade - Q.3) • Geometry: Find missing angles in triangles and quadrilaterals (Eighth grade - Q.6) • Geometry: Interior angles of polygons (Eighth grade - Q.8) • Geometry: Congruent triangles: SSS, SAS, and ASA (Eighth grade - Q.13) 8.G.5 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-1.aspx • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.cr.1.0000g.g.129_v1.pdf • http://www.illustrativemathematics.org/illustrations/59 • http://www.illustrativemathematics.org/illustrations/56			
GEOMETRY (8.G) Understand and	**M**	**Students** 8.G.6 Explain a proof of the Pythagorean Theorem and its converse. **Major content**	TEACHER NOTES See instructional strategies in the introduction	RESOURCE NOTES See resources in the introduction	ASSESSMENT NOTES See assessments in the introduction

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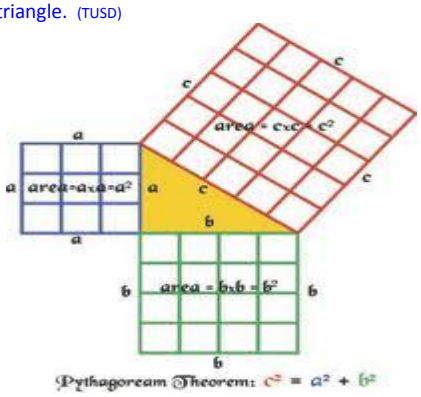
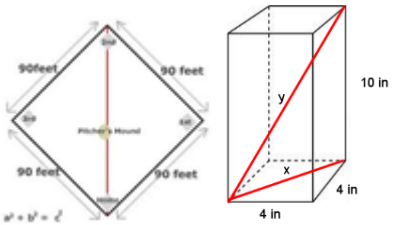
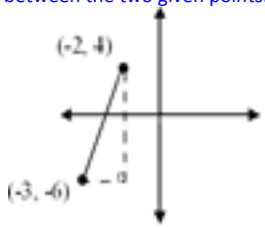
Curriculum Writers: Amanda Bednarczyk and Deborah Downes

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
apply the Pythagorean Theorem. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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 knowledge and skills** • Pythagorean Theorem states that for a right triangle the sum of the square of the two legs is equal to the square of the hypotenuse. ($a^2+b^2 = c^2$) • The converse of the Pythagorean Theorem states that if the sum of the squares of the smaller sides in a triangle equals the square of the third side, then the triangle must be a right triangle. **Teaching Examples:** • Pythagorean Theorem: Students should verify, using a model, that the sum of the squares of the legs is equal to the square of the hypotenuse in a right triangle. (TUSD)  • Image from: myastrologybook.com • Converse of Pythagorean Theorem: Students should also understand that if the sum of the squares of the 2 smaller legs of a triangle is equal to the square of the third leg, then the triangle is a right triangle. (TUSD) **Mathematical Practices** • Construct viable arguments and critique the reasoning of others • Model with mathematics ★ • Attend to precision • Look for and make use of structure	• *Connect to radicals, rational exponents, and irrational numbers* • *Previous understanding of triangles, such as the sum of two side measures is greater than the third side measure, angles sum, and area of squares, is furthered by the introduction of unique qualities of right triangles. Students should be given the opportunity to explore right triangles to determine the relationships between the measures of the legs and the measure of the hypotenuse. Experiences should involve using grid paper to draw right triangles from given measures and representing and computing the areas of the squares on each side. Data should be recorded in a chart allowing for students to conjecture about the relationship among the areas within each triangle.*	Textbook • *Holt Course 3* Chapters 4,8 • *McDougal –Littell Algebra 1* • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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	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 • Oral presentations • Problem/Performance based/common tasks
	M	8.G.7 Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions. **Major content** **Essential knowledge and skills** • If a triangle is a right triangle, Pythagorean Theorem can be used to find a missing side length or hypotenuse. **Mathematical Practices** • Make sense of problems and persevere in solving	• *The Pythagorean Thereom should be applied to finding the lengths of segments on a coordinate grid, especially those segments that do not follow the vertical or horizontal lines, as a*		

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		• Real world problems in both two and three dimensions that involve right triangles can be solved using Pythagorean theorem. • Through authentic experiences and exploration, students should use the Pythagorean Theorem to solve problems. Problems can include working in both two and three dimensions. Students should be familiar with the common Pythagorean triplets.  • Image from: akhnatonsjournal.org them • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure	*means of discussing the determination of distances between points. Contextual situations, created by both the students and the teacher, that apply the Pythagorean theorem and its converse should be provided. For example, apply the concept of similarity to determine the height of a tree using the ratio between the student's height and the length of the student's shadow. From that, determine the distance from the tip of the tree to the end of its shadow and verify by comparing to the computed distance from the top of the student's head to the end of the student's shadow, using the ratio calculated previously. Challenge students to identify additional ways that the Pythagorean Theorem is or can be used in real world situations or mathematical problems, such as finding the height of something that is difficult to physically measure, or the diagonal of a prism.* (ODE)	• www.ride.ri.gov Materials • Calculator • Geometric solids • Graph paper • Rulers	• Rubrics/checklists (mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres Arguments Information Research
	M	8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system. **Major content** **Essential knowledge and skills** • The distance between two points on a coordinate plane can be found by drawing the vertical and horizontal lines from the points to create a right triangle and then applying the Pythagorean theorem. **Teaching Examples:** • Students will create a right triangle from the two points given (as shown in the diagram below) and then use the Pythagorean Theorem to find the distance between the two given points. (TUSD)  (TUSD) **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			

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Academic vocabulary Adjacent angles Alternate interior angles Cone Congruent Corresponding angles Cylinder Dilation Exterior angles Hypotenuse Interior angles Parallel Lines Perpendicular lines Prism Pythagorean Theorem Reflection Right angle Rotation Similar Skew lines Sphere Transformation Translation Transversal Triangle Sum Theorem Vertical angles Volume ASSESSMENT PROBLEMS 8.G.6 Basic • Pythagorean theorem: Converse of the Pythagorean theorem: is it a right triangle? (Eighth grade - O.5) 8.G.6 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-6.aspx • http://www.illustrativemathematics.org/illustrations/724 8.G.7 Basic • Pythagorean theorem: Pythagorean theorem: find the length of the hypotenuse (Eighth grade - O.1) • Pythagorean theorem: Pythagorean theorem: find the missing leg length (Eighth grade - O.2) • Pythagorean theorem: Pythagorem theorem: find the perimeter (Eighth grade - O.3) • Pythagorean theorem: Pythagorean theorem: word problems (Eighth grade - O.4) 8.G.7Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-6.aspx • http://www.ode.state.or.us/wma/teachlearn/commoncore/mat.08.cr.1.0000g.h.002_v1.pdf • http://www.illustrativemathematics.org/illustrations/1130 8.G.8 Basic • Coordinate graphs: Distance between two points (Eighth grade - P.4) 8.G.8 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-6.aspx • http://www.illustrativemathematics.org/illustrations/1245			
GEOMETRY (8.G) Solve real-world and mathematical problems involving	**A**	**Students** 8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems. **Additional content** **Essential knowledge and skills**	TEACHER NOTES See instructional strategies in the introduction • *Begin by recalling the*	RESOURCE NOTES See resources in the introduction	ASSESSMENT NOTES See assessments in the introduction REQUIRED COMMON

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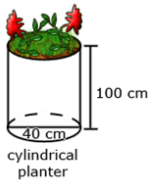
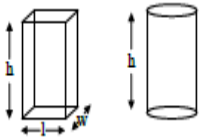
volume of cylinders, cones, and spheres. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments and critique the reasoning of others 4. Model with mathematics ★ 5. Use appropriate tools strategically 6. Attend to precision 7. Look for and make use of structure 8. Look for and express regularity in repeated reasoning		• The volume of a cylinder is the area of the base multiplied the height (circle x height) that is $V = \pi r^2 \times h$ • The volume of the cone is 1/3 the volume of a cylinder. $V = \frac{1}{3}(\pi r^2 \times h)$ *or* $V = \frac{\pi r^2 \times h}{3}$ • The volume of a sphere is $V = \frac{4}{3}\pi r^3$ • The formulas for finding the volume of three-dimensional figures are used to solve real world problems that involve filling three-dimensional figures. **Teaching Examples:** • Volume of a cylinder: $V = \pi r^2 \times h$ • Volume of a Cone: $V = \frac{1}{3}(\pi r^2 \times h)$ *or* $V = \frac{\pi r^2 \times h}{3}$ • Volume of a sphere is: $V = \frac{4}{3}\pi r^3$ Example: • James wanted to plant pansies in his new planter. He wondered how much potting soil he should buy to fill it. Use the measurements in the diagram below to determine the planter's volume. (TUSD)  cylindrical planter (TUSD) **Academic vocabulary** Adjacent angles Alternate interior angles Cone Congruent Corresponding angles Cylinder Interior angles Parallel Lines Perpendicular lines Prism Pythagorean Theorem Reflection Skew lines Sphere Transformation Translation Transversal Triangle Sum Theorem	**Mathematical Practices** • Make sense of problems and persevere in solving them • Reason abstractly and quantitatively • Construct viable arguments 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	*formula, and its meaning, for the volume of a right rectangular prism: V = l ×w ×h. Then ask students to consider how this might be used to make a conjecture about the volume formula for a cylinder:*  • *Most students can be readily led to the understanding that the volume of a right rectangular prism can be thought of as the area of a "base" times the height, and so because the area of the base of a cylinder is π r2 the volume of a cylinder is Vc = π r2h.* *To motivate the formula for the volume of a cone, use cylinders and cones with the same base and height. Fill the cone with rice or water and pour into the cylinder. Students will discover/experience that 3 cones full are needed to fill the cylinder. This non-mathematical derivation of the formula for the volume of a cone, V = 1/3 π r^2h, will help most students remember the formula. In a drawing of a cone*	Textbook • *Holt Course 3* • *McDougal –Littell Algebra 1* • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal 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	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 • Oral presentations • Problem/Performance based/common tasks • Rubrics/checklists

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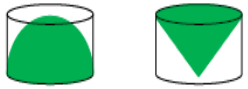
CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Dilation Exterior angles Hypotenuse Right angle Rotation Similar Vertical angles Volume ASSESSMENT PROBLEMS 8.G.9 Basic • Geometry: Volume of prisms and cylinders (Eighth grade - Q.27) • Geometry: Volume of pyramids and cones (Eighth grade - Q.28) • Geometry: Volume and surface area of spheres (Eighth grade - Q.29) 8.G.9 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-G-9.aspx • http://www.illustrativemathematics.org/illustrations/521	*inside a cylinder, students might see that that the triangular cross-section of a cone is $\frac{1}{2}$ the rectangular cross-section of the cylinder. Ask them to reason why the volume (three dimensions) turns out to be less than $\frac{1}{2}$ the volume of the cylinder. It turns out to be $\frac{1}{3}$*  (ODE)	Materials	(mathematical practice, modeling) • Tests and quizzes • Technology • Think-alouds • Writing genres Arguments Information Research
STATISTICS AND PROBABILITY (8.SP) Investigate patterns of association in bivariate data. Use **Mathematical Practices** to 1. Make sense of problems and persevere in solving them 2. Reason abstractly and quantitatively 3. Construct viable arguments 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	**S** **S**	**Students** 8.SP.1 Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. **Supporting content** Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association. **Essential knowledge and skills** • Data that is collected using two variables is called bivariate data. **Teaching Examples:** • http://www.tusd1.org/contents/distinfo/curriculum/index.asp - grade 8, p. p.44-45 **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure 8.SP.2 Know that straight lines are widely used to model relationships between two quantitative variables. **Supporting content** For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit by judging the closeness of the data points to the line. **Supporting content**	TEACHER NOTES See instructional strategies in the introduction • *Building on the study of statistics using univariate data in Grades 6 and 7, students are now ready to study bivariate data. Students will extend their descriptions and understanding of variation to the graphical displays of bivariate data.* • *Instructional Strategies* • *Scatter plots are the most common form of displaying bivariate data in Grade 8. Provide scatter plots and have students practice informally finding the line of best fit. Students should create and*	RESOURCE NOTES See resources in the introduction Textbook • *Holt Course 3* Chapter 9 • *McDougal –Littell Algebra 1* Chapter 9 • *Teaching the Common Core Math Standards, Muschla et. al* • *Exploration in Core Math* Holt McDougal Supplementary Books, Teacher (T) Student (S) Technology • Computers • LCD projectors • Interactive boards Websites	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

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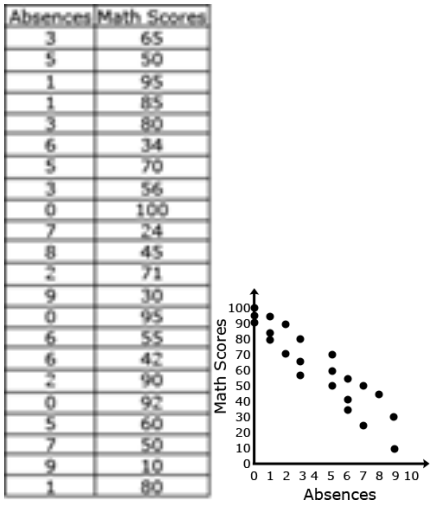
CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		Essential knowledge and skills • Scatterplots can suggest a linear association/ relationships. **Teaching Examples:** • The capacity of the fuel tank in a car is 13.5 gallons. The table below shows the number of miles traveled and how many gallons of gas are left in the tank. Describe the relationship between the variables. If the data is linear, determine a line of best fit. Do you think the line represents a good fit for the data set? Why or why not? What is the average fuel efficiency of the car in miles per gallon? Miles Traveled: 0, 75, 120, 160, 250, 300 Gallons Used: 0, 2.3, 4.5, 5.7, 9.7, 10.7 (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure	*interpret scatter plots, focusing on outliers, positive or negative association, linearity or curvature. By changing the data slightly, students can have a rich discussion about the effects of the change on the graph. Have students use a graphing calculator to determine a linear regression and discuss how this relates to the graph. Students should informally draw a line of best fit for a scatter plot and informally measure the strength of fit. Discussion should include "What does it mean to be above the line, below the line?"* • *The study of the line of best fit ties directly to the algebraic study of slope and intercept. Students should interpret the slope and intercept of the line of best fit in the context of the data. Then students can make predictions based on the line of best fit.* (ODE)	• 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 • Calculator • Graph paper • Rulers	• 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 Arguments Information Research
	S	8.SP.3 Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. **Supporting content** • *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.* **Essential knowledge and skills** • If a scatterplot suggests a linear relationship, then a line of best fit can be drawn and a linear equation can be created to model the relationship between the bivariate data. • An equation of a line of best fit can be used to interpret and solve problems in the context of bivariate measurement data. **Teaching Examples:** • In a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height. • Given data from students' math scores and absences, make a scatterplot. (TUSD) **Mathematical Practices** • Reason abstractly and quantitatively • Model with mathematics ★ • Use appropriate tools strategically • Attend to precision • Look for and make use of structure			

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

Absences	Math Scores
3	65
5	50
1	95
1	85
3	80
6	34
5	70
3	56
0	100
7	24
8	45
2	71
9	30
0	95
6	55
6	42
2	90
0	92
5	60
7	50
9	10
1	80

a. Draw a line of best fit, paying attention to the closeness of the data points on either side of the line.

b. From the line of best fit, determine an approximate linear equation that models the given data (about $y = -\frac{25}{3}x + 95$

c. Students should recognize that 95 represents the y intercept and $-\frac{25}{3}$ represents the slope of the line. Students can use this linear model to solve problems. For example, through substitution, they can use the equation to determine that a student with 4 absences should expect to receive a math score of about 62. They can then compare this value to their line. (TUSD)

	S	8.SP.4 Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. **Supporting content** Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. **Supporting content**			

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Use relative frequencies calculated for rows or columns to describe possible association between the two variables. **Supporting content**

- *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

Essential knowledge and skills

- Scatterplots and two-way frequency tables are used to show patterns of association and relationships between bivariate categorical data.

Teaching Examples:

a. Collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?

b. The table illustrates the results when 100 students were asked the survey questions: Do you have a curfew? and Do you have assigned chores? Is there evidence that those who have a curfew also tend to have chores?

		Curfew: Yes	Curfew: No
Chores	Yes	40	10
	No	10	40

Solution: Of the students who answered that they had a curfew, 40 had chores and 10 did not. Of the students who answered they did not have a curfew, 10 had chores and 40 did not. From this sample, there appears to be a positive correlation between having a curfew and having chores. (TUSD)

Mathematical Practices

- Reason abstractly and quantitatively
- Construct viable arguments and critique the reasoning of others
- Model with mathematics ★
- Use appropriate tools strategically
- Attend to precision
- Look for and make use of structure

Academic vocabulary

- Bivariate Data
- Clustering
- Frequency
- Line of best fit
- Linear association
- Linear model
- Negative association
- Nonlinear association.
- Outliers
- Positive association
- Relative Frequency
- Scatterplot
- Slope
- Two-way Table

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Curriculum Writers: Amanda Bednarczyk and Deborah Downes

CATEGORIES, DOMAINS, CLUSTERS	UNIT	STANDARDS/BENCHMARKS North Smithfield School Department	INSTRUCTIONAL STRATEGIES	RESOURCES	ASSESSMENTS
		ASSESSMENT PROBLEMS 8.SP.1 Basic • Charts and graphs: Scatter plots (Eighth grade - N.13) • http://www.illustrativemathematics.org/illustrations/1097 8.SP.1 Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-SP-1.aspx • http://www.illustrativemathematics.org/illustrations/975 8.SP.2Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-SP-1.aspx • http://www.illustrativemathematics.org/illustrations/41 8.SP.3 Basic • Ratios and proportions: Constant rate of change (Eighth grade - H.12) • Linear functions: Graph a line from an equation (Eighth grade - V.7) • Linear functions: Linear function word problems (Eighth grade - V.8) • Linear functions: Find the slope of a graph (Eighth grade - V.9) 8.SP.3Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-SP-1.aspx 8.SP.4 Basic • Charts and graphs: Interpret stem-and-leaf plots (Eighth grade - N.8) • Charts and graphs: Interpret histograms (Eighth grade - N.9) • Charts and graphs: Create histograms (Eighth grade - N.10) • Charts and graphs: Create frequency charts (Eighth grade - N.11) 8.SP.4Advanced • http://www.schools.utah.gov/CURR/mathsec/Core/8th-Grade-Core/8-SP-1.aspx • http://www.illustrativemathematics.org/illustrations/1098 • http://www.illustrativemathematics.org/illustrations/973			