Readington Township Public Schools

Grade 7 Math

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Approval Date: October 2014
Updated NJ Standards August 2016

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I. OVERVIEW

The Math 7 course is the required mathematics class for seventh graders working on grade level. This course is directly aligned with the New Jersey Student Learning Standards ("NJSLS") for grade 7. Through their work in this course, students will understand and apply their knowledge in real world applications. Focus will be on the content as specified in the NJSLS, as well as the NJSLS Practice Standards. The Practice Standards focus on the development of competencies used by mathematicians in all grades and throughout life.

Students in this course will develop understanding of and apply proportional relationships including percent problems. Students will develop understanding of operations with rational numbers and work with expressions and linear equations. Students will solve problems involving scale drawings and informal geometric constructions, and work with two- and three-dimensional shapes to solve problems involving area, surface area, and volume. Students in this course will make inferences based on samples, and examine probability models.

II. STUDENT OUTCOMES (Linked to New Jersey Student Learning Standards for Mathematics 2016)

RATIOS & PROPORTIONAL RELATIONSHIPS (7.RP)

Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units.

2. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
   a. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
   b. Represent proportional relationships by equations.
   c. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1, r) where r is the unit rate.

3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

THE NUMBER SYSTEM (7.NS)

Apply and extend previous understandings of operations with fractions to add, subtract, multiply, and divide rational numbers.

1. Apply and extend previous understandings of operations with fractions.
   a. Describe situations in which opposite quantities combine to make 0. *For example, In the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?*
   b. Understand p + q as the number located a distance |q| from p, in the positive or negative direction depending on whether q is positive or negative. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.
   c. Understand subtraction of rational numbers as adding the additive inverse, p - q = p+ (-q). Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.
   d. Apply properties of operations as strategies to add and subtract rational numbers.

2. Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.
    a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (-1)(-1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.
    b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then -(p/q) = (-p)/q = p/(-q). Interpret quotients of rational numbers by describing real-world contexts.
    c. Apply properties of operations as strategies to multiply and divide rational numbers.
    d. Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.

EXPRESSIONS & EQUATIONS (7.EE)
Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

    a. Solve word problems leading to equations of the form px + q = r and p(x + q) = r, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.
    b. Solve word problems leading to inequalities of the form px + q > r or px + q < r, where p, q, and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem.

GEOMETRY (7.G)
Draw, construct, and describe geometrical figures and describe the relationships between them.

1. Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.

2. Draw (with technology, with ruler and protractor as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.

3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

4. Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.

5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

6. Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

STATISTICS & PROBABILITY (7.SP)
Use random sampling to draw inferences about a population.

1. Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.

4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability.

7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.
    a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.
    b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
    a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.
    b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., "rolling double sixes"), identify the outcomes in the sample space which compose the event.
    c. Design and use a simulation to generate frequencies for compound events

III. ESSENTIAL QUESTIONS AND CONTENT

Unit 1 The Number System

How do we represent quantities with integers and rational numbers?
What are the properties of rational numbers compared to integers?
How can I use rational numbers and integers to solve real-world problems?

Unit 2 Expressions and Equations

How can I represent real-world conditions with expressions or equations?
What techniques can I use to solve problems with equations?

Unit 3 Ratios, Proportional Relationships and Inequalities

How are ratios, proportions, percent, rates, fractions and decimals related?
How does the slope of a line relate to ratios?
How do we use ratios and proportional relationships in real world problems?
What techniques do I need to use to solve inequalities?

Unit 4 Statistics and Probability

How do you describe the likelihood of an event or the number of possible results?
How can you find the number of possible outcomes of one or more events?
How can you compare data sets that represent two populations?

Unit 5 Geometry

What formulas can I use to solve real-world problems involving shapes, area, and volume?
Can I use ratio and proportion concepts to change the scale of a drawing?
How can I create shapes with specific criteria?

IV. STRATEGIES

The curriculum will be instructed through a variety of strategies, based in research on middle school learning and educational best practices. Students will be engaged in meaningful lessons and activities using guided and independent practice and cooperative learning. Students will participate in hands-on activities, use manipulatives or technology where appropriate, and participate actively in class discussions.

Teachers will encourage students to employ a number of problem solving strategies, relevant to the situations they are in. They will demonstrate evidence of understanding through modeling, verbal descriptions and oral presentations. Students may also use tools of technology where needed to better enhance their ability to complete and defend their mathematical reasoning.

V. EVALUATION

Teacher observations
Homework assignments
Notebooks
Student projects
Unit tests and quizzes
Benchmark unit assessments
Performance based assessments

VI. REQUIRED RESOURCES

Big Ideas Math 7 textbook (Ron Larson and Laurie Boswell; published by Big Ideas Learning)
Record and Practice Journal

Project Based Assignment Resources – Including:
Illustrative Mathematics (www.illustratviemathematics.org)
The MAP Project (www.map.mathshell.org/materials/index.php)
Gizmos

VII. SCOPE AND SEQUENCE

Unit 1 The Number System

Integers (15 days)

1. Integers and Absolute Value
2. Adding Integers
3. Subtracting Integers
4. Multiplying Integers
5. Dividing Integers

Rational Numbers (12 days)

1. Rational Numbers
2. Adding Rational Numbers
3. Subtracting Rational Numbers
4. Multiplying and Dividing Rational Numbers

Unit 2 Expressions and Equations

Expressions and Equations (15 days)

1. Algebraic Expressions
2. Adding and Subtracting Linear Expressions
3. Solving Equations Using Addition and Subtraction
4. Solving Equations Using Multiplication and Division
5. Solving Two-Step Equations

Unit 3 Ratios, Proportional Relationships, and Inequalities

Ratios and Proportions (20 days)

1. Ratios and Rates
2. Proportions
3. Writing Proportions
4. Solving Proportions
5. Direct Variation

Percents (20 days)

1. Percents and Decimals
2. Comparing and Ordering Fractions, Decimals, and Percents
3. The Percent Proportion
4. The Percent Equation
5. Percents of Increase and Decrease
6. Discounts and Markups
7. Simple Interest

Inequalities (15 days)

1. Writing and Graphing Inequalities
2. Solving Inequalities Using Addition and Subtraction
3. Solving Inequalities Using Multiplication and Division
4. Solving Two-Step Inequalities

Unit 4 Statistics and Probability
Probability and Statistics (15 days)
1. Outcomes and Events
2. Probability
3. Experimental and Theoretical Probability
4. Compound Events
5. Independent and Dependent Events
6. Samples and Populations
7. Comparing Populations

Unit 5 Geometry
Construction and Scale Drawings (20 days)
1. Adjacent and Vertical Angles
2. Complementary and Supplementary Angles
3. Triangles
4. Quadrilaterals
5. Scale Drawings

Circles and Area (10 days)
1. Circles and Circumference
2. Perimeters of Composite Figures
3. Areas of Circles
4. Areas of Composite Figures

Surface Area and Volume (10 days)
1. Surface Areas of Prisms
2. Surface Areas of Pyramids
3. Volume of Prisms
4. Volume of Pyramids

Unit 6: Project Based Learning (20 days)
Students will complete a number of projects to review and/or extend topics covered in this course and/or preview topics in the course which follows. Projects will vary in duration and form, and will be based on real-world situations and examples. Students will be required to apply and extend learning through their responses, calculations and/or presentations.