

**NEW MILFORD PUBLIC SCHOOLS**  
**New Milford, Connecticut**



Grade 7 Mathematics  
June 2016

Approved by BOE November 2016

## **New Milford Board of Education**

David Lawson, Chairperson  
Bill Dahl, Vice Chairperson  
Wendy Faulenbach, Secretary  
Tammy McInerney, Assistant Secretary  
Angelia Chastain  
Robert Coppola  
David Littlefield  
Brian McCauley  
J.T. Schemm

### **Superintendent of Schools**

Mr. Joshua Smith

### **Assistant Superintendent**

Ms. Alisha DiCorpo

### **Authors of Course Guide**

Cortni Muir, NMPS Grade 4 -7 Math Coach  
Peggy Neal, CREC Math Specialist  
Tamara Gloster, CREC Math Specialist

## **New Milford's Mission Statement**

The mission of the New Milford Public Schools, a collaborative partnership of students, educators, family and community, is to prepare each and every student to compete and excel in an ever-changing world, embrace challenges with vigor, respect and appreciate the worth of every human being, and contribute to society by providing effective instruction and dynamic curriculum, offering a wide range of valuable experiences, and inspiring students to pursue their dreams and aspirations.

## **Course Overview**

Grade 7 Connected Mathematics Program (CMP3) is problem-centered. Mathematical tasks for students in class and in homework are the primary vehicle for student engagement with the mathematical concepts to be learned. Ideas are explored through these mathematical tasks in the depth necessary to allow students to make sense of them. The curriculum helps students grow in their ability to reason effectively with information represented in graphic, numeric, symbolic, and verbal forms and to move flexibly among these representations to produce fluency in both conceptual and procedural knowledge. Topics specific to grade 7 include: rational numbers and their operations, solving problems with ratios, rates, percents, and proportions, understanding slope and linear relationships, similarity, volume, probability and data comparisons.

# Pacing Guide

<b>Unit Title</b>	<b># of Weeks</b>
Unit 1 – Two-Dimensional Geometry	3 Weeks
Unit 2 – Integers and Rational Numbers	6 Weeks
Unit 3 – Understanding Similarity	5 Weeks
Unit 4 – Ratios, Rates, Percents, and Proportions	6 Weeks
Unit 5 – Linear Relationships	7 Weeks
Unit 6 – Probability and Expected Value	2 Weeks
Unit 7 – Three-Dimensional Measurement	3 Weeks
Unit 8 – Making Comparisons and Predications	3 Weeks

# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 1 – Two- Dimensional Geometry	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 3
<b>Identify Desired Results</b>	
Common Core Standards	
<p><b>Standards of Focus in Unit</b></p> <ul style="list-style-type: none"> <li>• (7.EE.A.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.</li> <li>• (7.G.A.2) Draw (freehand, with ruler and protractor, and with technology) 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.</li> <li>• (7.G.B.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.</li> </ul> <p><b>Additional Standards in Unit</b></p> <ul style="list-style-type: none"> <li>• (7.EE.A.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. For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</li> </ul> <p style="text-align: center;"><b>Standards for Mathematical Practices</b></p> <ul style="list-style-type: none"> <li>• MP 1 - Make sense of problems and persevere in solving them.</li> <li>• MP 2 - Reason abstractly and quantitatively.</li> <li>• MP 3 - Construct viable arguments and critique the reasoning of others.</li> <li>• <b>MP 4 - Model with mathematics.</b></li> <li>• <b>MP5 - Use appropriate tools strategically.</b></li> <li>• MP6 - Attend to precision.</li> <li>• <b>MP7 - Look for and make use of structure.</b></li> <li>• MP8 - Look for and express regularity in repeated reasoning.</li> </ul>	
<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• Properties of polygons affect their shape.</li> <li>• The shape of the polygon impacts the relationship among its angles.</li> </ul>	<ul style="list-style-type: none"> <li>• How do properties of polygons affect their shape?</li> <li>• How does the shape of a polygon impact the relationship among its angles?</li> </ul>
<b>Expected Performances</b> What students should know and be able to do	
<b>Students will know the following:</b>	

- Different attributes to classify polygons according to sides and angles.
- Techniques for estimating and measuring angles using appropriate tools.
- Symmetries of a shape (rotation and reflection).

**Students will be able to do the following:**

- Identify and describe the attributes of a polygon.
- Estimate and measure angles using appropriate tools.
- Identify and describe the symmetries of a polygon.
- Develop and derive the formula for interior and exterior angle measures and sums.
- Solve problems that involve properties of angles.
- Determine what conditions produce a unique polygon, more than one, or no polygon, particularly triangles and quadrilaterals.

**Character Attributes**

- Cooperation
- Honesty
- Integrity
- Perseverance

**Technology Competencies**

- None

**Develop Teaching and Learning Plan**

Teaching Strategies:

**Use a problem-centered model with teacher-directed mini-lesson**

- Embed important mathematical ideas within contexts of interesting problems.
- Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.

**Use games to develop concepts and practice skills.**

**Use student-centered activities and worthwhile math tasks.**

- Arrange student seating so that learners can move freely to post, analyze, and discuss their work.

**Use a variety of grouping structures.**

- Collaborative groups, partners, individuals.
- Clearly communicate expectations about group work to students.

**Orchestrate class/student to student discourse.**

- Focus discussions on important

Learning Activities:

- Sort and sketch polygons to determine similarities and differences.
- Identify the common benchmark angles through investigations In a Spin and Estimating Measures of Rotations and Angles.
- Use appropriate tools to measure angles and draw triangles/quadrilaterals given specific constraints.
- Determine angle sums of any polygon including interior and exterior angles.

<p>mathematics and student strategies.</p> <ul style="list-style-type: none"> <li>• Facilitate student-to-student discourse.</li> <li>• Elicit participation from all students over the course of several discussions.</li> </ul>	
---	--

<b>Assessments</b>	
<b>Performance Task(s)</b>	<b>Other Evidence</b>
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p>
<p>N/A</p>	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 1, Shapes and Designs</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	



# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 2 – Integers and Rational Numbers	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 6
<b>Identify Desired Results</b>	
<b>Common Core Standards</b>	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.NS.A.1) Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</li><li>• (7.NS.A.1.a) Describe situations in which opposite quantities combine to make 0.</li><li>• (7.NS.A.1.b) Understand <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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.</li><li>• (7.NS.A.1.c) Understand subtraction of rational numbers as adding the additive inverse, <math>p - q = p + (-q)</math>. 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.</li><li>• (7.NS.A.1.d) Apply properties of operations as strategies to add and subtract rational numbers.</li><li>• (7.NS.A.2) Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.</li><li>• (7.NS.A.2.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 <math>(-1)(-1) = 1</math> and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.</li><li>• (7.NS.A.2.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 <math>p</math> and <math>q</math> are integers, then <math>-(p/q) = (-p)/q = p/(-q)</math>. Interpret quotients of rational numbers by describing real-world contexts.</li><li>• (7.NS.A.2.c) Apply properties of operations as strategies to multiply and divide rational numbers.</li><li>• (7.NS.A.2.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.</li><li>• (7.NS.A.3) Solve real-world and mathematical problems involving the four operations with rational numbers.</li><li>• (7.EE.B.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</li></ul>	

strategies.

- (7.EE.B.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.
- (7.EE.B.4.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.

### Standards for Mathematical Practices

- MP 1 - Make sense of problems and persevere in solving them.
- **MP 2 - Reason abstractly and quantitatively.**
- **MP 3 - Construct viable arguments and critique the reasoning of others.**
- **MP 4 - Model with mathematics.**
- MP5 - Use appropriate tools strategically.
- MP6 - Attend to precision.
- MP7 - Look for and make use of structure.
- **MP8 - Look for and express regularity in repeated reasoning.**

<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• Rational numbers consist of positive numbers, negative numbers and zero.</li> <li>• Rational numbers are an extension of integer models.</li> <li>• Different models can be used to represent operations of rational numbers.</li> </ul>	<ul style="list-style-type: none"> <li>• How do negative and positive numbers and zero help me to describe real world situations?</li> <li>• What models for rational numbers help me show relationships when solving problems?</li> <li>• How are the models of integer operations related to the rational number algorithm?</li> </ul>
<p style="text-align: center;"><b>Expected Performances</b> What students should know and be able to do</p>	
<p><b>Students will know the following:</b></p> <ul style="list-style-type: none"> <li>• Integers are a subset of the set of rational numbers.</li> <li>• Conceptual models and the algorithm can be used to perform operations with rational numbers.</li> </ul> <p><b>Students will be able to do the following:</b></p> <ul style="list-style-type: none"> <li>• Solve problems involving rational numbers using models and algorithms (including zero pairs and additive inverse).</li> <li>• Compare and order rational numbers.</li> <li>• Use properties to write equivalent rational number expressions.</li> <li>• Apply the algorithm of rational operations to solve real world problems.</li> </ul>	
<p style="text-align: center;"><b>Character Attributes</b></p>	
<ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Respect</li> <li>• Honesty</li> <li>• Responsibility</li> </ul>	

Technology Competencies	
<ul style="list-style-type: none"> <li>None</li> </ul>	
Develop Teaching and Learning Plan	
<p>Teaching Strategies:</p> <p><b>Use a problem-centered model with teacher-directed mini-lesson</b></p> <ul style="list-style-type: none"> <li>Embed important mathematical ideas within contexts of interesting problems.</li> <li>Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.</li> </ul> <p><b>Use games to develop concepts and practice skills.</b></p> <p><b>Use student-centered activities and worthwhile math tasks.</b></p> <ul style="list-style-type: none"> <li>Arrange student seating so that learners can move freely to post, analyze, and discuss their work.</li> </ul> <p><b>Use a variety of grouping structures.</b></p> <ul style="list-style-type: none"> <li>Collaborative groups, partners, individuals.</li> <li>Clearly communicate expectations about group work to students.</li> </ul> <p><b>Orchestrate class/student to student discourse.</b></p> <ul style="list-style-type: none"> <li>Focus discussions on important mathematics and student strategies.</li> <li>Facilitate student-to-student discourse.</li> <li>Elicit participation from all students over the course of several discussions.</li> </ul>	<p>Learning Activities:</p> <ul style="list-style-type: none"> <li>Play Math Fever to find the total value of combinations of positive and negative integers (intuitively finding the sum).</li> <li>Extend the integer number line to include rational numbers.</li> <li>Use the chip model to represent addition and subtraction in the investigation In the Chips.</li> <li>Predict the result of change when adding and subtracting of two rational numbers to derive an algorithm.</li> <li>Discover the relationship when you change a subtraction expression to addition by adding the opposite by using the chip model.</li> <li>Extend fact families to include rational numbers.</li> <li>Use number lines and chip models to discover patterns when multiplying rational numbers.</li> <li>Use the algorithm to multiply and divide rational numbers.</li> <li>Play Dealing Up to apply the properties to the operations of rational numbers when solving problems.</li> </ul>

Assessments	
Performance Task(s)	Other Evidence
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p>
<p>Title: Football Night</p> <p>Goal: Students will perform operations with integers to find averages, plot data on number lines, evaluate formulas, determine profit and money spent, and compare data relating to high school football.</p>	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>Mathematical Reflection Questions at end of each Investigations</li> </ul>

<p>Role: Statistician  Audience: Athletic Director, Principal, Parents  Situation: Jenna is the statistician for Midtown High School. She records and compiles that statistics for the football team. So far this season she has recorded the final scores of the games for Midtown and its biggest rival, Bayshore High School.  Product or Performance: Detailed responses, showing all work.  Standards for Success: A scoring rubric is shared with students at the onset of the project.</p>	<ul style="list-style-type: none"> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> <li>• Performance Task</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 2, Accentuate the Negative</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	

# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 3 – Understanding Similarity	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 5
<b>Identify Desired Results</b>	
Common Core Standards	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.</li><li>• (7.RP.A.2.a) 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.</li><li>• (7.RP.A.2.b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li><li>• (7.G.A.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.</li><li>• (7.G.A.2) Draw (freehand, with ruler and protractor, and with technology) 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.</li><li>• (7.G.A.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.</li></ul>	
<b>Additional Standards in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.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.</li><li>• (7.EE.B.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.</li><li>• (7.EE.B.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.</li></ul>	
<b>Standards for Mathematical Practices</b>	
<ul style="list-style-type: none"><li>• <b>MP 1 - Make sense of problems and persevere in solving them.</b></li><li>• MP 2 - Reason abstractly and quantitatively.</li><li>• MP 3 - Construct viable arguments and critique the reasoning of others.</li><li>• MP 4 - Model with mathematics.</li><li>• MP5 - Use appropriate tools strategically.</li></ul>	

<ul style="list-style-type: none"> <li>• <b>MP6 - Attend to precision.</b></li> <li>• <b>MP7 - Look for and make use of structure.</b></li> <li>• <b>MP8 - Look for and express regularity in repeated reasoning.</b></li> </ul>	
<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• Multiplication plays a role in similarity relationships.</li> <li>• Properties exist among the angles, side lengths, areas, and perimeters of similar figures.</li> <li>• Similarity can be used to solve real world problems.</li> </ul>	<ul style="list-style-type: none"> <li>• What is the same and what is different about similar figures?</li> <li>• How can I determine whether two shapes are similar?</li> <li>• How can I use similar figures to find missing measurements?</li> </ul>
<b>Expected Performances</b> What students should know and be able to do	
<b>Students will know the following:</b> <ul style="list-style-type: none"> <li>• Scale factors and ratios are used to describe and create similar figures.</li> <li>• Properties of similar figures exist among the angles, side lengths, areas, and perimeters.</li> <li>• Similarity properties can be used to find distances and heights that cannot be measured directly.</li> </ul>	
<b>Students will be able to do the following:</b> <ul style="list-style-type: none"> <li>• Determine similarity among shapes.</li> <li>• Use similarity properties to find distances and heights that cannot be measured directly.</li> <li>• Use scale factors and ratios to describe and create similar figures.</li> <li>• Predict the ways that stretching or shrinking a figure will affect its angles, side lengths, areas, and perimeters.</li> </ul>	
<b>Character Attributes</b>	
<ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Respect</li> <li>• Honesty</li> <li>• Responsibility</li> </ul>	
<b>Technology Competencies</b>	
<p>*** All available on CMP3 Dashboard</p> <ul style="list-style-type: none"> <li>• Expression Calculator</li> <li>• Mug Wumps</li> <li>• Coordinate Grapher</li> <li>• Pattern Blocks</li> </ul>	
<b>Develop Teaching and Learning Plan</b>	
Teaching Strategies: <b>Use a problem-centered model with teacher-directed mini-lesson</b> <ul style="list-style-type: none"> <li>• Embed important mathematical ideas within contexts of interesting problems.</li> <li>• Work with small groups of students</li> </ul>	Learning Activities: <ul style="list-style-type: none"> <li>• Define similarity by describing corresponding sides and angles.</li> <li>• Draw figures by changing at least one attribute, determine if the result is similar, and write algebraic rule to describe change.</li> </ul>

<p>to build conceptual understanding, fluency and application of key math focus areas.</p> <p><b>Use games to develop concepts and practice skills.</b></p> <p><b>Use student-centered activities and worthwhile math tasks.</b></p> <ul style="list-style-type: none"> <li>• Arrange student seating so that learners can move freely to post, analyze, and discuss their work.</li> </ul> <p><b>Use a variety of grouping structures.</b></p> <ul style="list-style-type: none"> <li>• Collaborative groups, partners, individuals.</li> <li>• Clearly communicate expectations about group work to students.</li> </ul> <p><b>Orchestrate class/student to student discourse.</b></p> <ul style="list-style-type: none"> <li>• Focus discussions on important mathematics and student strategies.</li> <li>• Facilitate student-to-student discourse.</li> <li>• Elicit participation from all students over the course of several discussions.</li> </ul>	<ul style="list-style-type: none"> <li>• Sketch similar triangles/quadrilaterals and examine the effects on perimeter and area.</li> <li>• Use scale factors to draw similar figures and to find missing side lengths in similar figures.</li> <li>• Use similar figures to find distance that is difficult to measure directly.</li> </ul>
---	---

<b>Assessments</b>	
<b>Performance Task(s)</b>	<b>Other Evidence</b>
<p>Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)</p> <p><b>Title:</b> Shrinking or Enlarging a Picture  <b>Goal:</b> Students will shrink or enlarge a picture or cartoon of their choice using the coordinate system to produce a similar image.  <b>Role:</b> Artist/Cartoonist  <b>Audience:</b> Teacher  <b>Situation:</b> You are an artist that is selecting a cartoon/picture that you will shrink or enlarge. You need to identify the scale factor and a complete listing of all the points, compare a pair of corresponding angles, and compare two corresponding areas within the drawings.  <b>Product or Performance:</b> Finished picture/cartoon and detailed work to</p>	<p>Application that is functional in a classroom context to evaluate student achievement of desired results</p> <p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly</li> </ul>

accompany.  
Standards for Success: A scoring rubric is shared with students at the onset of the project.

extend the mathematical knowledge and skills acquired.

### **Suggested Resources**

- Connected Mathematics Project 3 (CMP3) Unit 3, Stretching and Shrinking
- Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al
- CT State Department of Education, Mathematics Units of Study, Grade 7



# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 4 – Rates, Ratios, Percents and Proportions	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 6
<b>Identify Desired Results</b>	
Common Core Standards	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.1) Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units</li><li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.<ul style="list-style-type: none"><li>• (7.RP.A.2.a) 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.</li><li>• (7.RP.A.2.b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li><li>• (7.RP.A.2.c) Represent proportional relationships by equations.</li><li>• (7.RP.A.2.d) Explain what a point <math>(x, y)</math> on the graph of a proportional relationship means in terms of the situation, with special attention to the points <math>(0, 0)</math> and <math>(1, r)</math> where <math>r</math> is the unit rate.</li></ul></li><li>• (7.RP.A.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.</li><li>• (7.EE.B.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.<ul style="list-style-type: none"><li>• (7.EE.B.4.a) Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, where <math>p</math>, <math>q</math>, and <math>r</math> 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.</li></ul></li></ul>	
<b>Additional Standards in Unit</b>	
<ul style="list-style-type: none"><li>• (7.NS.A.3) Solve real-world and mathematical problems involving the four operations with rational numbers.</li><li>• (7.EE.B.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.</li></ul>	
<b>Standards for Mathematical Practices</b>	
<ul style="list-style-type: none"><li>• <b>MP 1 - Make sense of problems and persevere in solving them.</b></li><li>• <b>MP 2 - Reason abstractly and quantitatively.</b></li></ul>	

- MP 3 - Construct viable arguments and critique the reasoning of others.
- MP 4 - Model with mathematics.
- MP5 - Use appropriate tools strategically.
- MP6 - Attend to precision.
- **MP7 - Look for and make use of structure.**
- **MP8 - Look for and express regularity in repeated reasoning.**

<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
---	---

- |   |  |
|---|--|
| <ul style="list-style-type: none"> <li>• Ratios, rates, differences and percents can be used to write comparison statements.</li> <li>• Rate is a special ratio that compares two measurements with different units.</li> <li>• Proportional situations are represented by constant growth in tables, graphs and/or equations.</li> <li>• Unit rate and constant of proportionality are interchangeable.</li> </ul> | <ul style="list-style-type: none"> <li>• What are some strategies for comparing quantities?</li> <li>• How do I know a relationship is proportional?</li> <li>• How might ratios, rates, or proportions be used to solve problems?</li> <li>• What does unit rate or constant of proportionality tell me about a situation?</li> </ul> |
|---|--|

**Expected Performances**  
What students should know and be able to do

**Students will know the following:**

- Ratios, rates, differences and percents can be used to write comparison statements.
- Rate is a special ratio that compares two measurements with different units.
- Proportional situations are represented by constant growth in tables, graphs and/or equations.
- Unit rate and constant of proportionality are interchangeable

**Students will be able to do the following:**

- Interpret, analyze and/or write comparison statements using ratio, rates, differences, and/or percents.
- Solve involving part to part and part to whole ratios.
- Write and use proportions to solve a problem.
- Create rate tables to solve problems.
- Compare rates given in different formats (table, graph, equation, words).
- Find and describe unit rate/constant of proportionality from a table, graph or equation.
- Solve multi-step percent problems (tax, tip, commissions, markup, discount).

**Character Attributes**

- Cooperation
- Respect
- Honesty
- Responsibility

**Technology Competencies**

- \*\*\* All available on CMP3 Dashboard
- Expression Calculator

- Number Line
- Mug Wumps
- Coordinate Grapher
- Data and Graphs

### Develop Teaching and Learning Plan

<p>Teaching Strategies:</p> <p><b>Use a problem-centered model with teacher-directed mini-lesson</b></p> <ul style="list-style-type: none"> <li>• Embed important mathematical ideas within contexts of interesting problems.</li> <li>• Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.</li> </ul> <p><b>Use games to develop concepts and practice skills.</b></p> <p><b>Use student-centered activities and worthwhile math tasks.</b></p> <ul style="list-style-type: none"> <li>• Arrange student seating so that learners can move freely to post, analyze, and discuss their work.</li> </ul> <p><b>Use a variety of grouping structures.</b></p> <ul style="list-style-type: none"> <li>• Collaborative groups, partners, individuals.</li> <li>• Clearly communicate expectations about group work to students.</li> </ul> <p><b>Orchestrate class/student to student discourse.</b></p> <ul style="list-style-type: none"> <li>• Focus discussions on important mathematics and student strategies.</li> <li>• Facilitate student-to-student discourse.</li> <li>• Elicit participation from all students over the course of several discussions.</li> </ul>	<p>Learning Activities:</p> <ul style="list-style-type: none"> <li>• Describe the accuracy of comparison statements.</li> <li>• Write comparison statements in Surveying Opinions.</li> <li>• Compare ratios to make decisions.</li> <li>• Write and use proportions to solve real world problems.</li> <li>• Compare unit rates within a problem to decide which option is best.</li> <li>• Find unit rate in words, tables, graphs, and/or equations.</li> <li>• Use ratios, rates, rate tables, proportions, and equations to convert quantities to different measurement units.</li> <li>• Solve multi-step percent problems (tax, tip, commissions, markup, and discount).</li> </ul>
---	--

### Assessments

Performance Task(s)	Other Evidence
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
Title: Kyle Prices the Inventory Goal: Students will price inventory items, calculate profit on particular items, calculate discount prices based on sale	<b>Checkpoints</b> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> </ul>

<p>percentages, and find the percent increase of certain items.</p> <p>Role: Assistant Manager</p> <p>Audience: Manager and customers</p> <p>Situation: Kyle is the assistant manager at Digital Age. He is in charge of inventory and pricing for products such as TVs, tablets, and MP3 players. The manager has informed Kyle that a recent shipment has 120 items. Three fifths of the items are tablets, 15% of the items are TVs and the rest are MP3 players.</p> <p>Product or Performance: Detailed answers to each scenario.</p> <p>Standards for Success: A scoring rubric is shared with students at the onset of the project.</p>	<ul style="list-style-type: none"> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> <li>• Performance Task</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 4, Comparing and Scaling</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	

# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 5 – Linear Relationships	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 7
<b>Identify Desired Results</b>	
Common Core Standards	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.2.b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li><li>• (7.RP.A.2.c) Represent proportional relationships by equations.</li><li>• (7.RP.A.2.d) 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.</li><li>• (7.EE.A.1) Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</li><li>• (7.EE.A.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. For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05".</li><li>• (7.EE.A.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</li><li>• (7.EE.A.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.</li><li>• (7.EE.B.4.a) Solve word problems leading to equations of the form <math>px + q = r</math> and <math>p(x + q) = r</math>, 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.</li></ul>	
<b>Additional Standards in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.</li><li>• (7.RP.A.2.a) 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.</li><li>• (7.EE.A.4.b) Solve word problems leading to inequalities of the form <math>px + q &gt; r</math> or <math>px + q &lt; r</math>, 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.</li></ul>	
<b>Standards for Mathematical Practices</b>	
<ul style="list-style-type: none"><li>• MP 1 - Make sense of problems and persevere in solving them.</li></ul>	

- **MP 2 - Reason abstractly and quantitatively.**
- MP 3 - Construct viable arguments and critique the reasoning of others.
- **MP 4 - Model with mathematics.**
- **MP5 - Use appropriate tools strategically.**
- MP6 - Attend to precision.
- MP7 - Look for and make use of structure.
- **MP8 - Look for and express regularity in repeated reasoning.**

<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• The pattern of constant change between two variables forms a linear relationship.</li> <li>• A linear relationship can be presented in various formats (words, equations, tables, graphs).</li> <li>• Slope is the ratio of the vertical distance and the horizontal distance between two points on a line and the rate of change between two variables that have a linear relationship.</li> <li>• Compare and analyze linear relationships in various situations, presented in different formats, within the context of a problem.</li> <li>• Decisions and solutions can be made about linear relationships using information given in words, tables, graphs, and equations.</li> </ul>	<ul style="list-style-type: none"> <li>• What patterns in the problem suggest the relationship is linear?</li> <li>• Under what circumstances is a relationship linear and proportional?</li> <li>• How do changes in one variable affect changes in a related variable?</li> <li>• How does technology help me to see and analyze a linear relationship?</li> <li>• What elements do I use to compare and analyze linear relationships in various situations, presented in different formats, within the context of a problem?</li> </ul>
<b>Expected Performances</b> What students should know and be able to do	

**Students will know the following:**

- Slope is the ratio of the vertical distance and the horizontal distance between two points on a line and the rate of change between two variables that have a linear relationship and how to interpret its meaning and context.
- A linear relationship can be presented in various formats (words, equations, tables, graphs).
- $y = mx + b$  is the slope-intercept form of an equation and is proportional when  $b$  is equal to zero.

**Students will be able to do the following:**

- Move from one linear relationship format to another fluently.
- Interpret what is happening in the table, graph, equation, or word.
- Solve problems and make decisions about linear relationships using information give in words, tables, graphs, and equations.
- Write equations that represent linear relationships given specific pieces of information, and describe what information the variables and numbers represent.

- Solve multi-step equations presented conceptually, in context, or algebraically.
- Find the slope of a linear relationship.

#### Character Attributes

- Integrity
- Respect
- Honesty
- Responsibility
- Perseverance

#### Technology Competencies

- Desmos – free, online graphing tool  
\*\*\* The following are all available on CMP3 Dashboard
- Expression Calculator
- Number Line
- Climbing Monkeys
- Coordinate Grapher
- Data and Graphs

### Develop Teaching and Learning Plan

Teaching Strategies:

**Use a problem-centered model with teacher-directed mini-lesson**

- Embed important mathematical ideas within contexts of interesting problems.
- Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.

**Use games to develop concepts and practice skills.**

**Use student-centered activities and worthwhile math tasks.**

- Arrange student seating so that learners can move freely to post, analyze, and discuss their work.

**Use a variety of grouping structures.**

- Collaborative groups, partners, individuals.
- Clearly communicate expectations about group work to students.

**Orchestrate class/student to student discourse.**

- Focus discussions on important mathematics and student strategies.
- Facilitate student-to-student discourse.
- Elicit participation from all students

Learning Activities:

- Identify and describe patterns of change between the independent and dependent variables for linear relationships presented by tables, graphs, equations, or contextual settings.
- Write equations that represent linear relationships given specific pieces of information, and describe what information the variables and numbers represent.
- Find the rate of change or slope, y-intercept, x-intercept, and equation for a linear relationship.
- Solve multi-step equations conceptually and algebraically.
- Discover situations where linear relationships have a positive, negative, no slope, same slope, or negative reciprocals given tables, graphs, or equations.

over the course of several discussions.	
---	--

<b>Assessments</b>	
<b>Performance Task(s)</b> Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	<b>Other Evidence</b> Application that is functional in a classroom context to evaluate student achievement of desired results
<p><b>Title:</b> Apple Festival</p> <p><b>Goal:</b> Students will write and solve equations and inequalities to convert temperatures between different scales, computer travel distances, calculate pay per item, and determine the number of apples picked based on expressions.</p> <p><b>Role:</b> Students on field trip</p> <p><b>Audience:</b> Principal, Orchard Owner</p> <p><b>Situation:</b> A select group of Midtown High students travel to an Apple Festival. They plan to take advantage of all the opportunities the trip offers.</p> <p><b>Product or Performance:</b> Detailed responses and work for each part.</p> <p><b>Standards for Success:</b> A scoring rubric is shared with students at the onset of the project.</p>	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> <li>• Performance Task</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 5, Moving Straight Ahead</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	



# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 6 – Probability and Expected Value	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 3
<b>Identify Desired Results</b>	
Common Core Standards	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.SP.C.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.</li><li>• (7.SP.C.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.</li><li>• (7.SP.C.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.</li><li>• (7.SP.C.7.a) Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events.</li><li>• (7.SP.C.7.b) Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process</li><li>• (7.SP.C.8) Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.</li><li>• (7.SP.C.8.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.</li><li>• (7.SP.C.8.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.</li><li>• (7.SP.C.8.c) Design and use a simulation to generate frequencies for compound events.</li></ul>	
<b>Additional Standards in Unit</b>	
<ul style="list-style-type: none"><li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.</li><li>• (7.RP.A.2.a) 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.</li><li>• (7.RP.A.2.b) Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.</li><li>• (7.RP.A.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.</li></ul>	

### Standards for Mathematical Practices

- MP 1 - Make sense of problems and persevere in solving them.
- **MP 2 - Reason abstractly and quantitatively.**
- **MP 3 - Construct viable arguments and critique the reasoning of others.**
- MP 4 - Model with mathematics.
- MP5 - Use appropriate tools strategically.
- MP6 - Attend to precision.
- **MP7 - Look for and make use of structure.**
- MP8 - Look for and express regularity in repeated reasoning.

Enduring Understandings Generalizations of desired understanding via essential questions (Students will understand that ...)	Essential Questions Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• Probability of a chance event is a number between 0 and 1 that expresses the likelihood of an event occurring; the closer to 1 the more likely.</li> <li>• Experimental and theoretical probabilities are useful for predicting what will happen.</li> <li>• Experimental probability approaches theoretical probability as more trials are conducted.</li> <li>• Not all probabilities are equally likely; therefore not all games are fair.</li> <li>• Multiplication is used to determine compound probabilities.</li> </ul>	<ul style="list-style-type: none"> <li>• How do I know what the possible outcomes for an event are and how do I know if they are equally likely?</li> <li>• How do I know if a situation is fair or unfair?</li> <li>• How does experimental probability compare to theoretical probability for a given situation?</li> <li>• How can you determine all of the probabilities for a compound event?</li> </ul>

#### Expected Performances

What students should know and be able to do

#### **Students will know the following:**

- Probability is the chance an event occurs and represented as a number between 0 and 1 that expresses the likelihood of an event occurring; the closer to 1 the more likely.
- Experimental and theoretical probabilities are useful for predicting what will happen.
- Experimental probability approaches theoretical probability as more trials are conducted
- Not all probabilities are equally likely; therefore not all games are fair.
- Multiplication is used to determine compound probabilities.

#### **Students will be able to do the following:**

- Represent sample spaces for simple and compound events and find probabilities using organized lists, tables, tree diagrams, area models, and simulations.
- Interpret experimental and theoretical probabilities and the relationship between them, and recognize that experimental probabilities approach theoretical probabilities when more trials are conducted.

- Distinguish between outcomes that are equally likely or not equally likely by collecting data and analyzing experimental probabilities.
- Determine the fairness of a game.
- Analyze situations that involve two or more stages (or actions) called compound events

#### Character Attributes

- Integrity
- Respect
- Honesty
- Responsibility
- Perseverance

#### Technology Competencies

- Probability tool from CMP3 Dashboard

### Develop Teaching and Learning Plan

Teaching Strategies:

**Use a problem-centered model with teacher-directed mini-lesson**

- Embed important mathematical ideas within contexts of interesting problems.
- Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.

**Use games to develop concepts and practice skills.**

**Use student-centered activities and worthwhile math tasks.**

- Arrange student seating so that learners can move freely to post, analyze, and discuss their work.

**Use a variety of grouping structures.**

- Collaborative groups, partners, individuals.
- Clearly communicate expectations about group work to students.

**Orchestrate class/student to student discourse.**

- Focus discussions on important mathematics and student strategies.
- Facilitate student-to-student discourse.
- Elicit participation from all students over the course of several discussions.

Learning Activities:

- Conduct a simulation and recognize that the more data collected helps to predict the outcome of a situation.
- Use models to find possible outcomes, frequency and the likelihood of each outcome.
- Find theoretical probability using the notation and words to determine how it compares to experimental probability.
- Use the probability tool to recognize the properties of theoretical probability.
- Play the coin tossing game to determine if it is fair or unfair and use theoretical probability to determine the fairness of the game.
- Use strategies (tree diagram, lists, area models and simulations) to find the theoretical probability of compound events.

<b>Assessments</b>	
<b>Performance Task(s)</b>	<b>Other Evidence</b>
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
N/A	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 6, What Do You Expect?</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	

# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 7 – Three-Dimensional Measurement	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 3
<b>Identify Desired Results</b>	
Common Core Standards	
<p><b>Standards of Focus in Unit</b></p> <ul style="list-style-type: none"> <li>• (7.EE.A.1) Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</li> <li>• (7.EE.A.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. For example, <math>a + 0.05a = 1.05a</math> means that "increase by 5%" is the same as "multiply by 1.05."</li> <li>• (7.G.A.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.</li> <li>• (7.G.B.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.</li> <li>• (7.G.B.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.</li> </ul> <p><b>Additional Standards in Unit</b></p> <ul style="list-style-type: none"> <li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.</li> <li>• (7.NS.A.3) Solve real-world and mathematical problems involving the four operations with rational numbers.</li> <li>• (7.G.A.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.</li> </ul> <p style="text-align: center;"><b>Standards for Mathematical Practices</b></p> <ul style="list-style-type: none"> <li>• MP 1 - Make sense of problems and persevere in solving them.</li> <li>• <b>MP 2 - Reason abstractly and quantitatively.</b></li> <li>• <b>MP 3 - Construct viable arguments and critique the reasoning of others.</b></li> <li>• MP 4 - Model with mathematics.</li> <li>• MP5 - Use appropriate tools strategically.</li> <li>• <b>MP6 - Attend to precision.</b></li> <li>• MP7 - Look for and make use of structure.</li> <li>• <b>MP8 - Look for and express regularity in repeated reasoning.</b></li> </ul>	
<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions	<b>Essential Questions</b> Inquiry used to explore generalizations

(Students will understand that ...)	
<ul style="list-style-type: none"> <li>• Volumes of prisms and cylinders can be calculated as the product of the area of the base and the height.</li> <li>• Shapes are formed by the effects of slicing three dimensional figures.</li> <li>• Relationships exists between area, surface area and volume of prisms, area and circumference, radius (or diameter) and circumference of a circle and the volumes of cylinders and the volume of cones and spheres.</li> <li>• Volumes and surface areas of prisms are used to develop formulas for volumes and surface areas of cylinders.</li> </ul>	<ul style="list-style-type: none"> <li>• How do I calculate the surface area and volume of a rectangular prism?</li> <li>• As you change the dimensions of a rectangular prism by a certain scale factor, how does the surface area and volume of the prism change?</li> <li>• What surface shapes and three dimensional figures can be created by slicing a rectangular prism in various directions?</li> <li>• What are the relationships between the following: <ul style="list-style-type: none"> <li>○ Diameter (or radius) of a circle and its circumference?</li> <li>○ Area of a circle and its radius?</li> <li>○ Circumference and area of a circle?</li> </ul> </li> <li>• How is the procedure to calculate volume of a cylinder similar to calculating the volume of a prism?</li> <li>• How does the surface area of a cylinder compare to the surface area of a rectangular prism?</li> <li>• If a sphere and a cone have the same dimensions as a cylinder, how do the volumes compare?</li> </ul>

**Expected Performances**  
What students should know and be able to do

**Students will know the following:**

- Volumes of prisms and cylinders can be calculated as the product of the area of the base and the height.
- Shapes are formed by the effects of slicing three dimensional figures.
- Relationships exists between surface area and volume of prisms, area and circumference, radius (or diameter) and circumference of a circle and the volumes of cylinders and the volume of cones and spheres.
- Volumes and surface areas of prisms are used to develop formulas for volumes and surface areas of cylinders.

**Students will be able to do the following:**

- Solve problems involving surface areas and volumes of solid figures
- Describe and explain the surface area and volume beyond recital of the symbolic formula.
- Predict the effects of scaling dimensions on surface area and volume of prisms, cylinders, and other figures.
- Identify the figure created from slicing three dimensional figures.
- Recognize the relationships between surface area and volume of prisms, area

and circumference, radius (or diameter) and circumference of a circle, and the volumes of cylinders, cones and spheres in order to derive the formula for surface area and volume of prisms, cylinders, cones and spheres.

**Character Attributes**

- Integrity
- Respect
- Honesty
- Responsibility
- Perseverance

**Technology Competencies**

- 3D Geometry Tool on CMP3 Dashboard
- Virtual Box and Virtual Cylinder on CMP3 Dashboard

**Develop Teaching and Learning Plan**

Teaching Strategies:

**Use a problem-centered model with teacher-directed mini-lesson**

- Embed important mathematical ideas within contexts of interesting problems.
- Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.

**Use games to develop concepts and practice skills.**

**Use student-centered activities and worthwhile math tasks.**

- Arrange student seating so that learners can move freely to post, analyze, and discuss their work.

**Use a variety of grouping structures.**

- Collaborative groups, partners, individuals.
- Clearly communicate expectations about group work to students.

**Orchestrate class/student to student discourse.**

- Focus discussions on important mathematics and student strategies.
- Facilitate student-to-student discourse.
- Elicit participation from all students over the course of several discussions.

Learning Activities:

- Using centimeter cubes and graph paper to derive the formula volume of rectangular prisms, and finding the least surface area.
- Investigate how scale factor affects the surface area and volume of the prism.
- Develop the general strategy for finding the volume of any prism-triangular, rectangular, pentagonal, and so on.
- Slice rectangular prisms in various ways to determine what surface shapes will be formed.
- Measure the diameters and circumferences of several circles, organize their data in a table, and look for patterns to discover patterns relating to the circumference of a circle to its diameter or radius.
- Make squares with sides the same length as the radius of a circle and then determine how many of these radius squares they need to cover the circle.
- Dissect one figure and reassemble its parts into another, more convenient shape to show how circumference and area are related.
- Cut out a net for a cylinder and explore surface area.
- Use a hands-on activity to compare the volume of a cylinder to the

	<p>volumes of prisms.</p> <ul style="list-style-type: none"> <li>• With a partner, determine how the surface area of a cylinder compares to the surface area of a rectangular prism for a given volume.</li> <li>• Develop a visual image of the relationships among the volumes of spheres, cones, and cylinders.</li> <li>• Determine whether the volume of a sphere will fill a cone or a cylinder with the same dimensions.</li> </ul>
--	--

<b>Assessments</b>	
<b>Performance Task(s)</b>	<b>Other Evidence</b>
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
N/A	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and connections in the unit.</li> </ul> <p><b>Surveys of Knowledge</b></p> <ul style="list-style-type: none"> <li>• Quizzes: individual assessment instruments.</li> <li>• Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.</li> </ul>
<b>Suggested Resources</b>	
<ul style="list-style-type: none"> <li>• Connected Mathematics Project 3 (CMP3) Unit 7, Filling and Wrapping</li> <li>• Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al</li> <li>• CT State Department of Education, Mathematics Units of Study, Grade 7</li> </ul>	



# New Milford Public Schools

Committee Member(s): Cortni Muir, Peggy Neal, Tamara Gloster Unit Title: Unit 8 – Making Comparisons and Predictions	Course/Subject: Mathematics Grade Level: 7 # of Weeks: 3
<b>Identify Desired Results</b>	
Common Core Standards	
<b>Standards of Focus in Unit</b>	
<ul style="list-style-type: none"><li>• (7.SP.A.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.</li><li>• (7.SP.A.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.</li><li>• (7.SP.B.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.</li><li>• (7.SP.B.4) Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.</li></ul>	
<b>Additional Standards in Unit</b>	
<ul style="list-style-type: none"><li>• (7.SP.C.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.</li><li>• (7.RP.A.2) Recognize and represent proportional relationships between quantities.</li><li>• (7.NS.A.1) Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram.</li><li>• (7.NS.A.1.b) Understand <math>p + q</math> as the number located a distance <math> q </math> from <math>p</math>, in the positive or negative direction depending on whether <math>q</math> 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.</li></ul>	
<b>Standards for Mathematical Practices</b>	
<ul style="list-style-type: none"><li>• MP 1 - Make sense of problems and persevere in solving them.</li><li>• <b>MP 2 - Reason abstractly and quantitatively.</b></li><li>• MP 3 - Construct viable arguments and critique the reasoning of others.</li><li>• MP 4 - Model with mathematics.</li><li>• MP5 - Use appropriate tools strategically.</li></ul>	

- **MP6 - Attend to precision.**
- **MP7 - Look for and make use of structure.**
- **MP8 - Look for and express regularity in repeated reasoning.**

<b>Enduring Understandings</b> Generalizations of desired understanding via essential questions (Students will understand that ...)	<b>Essential Questions</b> Inquiry used to explore generalizations
<ul style="list-style-type: none"> <li>• Statistical investigation requires the posing of a question, collection of data, analysis and interpretation of that data.</li> <li>• Measures of center (mean, median) and measures of variability (range, IQR, MAD) and their displays (histogram, box and whisker) are used to describe data in a sample.</li> <li>• Sample sizes and sample plans influence the measure of center and variability.</li> <li>• Summary statistics of a representative sample can be used to gain information or make decisions about a population.</li> </ul>	<ul style="list-style-type: none"> <li>• How do I know if a sample is a representative sample?</li> <li>• How can I describe the data I collected and what conclusions about the population can I make?</li> <li>• How can I use samples to compare two or more populations?</li> </ul>
<p align="center"><b>Expected Performances</b> What students should know and be able to do</p>	
<p><b>Students will know the following:</b></p> <ul style="list-style-type: none"> <li>• Graphs of distributions, measures of center and measures of spread, are all used to compare data sets.</li> <li>• The process of statistical investigation involves posing questions, collecting and analyzing data and making interpretations to answer the original question.</li> </ul> <p><b>Students will be able to do the following:</b></p> <ul style="list-style-type: none"> <li>• Collect data in response to a question, graph and analyze the data.</li> <li>• Calculate measures of center and variability.</li> <li>• Summarize and interpret their findings to make a prediction or decision about a population.</li> </ul>	
<p align="center"><b>Character Attributes</b></p>	
<ul style="list-style-type: none"> <li>• Cooperation</li> <li>• Respect</li> <li>• Honesty</li> <li>• Responsibility</li> <li>• Perseverance</li> </ul>	
<p align="center"><b>Technology Competencies</b></p>	
<p>*** All available on CMP3 Dashboard</p> <ul style="list-style-type: none"> <li>• Probability</li> <li>• Coordinate Grapher</li> <li>• Data and Graphs</li> <li>• Expression Calculator</li> </ul>	
<p align="center"><b>Develop Teaching and Learning Plan</b></p>	

<p>Teaching Strategies:</p> <p><b>Use a problem-centered model with teacher-directed mini-lesson</b></p> <ul style="list-style-type: none"> <li>• Embed important mathematical ideas within contexts of interesting problems.</li> <li>• Work with small groups of students to build conceptual understanding, fluency and application of key math focus areas.</li> </ul> <p><b>Use games to develop concepts and practice skills.</b></p> <p><b>Use student-centered activities and worthwhile math tasks.</b></p> <ul style="list-style-type: none"> <li>• Arrange student seating so that learners can move freely to post, analyze, and discuss their work.</li> </ul> <p><b>Use a variety of grouping structures.</b></p> <ul style="list-style-type: none"> <li>• Collaborative groups, partners, individuals.</li> <li>• Clearly communicate expectations about group work to students.</li> </ul> <p><b>Orchestrate class/student to student discourse.</b></p> <ul style="list-style-type: none"> <li>• Focus discussions on important mathematics and student strategies.</li> <li>• Facilitate student-to-student discourse.</li> <li>• Elicit participation from all students over the course of several discussions.</li> </ul>	<p>Learning Activities:</p> <ul style="list-style-type: none"> <li>• Use measures of center and variability to compare samples and judge performance.</li> <li>• Distinguish categorical data from numerical data.</li> <li>• Use The Honesty Survey to discover how a sample of a larger population can be described.</li> <li>• Consider a variety of sampling methods and compare the samples using center and spread to determine how sample size relates to accuracy of decisions or predictions.</li> <li>• Use heights of basketball players to determine whether differences in sample data are large enough to be meaningful.</li> <li>• Conduct a simulation (tables, spinners, dice) to solve a real world problem.</li> <li>• Use capture-tag-recapture method to estimate size of a large population.</li> </ul>
---	---

<b>Assessments</b>	
<b>Performance Task(s)</b>	<b>Other Evidence</b>
Authentic application to evaluate student achievement of desired results designed according to GRASPS (one per marking period)	Application that is functional in a classroom context to evaluate student achievement of desired results
N/A	<p><b>Checkpoints</b></p> <ul style="list-style-type: none"> <li>• Investigation Classwork and ACE (Applications, Connections, Extensions) exercises.</li> <li>• Mathematical Reflection Questions at end of each Investigations</li> <li>• Looking Back which can be used as review, helping students to stand back and look at the big ideas and</li> </ul>

connections in the unit.

**Surveys of Knowledge**

- Quizzes: individual assessment instruments.
- Unit Tests: individual assessment that informs teachers about students' ability to apply, refine, modify, and possibly extend the mathematical knowledge and skills acquired.

**Suggested Resources**

- Connected Mathematics Project 3 (CMP3) Unit 8, Samples and Populations
- Teaching Student-Centered Mathematics, 6-8 by Van de Walle, et. al
- CT State Department of Education, Mathematics Units of Study, Grade 7