

## Grade 7 Mathematics

### **Overview:**

This curriculum is aligned to the 2005 Connecticut Mathematics Curriculum Frameworks and references the CMT 4<sup>th</sup>. Generation. It consists of 8 units, 6 to be completed before the CMT administration in March.

Each unit begins with a pre-assessment. This assessment is meant to be ungraded and is formative in that it allows teachers to better plan instruction for their students. The post-assessment is both summative and formative in nature. It is graded, and provides the teacher with data as to students who have mastered concepts and skills and those who may still need work in some areas.

Grade level expectations (GLEs) are coded (see below). For each GLE, or group of GLEs, activities are listed that are specific to those expectations. It is up to the teacher to use pre-assessment data along with CMT data to plan each unit for their students. Extensions, Interventions, Technology and other support materials (including those listed in the teachers' manuals) are listed to help with differentiation of math instruction.

### **Vocabulary:**

A list of important mathematical vocabulary can be found at the end of each unit. Students need to become fluent with vocabulary so that they can communicate effectively in mathematics. It is suggested that math vocabulary be posted for each unit, and that students have opportunities to "define" terms using words, numbers, pictures, examples and by making connections to their lives or other areas of mathematics.

Appendix A contains a list of grade specific vocabulary that will be found on the CMT.

### **Connections to Connecticut Mastery Test:**

Connecticut Mastery Test Content is listed at the end of each unit. These are specific to your grade level test. It should be noted that students were introduced to and provided instruction to these topics in previous grades. Sample items can be found in the Connecticut CMT Handbook for Mathematics and the CMT Coach (as referenced throughout the unit)

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### Key to Coding:

This curriculum is based on the 2005 Mathematics Curriculum Framework and the 2007 Grade Level Expectations (which were written to further clarify what students should know and be able to do at each grade level.)

There are 4 content standards. Each includes two or three component statements.

Algebraic Reasoning: Patterns and Functions

- 1.1 Students should understand and describe patterns and functional relationships
- 1.2 Students should represent and analyze quantitative relationships in a variety of ways
- 1.3 Students should use operations, properties and algebraic symbols to determine equivalence and solve problems

Numerical and Proportional Reasoning

- 2.1 Students should understand that a variety of numerical representations can be used to describe quantitative relationships
- 2.2 Students should use numbers and their properties to compute flexibly and fluently, and to reasonably estimate measures and quantities

Geometry and Measurement

- 3.1 Students should use properties and characteristics of two- and three-dimensional shapes and geometric theorems to describe relationships, communicate ideas and solve problems
- 3.2 Students should use spatial reasoning, location and geometric relationships to solve problems
- 3.3 Students should develop and apply units, systems, formulas and appropriate tools to estimate and measure

Working with Data: Probability and Statistics.

- 4.1 Students should collect, organize and display data using appropriate statistical and graphical methods
- 4.2 Students should analyze data sets to form hypotheses and make predications
- 4.3 Students should understand and apply basic concepts of probability

These component statements are further delineated in the Grade Level Expectations document. (See Appendix A).

Therefore, a statement coded 4.1.2 refers to collecting, organizing and displaying data. The .2 refers to the grade level expectation and will describe specific graphs that will be used.

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**Unit 1: Fundamentals of Algebra.** Students use properties of numbers and operations to represent numbers and situations and solve problems and equations.

### Pre-assessment for Unit 1

**Grade level expectations:** The student will be able to:

2.2.13 Compare the magnitude of and compute with whole numbers expressed in expanded form and as positive powers of 10.

**Activities:**

a. Students solve problems using a four-step plan. MC pgs. 25-29

b. Students review powers and exponents. MC pgs. 30-31

c. Students build a chart or table showing a power of 10 in standard form, expressed as a chain multiplication and as a power of 10. Discuss patterns that they see in the table. Show that just as you multiply by 10 to find the next number on the chart, you divide by 10 to find the previous number on the chart. By working backwards students should discover that  $10^0$  is equal to 1, not zero. You can also use this chart to have students discover the rules for multiplying using powers by asking them to write  $10^2 \times 10^3$  using chain multiplication. They should see that it equals  $10 \times 10 \times 10 \times 10 \times 10$  or  $10^5$ . Have them repeat this process and develop a rule.

d. Students write numbers in expanded form

e.g.  $8,354 = (8 \times 1000) + (3 \times 100) + (5 \times 10) + (4 \times 1) = (8 \times 10^3) + (3 \times 10^2) + (5 \times 10^1) + (4 \times 10^0)$

e. Students determine which has the larger value:  $8 \times 10^3$  or  $3 \times 10^8$

*Support with CMT COACH pgs. 42-46*

2.1.6 **Read, write, compare and solve problems with whole numbers in scientific notation and vice versa.**

**Activities:**

a. Students give examples of when we use really large numbers (populations, area estimates of large land masses, number of grains of sand on a beach, measurements about space). **Teacher note:** You may wish to have students look for large numbers in newspapers or magazines in any form. Discuss what numbers like 6.2 million or 3.5 billion look like in standard form. Use this as a lead into scientific notation and discuss why we write numbers in scientific notation. Have students enter large numbers into their calculators. Show them the difference between what happens with a scientific calculator and one that is not.

*Support with old MC Course 2 book pgs. 43-45. (see appendix for leveled worksheets)*

*Support with CMT COACH pgs. 47-50*

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2.2.14 Develop and describe strategies for estimating and multiplying whole numbers expressed in scientific notation.

**Activities:**

a. Students use examples such as  $3.25 \times 10^2 + 4.9 \times 10^2$  to develop strategies for estimating large numbers

2.2.15 Estimate and solve problems containing whole numbers expressed in expanded notation, powers of 10 and scientific notation.

**Activities:**

a. Using examples of very large numbers, (for example, the population of China, the number of books in the Library of Congress, etc.) have a student reveal the situation but not the actual number. That student then writes the number in standard form, expanded form, using powers of 10 and in scientific notation. The class estimates the number and compares it to the actual number.

b. Students create some of their own problems using information containing large numbers that they have found either online or in newspapers. They can swap with a partner and try to estimate solutions to the problems.

*Support with CMT COACH pgs. 83-86*

2.1.4 Use patterns to compute with and write whole numbers and fractions as powers of whole numbers and vice versa,

e.g.,  $2^2 = 4$ ,  $2^1 = 2$ ,  $2^0 = 1$ ,  $2^{-1} = \frac{1}{2}$ ,  $2^{-2} = \frac{1}{4}$

**Activities:**

a. Students use a physical model to determine what happens when they repeatedly halve a piece of paper in the following activity.

[http:// education.ti.com/educationportal/activityexchange/Activity.do?cid=US&ald=8606](http://education.ti.com/educationportal/activityexchange/Activity.do?cid=US&ald=8606).

**Teacher note:** Use negative exponents as an introduction only at this time.

2.1.5 Understand the relationship between squares and square roots.

**Activities:**

a. Students explore patterns in perfect squares. MS Perfect Pattern Predictions, pgs. 106-107

*Extension:* The activities in MS pgs. 108-11 may be used as extensions. **Teacher note:** the examples that deal with negative numbers may be used as a challenge.

**2.2.8 Apply the order of operations and algebraic properties;** i.e., commutative, associative, distributive, inverse operations, and the additive and multiplicative identities; **to write, simplify,** e.g.,  $4(3\frac{1}{2}) = 4(3) + 4(\frac{1}{2}) = 12 + 2 = 16$ , **and solve problems, including those with parentheses and exponents.**

**Activities:**

a. Students work with 3 or 4 randomly picked digits and find as many different answers as possible, including using parentheses and exponents.

b. Students evaluate expressions using order of operations. MC pgs. 38-41

c. Students use algebraic properties to solve problems. MC pgs. 53-56

*Support with CMT COACH pgs. 241-244*

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*Extension:* Challenge students to create as many problems that equal numbers between 0 and 10 using only five 5's (or six 6's) and any operations, using the order of operations rules including parentheses and exponents.

### 1.2.4 Write expressions, formulas, equations or inequalities using variables to represent mathematical relationships and solve problems.

**Activities:**

- a. Students translate steps from a “think of a number” problem into algebra. For example: Think of a number, Multiply your number by 3, now add 4. If I got 22, what number did I start with?  $n \times 3 + 4 = 22$
- b. Students write expressions and equations. MS Describing the Ideal School pgs. 184-185
- c. Students write and interpret inequalities. MS Not All Things are Equal pgs. 186-187
- d. Students work with equivalent expressions and equations. MS Different Ways to Say the Same Thing pgs. 188-189
- d. Students describe data by writing an equation. MS Raising Funds pgs. 190-191

*Support with MC* pgs. 128-133

*Support with CMT COACH* pgs. 250-253

*Extension:* Students use the following website activity to transition from arithmetical to algebraic thinking by exploring problems that are not limited to single-solution responses. (Values organized into tables and graphs are used to move toward symbolic representations.)

<http://illuminations.nctm.org/LessonDetail.aspx?id=L247>

**Teacher note:** This concept will be addressed again in Unit 8.

### 1.3.7 Evaluate and simplify algebraic expressions, equations and formulas using algebraic properties (i.e., commutative, associative, distributive, inverse operations, and the additive and multiplicative identities) and the order of operations.

**Activities:**

- a. Students evaluate algebraic expressions. MC pgs. 44-47
- Support with CMT COACH* pgs. 254-259

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### 1.3.9 Write, model and solve one- and two-step (e.g., $2x + 3 = 11$ ) equations using a variety of methods such as tables, concrete models and the Properties of Equality and justify the solution in writing.

#### **Activities:**

- a. Students solve a scenario like the following: A king needs to send money to his son in another country. To minimize theft, he sends the money in envelopes, each containing the same amount of money. Your mission is to find out how many dollars are in each envelope if:

- He has three envelopes totaling \$36.
- He has one envelope and \$3 for a total of \$17.

*Extend* the story above to problems such as the following:

- He has 5 envelopes and \$2 totaling \$97.
- He has 7 envelopes and \$12 totaling \$75.

- b. Students solve one-step equations using mental math strategies. MC pgs. 49-51

- c. Students solve one-step equations using models. MC pgs. 134-135

- d. Students solve two-step equations using models. MC pgs. 151-155

*Extension:* Students solve more complex equations using a scale. MS The Balancing Act pgs. 208-209

- e. Students use algebra tiles or balance scales to demonstrate equality, performing the same operation on both sides of the equation Hands On Equations Lessons 1-3, First Experiences in Algebra (see appendix)

*Support* with Groundworks in Algebra Grade 7

**Teacher note:** At this time, students are not using formal methods to solve equations. Students use substitution as a method. Use negative numbers for enrichment only at this time.

### 1.3.8 Solve real world problems using a variety of algebraic methods including tables, graphs, equations and inequalities.

#### **Activities:**

- a. Students make function tables and write equations. MC pgs. 63-69

- b. Students solve a rollerblade rental problem using tables, graphs and equations. MS Situations and Solutions pgs. 204-205

#### **Assessment: Post-assessment for Unit 1**

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### CMT CONNECTION

#### UNIT 1 VOCABULARY

Associative property  
Commutative property  
Distributive property  
Equality  
Equation  
Evaluate  
Expanded form  
Exponent  
Expression  
Identity property of addition  
Identity property of multiplication  
Inequality  
Inverse operation  
Order of operations  
Perfect square  
Power  
Power of 10  
Scientific notation  
Simplify  
Solve  
Standard form  
Square  
Square root  
Variable

2.1.6

1C. Identify alternative forms of expressing numbers using scientific notation.

2.2.15

1A. Solve problems involving 0.1 more/less or 0.01 more/less than a given number.

1B. Identify alternative forms of expressing whole numbers and decimals using expanded notation.

2.2.8

23B. Use order of operations.

8B. Multiply whole numbers and fractions by fractions and mixed numbers.

1.2.4

23D. Represent situations with algebraic expressions.

23E. Write an expression to represent a situation.

1.3.7

23C. Evaluate expressions or solve equations and use formulas.

1.3.9

23A. Solve simple one- or two-step algebraic equations.

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**Unit 2: Rational Numbers.** Students review concepts about fractions and decimals leading students to add, subtract, multiply and divide with any rational number. The concepts in this unit should be presented through contextual problems and not focused on developing discrete skills for each GLE.

### Pre-assessment for Unit 2

**Teacher note:** a review of ordering and comparing fractions and decimals may be necessary. The extent of this review will be based on the results of the pre-assessment Unit 2.

Students will compare and order fractions and decimals using multiple strategies including:

- Using benchmark numbers such as close to 0,  $\frac{1}{2}$ , 1
- Change all fractions so that they have common denominators
- Change fractions to  $n/100$
- Change all numbers to percentages

**Activities (if needed):**

- a. Students work with fractions and decimals. MC pgs. 196-200
- b. Students work with fractions and percent. MC pgs. 202-205
- c. Students work with percents and decimals. MC pgs. 206-210
- d. Students find least common multiple of two or more numbers. MC pgs. 211-214  
*Support with CMT COACH pgs. 67-71*

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**Grade level expectations:** The student will be able to:

**2.2.9 Apply a variety of strategies to write and solve problems involving addition, subtraction, multiplication and division of positive rational numbers, i.e., whole numbers, fractions and decimals.**

**Activities:**

**Teacher note:** Have students estimate answers before computation occurs, compare estimate to exact answer. Then, justify reasonableness of answer for selected problems. See appendix for graphic organizer.

a. Students add and subtract fractions. MC pgs. 236-241

b. Students add and subtract mixed numbers. MC pgs. 242-247

c. Students use area models to multiply fractions and mixed numbers. MC pgs. 250-257

d. Students divide fractions and mixed numbers. MC pgs. 264-270

e. Students design their own pizza following specific constraints and then use fraction multiplication to determine the price. (See appendix for Performance task: “Make Everyone Happy” Pizza)

*Support with:* Step-by-Step for work with decimals

Pizzazz for applications

CMT COACH pgs. 87-91, 92-97, 102-106, 107-112

**Teacher note:** It is important for students to write their own story problems involving all four operations with decimals or fractions.

**Teacher note:** Discuss magnitude of quotient compared to dividend when using fraction or decimal as divisor, example: is your answer going to be more than 1 or less than 1.

**2.2.8 Apply the order of operations and algebraic properties; i.e., commutative, associative, distributive, inverse operations, and the additive and multiplicative identities; to write, simplify, e.g.,  $4(3\frac{1}{2}) = 4(3) + 4(\frac{1}{2}) = 12 + 2 = 16$ , and solve problems, including those with parentheses and exponents.**

**Activities:**

a. Students apply properties to solve problems such as  $5 \times 3\frac{1}{2}$

*Extension:* apply properties to more complex problems, such as  $3\frac{1}{2} \times 4\frac{1}{4} = (3 \times 4) + (3 \times \frac{1}{4}) + (\frac{1}{2} \times 4) + (\frac{1}{2} \times \frac{1}{4})$ .

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### 2.2.7 Estimate solutions to problems in context or computations with rational numbers and justify the reasonableness of the estimate in writing.

**Activities:**

a. Students estimate with fractions. MC pgs. 230-235

b. Students play a game in which you present a contextual problem with several operations involving rational numbers. Groups of students working together have 30 seconds to decide on an appropriate estimation strategy and estimated answer. Work out the answer as a class, using a calculator. Award a point to the group whose estimate was closest to the actual answer.

*Support with:* CMT COACH pgs. 72-75, 113-116, 117-121.

2.1.1 Compare and order rational numbers, e.g.,  $-2$ ,  $\frac{3}{8}$ ,  $-3.15$ ,  $0.8$ , in context and locate them on number lines, scales and coordinate grids. additive and multiplicative identities.

**Activities:**

a. Students compare and order fractions, decimals and percents using number lines and in context. MC pgs. 215-220

*Support with:* CMT COACH pgs. 61-66, 76-79

2.1.2 Represent rational numbers in equivalent fraction, decimal and percentage forms.

**Teacher note:** students have already had experiences with this expectation.

*Differentiation:* Students use real-world models to develop an understanding of fractions, decimals, unit rates, proportions and problem solving by solving the cake problems in this online lesson <http://illuminations.nctm.org/LessonDetail.aspx?id=L284>.

*Intervention:* For students struggling with the relationships between fractions, decimals and percentages go to the following interactive website: <http://illuminations.org/ActivityDetail.aspx?ID=11>

*Support with* CMT COACH pgs 51-55

2.1.3 Represent fractions as terminating, e.g.,  $\frac{1}{2} = 0.5$ , or repeating, e.g.,  $\frac{1}{3} = 0.333\dots$  decimals and determine when it is appropriate to round the decimal form in context.

**Activities:**

a. Students solve problems such as Green beans and Gas Prices (see appendix)

**Teacher note:** Pose problems that require students to make decisions about rounding and have them investigate what happens when you round to different decimals (e.g., rounding to 0.3 vs. 0.33 vs. 0.333).

*Support with:* CMT COACH pgs. 56-60

### **Assessment: Post-assessment for Unit 2**

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### VOCABULARY UNIT 2

Compatible numbers  
Equivalent fraction  
Equivalent fraction  
Fraction  
Least common multiple  
Like fraction  
Percent  
Ratio  
Rational number  
Repeating decimal  
Terminating decimal  
Unlike fraction

### CMT CONNECTIONS

2.2.9

- 5A. Identify the appropriate operation or equation to solve a story problem.
- 5B. Write a story problem from an equation.
- 7A. Add and subtract two-, three- and four-digit whole numbers, money amounts and decimals.
- 7B. Multiply and divide two- and three-digit whole numbers, money amounts and decimals by one-digit numbers and decimals (multiply only).
- 7C. Multiply and divide whole numbers and decimals by 10, 100 and 1,000.
- 8A. Add and subtract fractions and mixed numbers with reasonable and appropriate denominators.
- 9A. Solve one-step story problems involving whole numbers, fractions, decimals and money amounts with or without extraneous information.
- 9B. Solve multistep problems involving fractions and mixed numbers with or without extraneous information.
- 9C. Solve multistep problems involving whole numbers, decimals, money amounts and mixed numbers, including means.
- 9D. Solve multistep problems involving whole numbers, decimals or money amounts, and explain how the solution was determined.

2.2.8

23B. Use order of operations.

8B. Multiply whole numbers and fractions by fractions and mixed numbers

2.2.7

4E. Round whole numbers, fractions and decimals in context.

10A. Identify the best expression to find an estimate.

10B. Identify whether and why a particular strategy will result in an overestimate or an underestimate.

11A. Identify a reasonable estimate to a problem.

11B. Determine a reasonable estimate, and describe the strategy used to arrive at the estimate.

11C. Given an estimate as a solution, judge its reasonableness and justify the decision.

2.1.1

4F. Locate points on number lines and scales, including fractions, mixed numbers, decimals and integers.

18E. Locate and draw points on grids.

4A. Order whole numbers and decimals.

4B. Order fractions and decimals including mixed numbers in context.

4C. Describe magnitude of whole numbers and decimals in and out of context.

4D. Describe magnitude or order of fractions and mixed numbers in context.

2A. Relate fractions, mixed numbers, decimals and percents to their pictorial representations and vice versa.

2B. Identify and/or shade fractional parts

2A. Relate fractions, mixed numbers, decimals and percents to their pictorial representations and vice versa.

2B. Identify and/or shade fractional parts of regions or sets, decimals and mixed numbers in pictures.

2.1.3

3A. Rename fractions and mixed numbers as equivalent decimals and vice versa.

3B. Rename fractions and decimals (up to 1.00) as equivalent percents and vice versa.

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**Unit 3: Proportional Reasoning.** Students solve a variety of problems that involve ratios and proportions and connect the ideas to percentage problems.

### Pre-assessment for Unit 3

**Grade level expectations:** The student will be able to:

2.2.10 Write ratios and proportions to solve problems in context involving rates, scale factors and percentages.

**Activities:**

- a. Students write ratios as fractions and determine whether two ratios are equivalent. MC pgs. 282-286
- b. Students determine unit rates. MC pgs. 287-292
- c. Students solve problems involving scale drawings. MC pgs. 320-327
- d. Students use proportions when working with similar figures. MC pgs. 540-545

*Technology:* Students solve introductory similar figure problems or investigate and solve problems involving the golden ratio using the following interactive website: <http://illuminations.nctm.org/LessonDetail.aspx?ID=L510>.

**Teacher note:** on the following lessons, you may choose to use excel spreadsheets to write solve formulas.

- e. Students compare unit prices. MS What's the Best Buy? pgs. 6-7
- f. Students solve real-life problems by finding the better buy. MS It Really Adds Up pgs. 12-13
- g. Students write and compare ratios. MS Quilting Ratios pgs. 16-17
- h. Students use ratio tables to solve problems. MS In the Mix pgs. 18-19
- i. Students use proportions to solve problems. MS Halftime Refreshments pgs. 20-21
- j. Students use proportions to solve problems. MS Can I Use a Proportion? Pgs. 22-23

*Support with CMT COACH* pgs. 122-126

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### 3.3.11 Write and solve problems in context involving conversions of customary or metric units and units of time.

#### **Activities:**

- Students: convert units in the customary system. MC pgs. 298-303
- Students convert metric units. MC pgs. 304-309
- Students convert units of time. Hot Topics pgs. 406-407

*Extension:* Have students perform conversions rates such as inches per minute to miles per hour.

*Support with CMT COACH* pgs. 136-142

### 2.2.11 Find and/or estimate a percentage of a number, including percentages that are more than 100 percent and less than 1 percent using a variety of strategies.

**Teacher note:** These strategies should include:

- Number patterns – e.g., find 20 percent of 50. Solution: 10 percent of 50 = 5, so 20 percent of 50 = 2 (5) = 10
- Distributive Property – e.g., find 150 percent of 20. Solution: 150 percent of 20 = 100 percent of 20 + 50 percent of 20.  $20 + 10 = 30$
- Proportions – e.g., 75 percent of 48 Solution:  $\frac{75}{100} = \frac{x}{48}$   $x = 36$
- Multiplication of decimal equivalent – e.g., 0.7 percent of 48. Solution:  $0.007 (48) = 0.336$
- Estimation – e.g., 22 percent of \$49.95. Estimate 22 percent of \$49.95  $\approx$  20 percent of 50. 10 percent of 50 = 5, so 20 percent of 50 = 2 (5) = 10, therefore, 22 percent of \$49.95  $\approx$  \$10

### 2.2.12 Solve percent problems in context including what percent one number is of another, percent increase and percent decrease using a variety of strategies (e.g., proportions or equations).

#### **Activities:**

- Students estimate percents. MS Team Spirit pgs. 26-27
  - Students interpret and create circle graphs to represent percents. MS Playing Around pgs. 28-39
  - Students use percents to calculate sale prices and discounts. MS Sale Daze pgs. 30-31
- Teacher note:** students could use excel spreadsheets to keep track of money spent.
- Extension:* Students calculate percents in real-life situations. MS Percent Smorgasbord pgs. 32-33
- Students find percent of a number. MC pgs. 345-349
  - Students solve problems using the percent proportion. MC pgs. 350-354
  - Students estimate percents using fractions and decimals. MC pgs. 355-360

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g. Students solve problems using the percent equation. MC pgs. 361-367

h. Students find the percent of increase or decrease. MC pgs. 369-374

i. Students solve problems involving sales tax and discount. MC pgs. 375-378

j. Students solve problems involving simple interest. MC pgs. 379-383

*Intervention:* Have students start with 100 percent of a number and then take 50 percent of the number and 200 percent of the number to visualize their relationship to the original whole or use 10 x 10 grids to help visualize problems.

*Support* with CMT COACH pgs. 127-130

### **Assessment: Post-assessment for Unit 3**

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#### UNIT 3 VOCABULARY

Corresponding angle  
Corresponding side  
Customary system  
Discount  
Equivalent ratio  
Metric system  
Percent decrease  
Percent increase  
Percent proportion  
Proportion  
Rate  
Ratio  
Sales tax  
Scale factor  
Similar figures  
Simple interest  
Unit rate

#### CMT CONNECTION

2.2.10

12A. Solve problems involving ratios.

12B. Solve one-step problems involving proportions in context.

3.3.11

16C. Identify appropriate customary or metric units of measure for a given situation.

16D. Solve problems involving conversions of customary or metric units of measure.

16E. Solve problems involving conversions of time units.

2.2.11

13A. Find percents of whole numbers or the percent a given number is of another number.

13B. Solve one-step problems involving percents in context.

## Grade 7 Mathematics

**Unit 4: Polygons and their Transformations.** In this unit, students build on their knowledge of polygons to classify and understand congruence, similarity and their transformational properties.

### Pre-assessment for Unit 4

**Grade level expectations:** The student will be able to:

3.1.1 Classify two- and three-dimensional geometric figures based on their properties including relationships of sides and angles and symmetry (line and/or rotational) and apply this information to solve problems.

**Activities:**

- a. Students identify and classify triangles. MC pgs. 524-529
- b. Students identify and classify quadrilaterals. MC pgs. 533-538
- c. Students identify and classify polygons. MC pgs. 546-551
- d. Students build 3-D figures from various views. MC pgs. 603-607

**Teacher note:** As an alternate strategy, use Venn Diagrams as in this lesson found at <http://illuminations.nctm.org/LessonDetail.aspx?id=L277>.

Support with Groundworks Reasoning in Geometry  
CMT COACH pgs. 143-185

3.1.2 Identify polygons that have line and/or rotational symmetry.

**Activities:**

- a. Students investigate symmetry for polygons. MS Symmetric Situations pgs. 290-291

**Teacher note:** the assessment at the end of this unit has been reworked and can be found in the appendix.

- b. Students graph rotations on a coordinate plane. MC Grade 6 book pgs. 615-619, 624, 703 (see appendix for worksheets)

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**3.1.3 Draw the result of transformations on polygons on coordinate planes including translations, rotations, reflections and dilations (reductions and enlargements)**

**3.1.4 Describe the effect of transformations; i.e., position and orientation from the original figure, size; on polygons that have line and/or rotational symmetry.**

***Activities:***

- a. Students use *Geometer's Sketchpad* to explore and demonstrate effects of various transformations within a coordinate plane (see appendix for lesson: Polygons and Their Transformations).
- b. Students create logos by enlarging triangles. MS Enlarging Triangles pgs. 280-281
- c. Students examine polygons for congruence. MS Moving Polygons Around pgs. 288-289
- d. Students graph translations of polygons on a coordinate plane. MC pgs. 553-557
- e. Students graph reflections on a coordinate plane. MC pgs. 558-562
- f. Students graph rotations on a coordinate plane. MC pgs. 743  
*Support with Groundworks Reasoning in Geometry Grade 7*

**3.1.5 Compare and describe in writing the relationships (including congruence, equality, scale) between the angles, sides, perimeter and area of congruent and similar geometric shapes.**

***Activities:***

- a. The following website will help students to understand ratio, proportion, scale factor and similarity using perimeter, area, volume and surface area of various rectangular shapes. <http://illuminations.nctm.org/LessonDetail.aspx?id=U98>
- b. Students determine whether figures are similar and find a missing length in a pair of similar figures. MC pgs. 540-545

*Support with CMT COACH pgs. 155-161*

**Assessment: Post-assessment for Unit 4**

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### UNIT 4 VOCABULARY

Angle  
Base  
Center  
Cone  
Congruence  
Cylinder  
Decagon  
Dilation  
Edge  
Equivalent  
Face  
Hexagon  
Isosceles triangle  
Line of symmetry  
Octagon  
Parallel  
Pentagon  
Perimeter  
Polygon  
Prism  
Pyramid  
Quadrilateral  
Regular polygon  
Reflection  
Rhombus  
Rotation  
Rotational symmetry  
Scale  
Side  
Sphere  
Symmetry  
Transformation  
Translation  
Trapezoid  
Triangle  
Vertex (vertices)

### CMT CONNECTIONS

3.1.1

17A. Identify, describe or classify two- and three-dimensional geometric shapes and figures.

17B. Draw, describe and classify two-dimensional geometric shapes and figures.

3.1.2

18A. Identify lines of symmetry.

3.1.3

18B. Draw lines of symmetry.

18F. Identify geometric transformations (reflections, rotations and translations).

18G. Draw geometric transformations (reflections and rotations).

3.1.5

18C. Identify congruent and similar figures.

18D. Identify and explain congruent or similar figures.

25A. Solve extended numerical and statistical problems.

## Grade 7 Mathematics

**Unit 5: Two- and Three-Dimensional Measurement.** In this unit, students extend what they have learned about perimeter and area to develop the concepts of surface area and volume. Formulas for volume should be developed through activities that lead students to understanding the relationship between the dimensions and volume rather than introducing the formulas first.

### Pre-assessment for Unit 5

**Grade level expectations:** The student will be able to

3.1.1 Classify 2- and 3-dimensional geometric figures based on their properties including relationships of sides and angles and symmetry (line and/or rotational) and apply this information to solve problems.

**Activities:**

- a. Students identify and classify triangles. MC pgs. 534-529
- b. Students identify and classify quadrilaterals. MC pgs. 533-538
- c. Students identify and classify 3D figures . MC pgs. 603-607

3.3.8 Use formulas to determine perimeters and areas of polygons and circles.

**Activities:**

- a. Students use formulas to areas of parallelograms. MC pgs. 572-576
- b. Students find the area of triangles and trapezoids. Measurement Lab MC pg. 577-582
- c. Students use formulas to find the circumference of circles. MC pgs. 583-588
- d. Students use formulas to find the area of circles. MC pgs. 589-593  
*Support* using CMT COACH pgs. 143-147, 162-166

## Grade 7 Mathematics

3.3.11 Write and solve problems in context involving conversions of customary or metric units and units of time.

**Activities:**

a. Students solve problems using conversions in the customary system. MC pgs. 298-303

b. Students solve problems using conversions in the metric system. MC pgs. 304-309

c. Students use conversions of time. (see appendix – Understanding Measurement)

Teacher note: Have students create a short story that includes specific units of measure for capacity, time length, etc. in a scenario. Then have them remove the unit labels and leave a blank space putting the list of measurement units as a word bank below the paragraph. Now have students exchange stories and try to fit the units in the correct spaces. For samples, see *Groundworks: Reasoning with Measurement Grade 7*

*Support* using CMT COACH pgs. 136-142

**3.2.6 Identify and/or draw two-dimensional representations of three dimensional geometric solids using nets, cross-sections, front, side and top views to solve problems.**

**Activities:**

a. Students identify and draw nets of geometric solids. Measurement Lab MC pgs. 600-601, see appendix for Grade 6 book pgs. 554-555

b. Students build 3D figures given top, side and front views. Geometry Lab MC pg. 607

c. Students draw 3D figures given top, side and front views. MC pgs. 608-612

Technology: This lesson uses a real-world situation to help develop students' spatial visualization skills and geometric understanding. Emma, a new employee at a box factory, is supposed to make cube shaped jewelry boxes. Students help Emma determine how many different nets are possible and then analyze the resulting cubes." <http://illuminations.nctm.org/LessonDetail.aspx?id=L570>  
See appendix for lesson.

d. Students identify representations of cross-sections. See MC pgs. 745-746

*Support* using CMT COACH pgs. 174-179

*Support* through Tech. Ed.

## Grade 7 Mathematics

### 3.2.7 Use two-dimensional representations of rectangular prisms, pyramids and cylinders to determine surface area.

**Activities:**

a. Students use cubes to find the surface area of a rectangular prism. Mini Lab MC pgs. 649-653

**Teacher note:** Have students build all the possible rectangular solids using cubes for a fixed volume. Have them calculate the surface area for each solid they build and record it in a chart. Have them look for and discuss any patterns that they see for either volume or surface area. See Mouse and Elephant activities in appendix

b. Students find surface area of a cylinder. MC pgs. 656-659

c. Students find surface area of pyramids. MC Grade 8 pgs. 393-395 (see appendix)

### 3.3.9 Develop and use formulas to determine volumes of geometric solids (rectangular prisms and cylinders).

**Activities:**

a. Students develop formulas for the volume of prisms. Mini Lab MC pgs. 613-614

b. Students develop formulas for the volume of a cylinder. Mini Lab MC pgs. 619-623  
*Support with CMT COACH pgs. 180-185*

### 3.3.10 Use estimation and measurement strategies to solve problems involving area of irregular polygons and volumes of irregular solids and justify solutions in writing.

**Activities:**

a. Students find areas of composite figures. MC pgs. 596-599

b. Students find areas of composite solids. MC pg. 748  
*Support with CMT COACH pg. 266 #2*

### **Assessment: Post-assessment for Unit 5**

## Grade 7 Mathematics

### UNIT 5 VOCABULARY

Base  
Center  
Circle  
Composite figure  
Cone  
Customary system  
Cylinder  
Diameter  
Edge  
Face  
Height  
Hypotenuse  
Metric system  
Pi  
Prism  
Pyramid  
Radius  
Rectangular prism  
Sphere  
Surface area  
3D figure  
Triangular prism  
Vertex  
Volume

### CMT CONNECTION

3.1.1

17A. Identify, describe or classify two- and three-dimensional geometric shapes and figures.

17B. Draw, describe and classify two-dimensional geometric shapes and figures.

3.3.8

15A. Estimate lengths, areas and angle measures.

16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.

16B. Determine perimeters, areas and volumes.

3.3.11

16C. Identify appropriate customary or metric units of measure for a given situation.

16D. Solve problems involving conversions of customary or metric units of measure.

16E. Solve problems involving conversions of time units.

3.2.6

18H. Relate two- and three-dimensional representations and visa versa.

3.3.9

16B. Determine perimeters, areas and volumes.

3.3.10

25A. Solve extended numerical and statistical problems

## Grade 7 Mathematics

**Unit 6:** Surveys and Experiments. In this unit, students develop questions about the world around us and design studies to learn about new types of graphical representations and apply statistical measures. The data gathered should be used to introduce the concepts of experimental and theoretical probability, which can be further developed through probability experiments.

### Pre-assessment for Unit 6

**Grade level expectations:** The student will be able to

**4.1.1 Formulate questions and design studies; e.g., surveys, experiments, research using published sources and the Internet; to collect and analyze data.**

**4.1.2 Organize and display data using appropriate graphical representation such as, tables and charts, line, bar and circle graphs, Venn diagrams, stem and leaf plots, scatter plots, histograms.**

4.2.3 Make and defend in writing predictions based on patterns and trends from the graphical representations.

**4.2.4 Find, use and interpret measures of central tendency and spread, including mean, median, mode, range and outliers.**

**4.2.5 Compare two sets of data based on their spread and measures of central tendency.**

**Activities:**

- a. Students formulate a question and design a survey to collect and analyze data. See webquest MC pgs. 392-393
- b. Students display and analyze data using a line plot. MC pgs. 396-401
- c. Students describe a set of data using mean, median, mode and range. MC pgs. 402-409
- d. Students display and analyze data using a stem-and-leaf plot. MC pgs. 410-414
- e. Students display and analyze data using bar graphs and histograms. MC pgs. 415-421
- f. Students solve problems using graphs. MC pgs. 424-425
- g. Students analyze to make predictions based on patterns. MC pgs. 426-431
- h. Students use data to make predictions. MC pgs. 434-437
- i. Students compare 2 sets of data based on their measures of central tendency. See appendix Basketball Problem

## Grade 7 Mathematics

*Support with CMT COACH pgs. 434-437*

**4.3.6 Identifying all possible outcomes using models, tree diagrams, tables and/or organized lists to determine theoretical probabilities.**

4.3.7 Perform experiments to determine experimental probabilities.

**4.3.8 Compare and contrast experimental probability results to theoretical probabilities in writing.**

**4.3.9 Solve probability problems in familiar contexts including simple events** (flipping a coin) **and compound events** (flipping a coin and rolling a number cube).

***Activities:***

- a. Students find probability of a simple event. MC pgs. 460-464
- b. Students find sample spaces and probabilities. MC pgs. 465-470
- c. Students use the Fundamental Counting Principle to find the number of outcomes. MC pgs. 471-474
- d. Students find a permutation. MC pgs. 475-478
- e. Students find combinations. MC pgs. 480-483
- f. Students find and compare theoretical and experimental probabilities. MC pgs. 486-490

***Teacher note:*** Use area models to introduce the probability of compound events. Have students use a grid to help them determine the probability of compound events. For example if you were to toss a coin and role a die, find the probability of getting (heads, an even number). First, divide the grid in  $\frac{1}{2}$  and label one side heads and one side tails. Then take each side and divide it into two sections, one for odd and one for even. What fraction of the entire grid is labeled both heads and even? Compare the grid to the area model for multiplication:  $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$ . (see appendix MC Grade 8 pgs. 747-748)

- g. Students find probabilities of compound events. MC pgs. 492-497
- h. Students work with probability using MS Chance Encounter Module

*Support with CMT COACH pgs. 206-214*

**Assessment: Post-assessment for Unit 6**

## Grade 7 Mathematics

### UNIT 6 VOCABULARY

Combination

Dependent variable

Experimental probability

Fundamental Counting Principle

Independent event

Outcome

Permutation

Probability

Random

Sample space

Theoretical probability

Tree diagram

### CMT CONNECTION

4.1.2

19B. Create bar graphs, line graphs and stem-and-leaf plots from data in tables and charts.

24B. Sort or classify objects, and draw logical conclusions from data including Venn diagrams, combinations, permutations and transitive reasoning questions.

4.2.3

19A. Identify correct information from tables, graphs and charts.

20A. Draw reasonable conclusions from data in tables, graphs and charts.

20B. State a conclusion and explain why an answer is or is not reasonable based on the data.

4.2.4

20C. Solve problems involving means, medians, modes and ranges of sets of data.

4.3.6

24A. Solve problems involving the organization of data.

24B. Sort or classify objects, and draw logical conclusions from data including Venn diagrams, combinations, permutations and transitive reasoning questions.

4.3.7, 4.3.8

21A. Identify correct solutions to problems involving elementary notions probability and fairness expressed as fractions, decimals or percents.

21B. Solve problems involving elementary notions of probability and fairness expressed as fractions, decimals or percents and justify solutions.

21C. Solve problems involving expected outcomes or predictions and justify solutions.

4.3.9

25A. Solve extended numerical and statistical problems.

## Grade 7 Mathematics

**Unit 7: Integers.** In this unit, students review basic integer concepts including addition and focus on the development of computational strategies for subtraction, multiplication and division with integers.

### Pre-assessment for Unit 7

**Grade level expectations:** The student will be able to

**2.2.16 Develop and describe in writing strategies for addition, subtraction, multiplication and division and solve problems with positive and negative integers using models, number lines, coordinate grids and computational strategies.**

**Activities:**

**Teacher note:** Introduce students to the idea of positive numbers as having money and negative numbers as owing money or paying out money. Practice several examples of either having or owing money and representing them using integers. Then discuss the concept of days ahead from now or days ago. Three days from now would be a positive 3 and three days ago would be a negative 3. Set up situations that would model multiplication using four possible scenarios (see appendix for lesson: Monetary Model).

a. Students use cubes to model adding and subtracting positive and negative numbers. MS Statements about Signs pgs. 97-97

b. Students predict results of integer addition and subtraction. MS Counterexamples and Cube Combinations pgs. 98-99

*Support using:*

- Students use counters to model the addition of integers. Algebra Lab MC pgs. 93-94
- Students add integers using number lines and solve problems in context MC pgs. 95-99
- Students use counters to model subtraction of integers. Algebra Lab MC pgs. 101-102
- Students subtract integers using number lines and solve problems in context. MC pgs. 103-106

c. Students explore integer multiplication and division. MS More Cases to Consider pgs. 100-101

*Support using:*

- Students multiply integers using counters and number lines and solve problems in context. MC pgs. 107-111
- Students divide integers using counters and solve problems in context. MC pgs. 114-118

d. Students plot point on a coordinate plane (all 4 quadrants) MS Seeing Things Graphically pg. 194 and homework pg. 216

*Support using* CMT COACH pgs. 98-101

*Technology:* Students solve a series of problems in context at [http://www.mathgoodies.com/lessons/vol5/challenge\\_vol5.html](http://www.mathgoodies.com/lessons/vol5/challenge_vol5.html).

**2.2.17 Develop an understanding of absolute value using a number line while solving problems involving distance.**

**Activities:**

a. Students use a numberline to find absolute value and solves problems in context. MC pgs. 80-83

### **Assessment: Post-assessment for Unit 7**

## Grade 7 Mathematics

### UNIT 7 VOCABULARY

Absolute value  
Additive inverse  
Coordinate plane  
Integer  
Negative integer  
Opposite  
Ordered pair  
Origin  
Positive integer  
Quadrant  
x-axis  
x coordinate  
y-axis  
y coordinate

### CMT CONNECTIONS

1.1.1

22A. Identify the missing terms in a pattern, or identify rules for a given pattern using numbers and attributes.

22B. Extend or complete patterns and state rules for given patterns using numbers and attributes.

4.2.3

19A. Identify correct information from tables, graphs and charts.

20A. Draw reasonable conclusions from data in tables, graphs and charts.

20B. State a conclusion and explain why an answer is or is not reasonable based on the data.

1.3.7

23C. Evaluate expressions or solve equations and use formulas.

1.3.8

25A. Solve extended numerical and statistical problems.

## Grade 7 Mathematics

**Unit 8: Linear and Nonlinear Relationships.** In this unit, students develop the foundation for the study of functions in Grade 8 and beyond. The focus should be on relating contextual situations to algebraic representations and making connections between the representations.

### Pre-assessment for Unit 8

**Grade level expectations:** The student will be able to

**Teacher note:** The 8 lessons in MS The Language of Algebra (pgs. 182-223) will address these GLEs. Other activities are listed to support this module.

1.1.1 Analyze a variety of patterns (physical phenomena, numeric and geometric patterns, arithmetic sequence) and generalize with algebraic expressions, formulas or equations.

1.2.4 **Write expressions, formulas, equations or inequalities using variables to represent mathematical relationships and solve problems.**

**Activities:**

a. Students extend and write rules for a variety of patterns. AIMS activities (see appendix)

b. Students describe relationships and extend terms in an arithmetic sequence. Algebra Lab MC pgs. 57-61

1.1.3 Determine when mathematical situations are continuous (distance traveled over time) or discrete sets of points, e.g., weekly sales.

**Activities:**

a. Use this video to have students visualize continuous vs. discrete. A worksheet is included.

[http://www.coolclassroom.org/cool\\_projects/lessons/miniunits/lesson1.html](http://www.coolclassroom.org/cool_projects/lessons/miniunits/lesson1.html)

1.1.2 Identify and describe in writing the independent and dependent variables in a mathematical situation, e.g. age vs. height of children.

**Teacher note:** Make connections to graphing realizing that independent variables should be graphed on the horizontal axis in most cases. Also, this concept is used in science at this level.

1.2.5 Represent and compare the characteristics of linear and nonlinear relationships using verbal descriptions, e.g., linear –“increases \$1 per month” vs. nonlinear – “doubles every month,” tables, graphs, equations or inequalities (when possible).

**Activities:**

a. Students examine common situations that describe linear and nonlinear relationships by writing equations, making tables and graphing the values (see appendix for lesson: Linear and Nonlinear Function Problems)

1.2.6 **Examine situations with constant or varying rates of change and know that a constant rate of change describes a linear relationship.**

**Activities:**

a. Students identify rate of change using tables and graphs. MC pgs. 293-297

*Technology:* students explore the rate of increase of the bouncing tennis balls: <http://illuminations.nctm.org/LessonDetail.aspx?id=L246>

## Grade 7 Mathematics

1.3.7 Evaluate and simplify algebraic expressions, equations and formulas using algebraic properties (i.e. commutative, associative, distributive, inverse operations, and the additive and multiplicative identities) and the order of operations.

**1.3.8 Solve real world problems using a variety of algebraic methods including tables, graphs, equations and inequalities.**

**Assessment: Post-assessment for Unit 8**

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### UNIT 8 VOCABULARY

Arithmetic sequence

Dependent variable continuous set

Discrete set

Geometric sequence

Independent variable

Linear relationship

Nonlinear relationship

Rate of change

### CMT CONNECTION

1.1.1

22A. Identify the missing terms in a pattern, or identify rules for a given pattern using numbers and attributes.

22B. Extend or complete patterns and state rules for given patterns using numbers and attributes.

4.2.3

19A. Identify correct information from tables, graphs and charts.

20A. Draw reasonable conclusions from data in tables, graphs and charts.

20B. State a conclusion and explain why an answer is or is not reasonable based on the data.

1.3.7

23C. Evaluate expressions or solve equations and use formulas.

1.3.8

25A. Solve extended numerical and statistical problems.