

## Grade 5 Mathematics

### Mathematics Background for Grade 5 Teachers

**Algebraic Reasoning: Patterns and Functions:**

Patterns and functional relationships can be represented and analyzed using a variety of strategies, tools and technologies.

**Central Understanding:** Numerical relationships can be represented using symbols.

**Background:** Functional relationships are represented by: describing a pattern, using a chart or table, using a graph, and by using descriptive language. Functions in their most abstract form are written as equations. Equations apply the rules of arithmetic and algebra to determine equivalence and calculate values. A value can be represented as a number, a numerical expression, an algebraic expression, or an equation. Different symbols in an equation can have the same, or different, values. In mathematical situations and structures, using letters as variables facilitates generalizations and the exploration of numbers and their operations.

**Numerical and Proportional Reasoning:**

Quantitative relationships can be expressed numerically in multiple ways in order to make connections and simplify calculations using a variety of strategies, tools and technologies.

**Central Understanding:** Numerical relationships are not changed when rational numbers are represented in different ways.

**Background:** Rational numbers are numbers which can be expressed as ratios and operated upon as division problems. The equivalence of fractions, decimals and percent allows for translation among different representations for the same quantity. Context and efficiency dictate the appropriate representation when solving problems. Operations involving rational numbers are consistent with whole number operations. Familiar situations can also be described using , which are positive numbers, negative numbers that represent quantities less than zero and zero.

**Geometry and Measurement**

Shapes and structures can be analyzed, visualized, measured and transformed using a variety of strategies, tools and technologies.

**Central Understanding:** Geometric relationships can be represented spatially and generalized through formulas.

**Background:** The exploration and analysis of shapes, structures, and properties leads to generalizations that can be expressed as formulas. Measures of attributes provide numerical data which summarize what is typical for a specific situation and condition.

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### **Working with Data: Probability and Statistics**

Data can be analyzed to make informed decisions using a variety of strategies, tools and technologies.

**Central Understanding:** Organized data can be used to summarize what is typical for a specific situation and condition.

**Background:** Measures of central tendency are descriptors of what is typical for a specific situation or condition. Data from a sample that is representative of a larger population are used to identify trends, make generalizations and make predictions, providing the foundation for further investigations of conjectures and conclusions.

Source: Model for Mathematics Curriculum, CSDE 2008

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### 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, 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, CMT Coach (as referenced throughout the unit) and in Ledyard Grade 5 CMT Fourth Generation Sample Items Review (see Appendix A).

### Pacing Guide:

Refer to the pacing guide for lessons that come before March (CMT administration) and for those that come after March.

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### Terms to help with pacing and planning:

The following terms are included in this curriculum guide to help teachers with their planning and pacing:

**Explore:** a topic which is not formally taught. For example, when kindergarteners use tiles to cover a desk, they are exploring the concept of area. They will not be asked for a definition of area nor will they be assessed on the topic.

**Introduce:** a skill which is presented by the teacher and students practice, but are not expected to master.

**Master:** a topic that most students are expected to know and understand. The topic has been introduced previously, practiced and students are able to apply the concept or skill 80% of the time.

**Extend:** activities that take students more deeply into a topic.

### 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 4.1.1 refers to collecting, organizing and displaying data. The .1 refers to the grade level expectation and will describe specific graphs that will be used.

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### Unit 1: Place Value

Pacing: 8 days

In this unit, students represent, compare, and order whole numbers and decimals.

#### Pre-Assessment for Unit 1

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

- 2.1.1 Compare, order and round whole numbers to 1,000,000 using number patterns, number lines and diagrams.
- 1.2.3 Represent and describe mathematical relationships using variables or symbols in expressions, equations and inequalities
- 2.1.2 Represent whole numbers up to 1,000,000 in expanded and regrouped forms and use the forms to support computation.
- 2.1.3 Construct and use models, number patterns and pictorial representations to extend place value concepts and patterns to decimals, e.g., 0.1 is one-tenth of one and 0.01 is one one-hundredth of one and one-tenth of 0.1.
- 2.2.10 Solve practical problems involving 10, 100, 1,000 and 10,000 more or less than a number.

#### Activities:

1. Students read and write whole numbers, through billions, in multiple ways: standard form, expanded form and in words. MC 1-1

*Teacher notes:*

- Use both models for expanded, i.e,  $(7 \times 100) + (3 \times 10) + (2 \times 1) = 700 + 30 + 2 = 732$  See Ledyard CMT samples 1B
- Also use regrouped form, such as 3 thousands and 13 hundreds = 4,300 (see COACH pgs. 42-46) See Ledyard CMT samples 1C
- Given a number, such as 32, 584, have students write a number that is 10, 100, 1,000 and 10,000 more or less and explain their strategy. See Ledyard CMT samples 1A
- Use the following question stem: The value of 4, 837 would change by how much if the 4 were replaced by a 2? Have students use the question stem to create their own problems, solve, and explain their strategy. See Ledyard CMT samples 1D

(Extend) Master to millions, extend to billions when possible.

2. Students compare whole numbers using number lines and symbols ( $>$ ,  $<$ ,  $=$ ) MC 1-2. Complete H.O.T. #40, 41 and WiM #43 page 23

3. Students represent fractions (tenths, hundredths) as decimals. MC 1-4. Complete H.O.T. #31 page 30 See Ledyard CMT samples 2A

*Teacher note:*

(Extend) Master tenths and hundredths, extend to thousandths when possible.

4. Students use place value through thousandths. MC 1-5. Complete H.O.T. #32 page 35.

*Teacher note:*

(Extend) Master to tenths and hundredths, extend to thousandths when possible.

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5. Students compare decimals using number lines, decimal squares and symbols. MC 1-6. Complete H.O.T. #35 and WiM #37 page 38

*Teacher note:*

(Extend) Concentrate on tenths and hundredths, extend to thousandths when possible. Decimal Squares are a good model to use for conceptual development. See appendix for blank models.

6. Students order whole numbers and decimals using real world examples. MC 1-7. Complete H.O.T. #23 and WIM #25 page 45. See Ledyard CMT samples 4A, 4C

*Teacher note:* Have children begin by constructing human number lines that represent decimal numbers. Initially, the number lines must be from 0-1 and divided into tenths, and then into hundredths so that students understand that 0.45 is between 0.4 (0.40) and 0.5 (0.50).

Complete **problem solving activities** 1-3 (4-step plan) and 1-8 (Guess and Check).

*Teacher note:* more samples for Guess and Check can be found in *The Problem Solver Grade 5*.

### Post Assessment Unit 1

#### Electronic Resources:

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=12> General reference for Number and Proportional Reasoning, interactive

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### UNIT I VOCABULARY

Decimal

Decimal notation

Decimal point

Equation

Expanded form

Fraction

Inequality

Place value

Regrouped form

Value

### CMT CONNECTIONS

1A. Solve problems involving 100 more/less or 1,000 more/less than a given number.

1B. Identify alternative forms of expressing whole numbers less than 10,000 using expanded notation.

1C. Identify alternative forms of expressing whole numbers less than 10,000 using regrouping.

1D. Use place value concepts to identify and compare the magnitude and value of digits in numbers.

2A. Relate decimals (0.01-2.99) to pictorial representations and vice versa.

4A. Order whole numbers less than 100,000.

4C. Describe magnitude of whole numbers less than 100,000 and decimals.

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### Unit 2: Computation with whole numbers and decimals

**Pacing:** 30 days

In this unit, students compute with whole numbers and decimals and apply these skills to real world situations. They use estimation strategies to judge the reasonableness of their answer.

#### Pre-Assessment for Unit 2

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

**2.1.1 Compare, order and round whole numbers to 1,000,000 using number patterns, number lines and diagrams.**

**2.2.11 Estimate products and missing factors using multiples of 10, 100 and 1,000.**

**2.2.12 Develop and use strategies involving place value relationships, inverse operations and algebraic properties (commutative, associative and distributive) to simplify addition, subtraction and multiplication problems with three-, four- and five-digit numbers and money amounts and division by one-digit factors.**

**2.2.13 Multiply and divide decimals and money amounts by whole numbers.**

**2.2.14 Write and solve multistep problems for all four operations involving multidigit whole numbers and money amounts and explain how answers were determined, orally and in writing.**

**2.2.18 Use estimation to predict results and to recognize when an answer is or is not reasonable, or will result in an overestimate or underestimate and explain the reasoning used orally and in writing.**

#### Activities:

1. Using number lines, students round whole numbers and decimals. MC 2-1. Complete H.O.T. #33 and WiM #35 page 63.  
See Ledyard CMT samples 4E, 4F

2. Students estimate sums and differences by rounding and using compatible numbers. MC 2-2. Complete H.O.T. #30, 31, WiM #32 page 66.  
*Teacher note:* Connect WiM #32 using the terms overestimate and underestimate. See Ledyard CMT samples 5A, 10B

3. Students add and subtract multidigit whole numbers with regrouping. MC 2-4. Complete H.O.T. #26, 27 and WiM #28 page 72. See Ledyard CMT samples 7A

*Teacher note:* as students solve the word problems in the sections, have them explain (sometimes in writing) how they found their answer.

4. First using decimal square models, then traditional algorithms, students add and subtract decimals. MC 2-6.  
Complete H.O.T. #27 and WiM #28 page 82.

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5. Students use algebraic properties (commutative, associative, identity) to add whole numbers and decimals. MC 2-7. Complete H.O.T. #23 page 87.
6. Students use strategies to add and subtract mentally. MC 2-8. Complete H.O.T. #27, 28 and WiM #29 page 90.
7. Students use basic facts and patterns to multiply multiples of 10, 100 and 1,000. MC 3-1. Complete H.O.T. #33-39 page 105. See Ledyard CMT samples 6A
8. Students use the distributive property to simplify addition and multiplication. MC 3-2. Complete H.O.T. #30 page 110.
9. Students estimate products by rounding and using compatible numbers. MC 3-3. Complete H.O.T. #41-42 and WiM #44 page 115. Teacher note: see Ball Park Estimation (see appendix) for ballpark-type problems.
10. Students multiply multi-digit numbers by one-digit. MC 3-4. Complete WiM #33 page 118.  
*Teacher note:* as an alternate strategy, use lattice multiplication. See appendix grade 4 IMPACT T3-T4
11. Using an area model, students multiply a two-digit number by a two-digit number. MC teacher manual “introduce” pg. 122
12. Using an algorithm, students multiply a two-digit number by a two-digit number. MC 3-6. Complete WiM #34, page 124.
13. Students use properties of multiplication to simplify multiplication problems. MC 3-7. Complete H.O.T. #35 and WiM # 37 page 128.
14. Students solve multiplication problems involving money. MC 3-8. Complete H.O.T. #26 and WiM #29 page 135.
15. Students use basic fact patterns to divide multiples of 10, 100, 1000. MC 4-1. Complete H.O.T. #28-30 page 151. See Ledyard CMT samples 7B
16. Students estimate quotients using rounding and compatible numbers. MC 4-2. Complete H.O.T. #33 and WiM #34 page 154.
17. Students first use model with power of ten blocks, then algorithms to divide by a one-digit number. MC 4-3. Complete H.O.T. #32 and WiM # 34 page 161. See Ledyard CMT samples 5B
18. Students work with division problems having remainders, and interpret the remainder. MC 4-6. Complete H.O.T. #18-20 page 172. See Ledyard CMT samples 7C  
*Teacher notes:*
  - have students write remainders as a fraction
  - for assessment, use Impact C-3 pg. A10 “Tent Trouble”

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19. Students estimate quotients of decimals (including money). MC 4-7. Complete H.O.T. #18 page 176.

Complete **problem solving activities** 2-3 (working backwards), 2-5 (estimate or exact?), 3-5 (draw a picture), 3-9 (extra or missing information), 4-5 (act it out), 4-8 (choose best strategy) See Ledyard CMT samples 9A, 9B, 10A

*Teacher notes:*

- students should solve 2 step problems. More samples can be found in *Problem Solving Experiences Grade 5*
- more samples of the above strategies can be found in *The Problem Solver Grade 5*
- Integrated Understanding opportunity see Impact T32 Organize a Class Party

### Post assessment Unit 2

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#### Electronic Resources:

<http://www.stfx.ca/special/mathproblems/grade5.html> Forty-Eight Word Problems, good for extensions

<http://www.aaamath.com/grade5.html> Grade 5 Math, all topics, interactive, contains teacher tutorials

[http://www.internet4classrooms.com/skills\\_5th\\_original.htm](http://www.internet4classrooms.com/skills_5th_original.htm) Interactive games, leveled

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=29> Product Game – game for two people

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### UNIT 2 VOCABULARY

Associative  
Commutative  
Compatible numbers  
Difference  
Distributive  
Divisor  
Estimate  
Factor  
Overestimate  
Product  
Quotient  
Remainder  
Round  
Sum  
Underestimate

### CMT CONNECTIONS

- 4E. Round whole numbers in context.
- 4F. Round decimals.
- 5 A. Identify the appropriate operation or number sentence to solve a story problem.
- 5B. Write story problems from multiplication or division number sentences, using one- and two-digit numbers.
- 6A. Multiply and divide facts.
- 7A. Add and subtract two-, three- and four-digit whole numbers and money amounts less than \$100.
- 7B. Multiply and divide multiples of 10 and 100 by 10 and 100.
- 7C. Multiply and divide two- and three-digit whole numbers and money amounts less than \$10 by one-digit numbers.
- 9A. Solve one-step story problems involving whole numbers and money amounts with or without extraneous information. Use all operations.
- 9B. Solve two-step story problems involving whole numbers and money amounts with or without extraneous information.
- 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, including estimating change.

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### Unit 3: Working with Data

Pacing: 10 days

In this unit, students collect, organize and analyze data. They select and make an appropriate graph for presenting different types of data.

#### Pre-Assessment for Unit 3

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

- 4.1.1 Represent sets of data using line plots, bar graphs, double bar graphs, pictographs, simple circle graphs, stem and leaf plots and scatter plots.**
- 4.1.2 Compare different representations of the same data set and evaluate how well each kind of display represents the features of the data**
- 4.2.3 Design and conduct surveys of a representative sample of a population and use the data collected to begin to make inferences about the general population.
- 4.2.4 Determine the mean, mode and median of a data set and explain in writing, how they are affected by a change in the data set.**

#### Activities:

*Teacher note:* Catch It! – Embedded Science Task can be used to measure reaction time and to record and analyze data.

1. Students describe data using three measures of central tendency (mean, median, mode). MC 7-1. Complete H.O.T. #20 and WiM #21 page 281. Note: Problems in Teacher manual have different numbering than those in Student text on page 281.

*Teacher notes:*

- Use different color interlocking or Unifix cubes to represent the number of family members in each child's family. Working in groups of five, have children decide how to find the mean number of family members for their group. Have each group share their methods and results with the whole class..
2. Students review interpreting pictographs. See appendix for samples
3. Students construct and interpret line plots. MC 7-3.
4. Students write a survey question that has a numerical answer, collect data, and organize it using a line plot. They use the line plot to make conclusions about their data. Complete H.O.T. #18 page 287.

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5. Students construct and interpret frequency tables. MC 7-4. Complete H.O.T. #18 and WiM #19 page 292.
6. Students choose appropriate scales and intervals for a set of data. MC 7-5. Complete H.O.T. #21 page 297.
7. Students construct and interpret bar (horizontal and vertical) and double bar graphs. MC 7-6. Complete H.O.T. #24-25 page 303.  
See Ledyard CMT samples 19A, 19B, 20A, 20B  
*Teacher note:* OR you may use Impact T71-72 Creating Charts to Organize Data
8. Students construct and interpret line and double line graphs. MC 7-7. Complete H.O.T. #21 problems on page 309.  
*Teacher note:*
  - OR you may use Impact T74 Making Predictions from Data
  - Optional activity: Billy's Bath (see appendix) students analyze a line graph and write a story to go with the data.
9. Students interpret simple circle graphs. See CMT Coach pgs 203-207  
*Teacher notes:*
  - see Impact T76 Find a Graph – analyze data in circle graph
  - see appendix for other circle graphs
10. (Introduce) Students construct and interpret stem and leaf plots. *Groundworks* pgs. 8-15 see appendix  
*Teacher note:* scatterplots will be introduced in grade 6
11. Students choose appropriate graphical representations for a data set. MC 7-8. Complete H.O.T. #14-16 and WiM #17 page 317.

Complete **problem solving activities** 7-2 (choose best strategy), 7-9 (make a graph).

### Post assessment Unit 3

#### Electronic Resources:

<http://standards.nctm.org/document/eexamples/chap5/5.4/index.htm> Accessing and Investigating Data involving census

<http://mathforum.org/workshops/usi/dataproject/> Exploring Data is broken into K-4 and 4-8 lessons

<http://www.learnnc.org/lessons/NancySaunders5232002144> Plotting with Pennies – interactive, deals with money, decimals and graphs

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### UNIT 3 VOCABULARY

Bar graph  
Circle graph  
Data set  
Frequency table  
Interval  
Line plot  
Mean  
Median  
Mode  
Outlier  
Pictograph  
Range  
Stem and leaf plot  
Survey

### CMT CONNECTIONS

- 19A. Identify correct information from tables, bar graphs, pictographs and charts.
- 19B. Create bar graphs and pictographs from data in tables and charts.
- 20A. Draw reasonable conclusions from data in tables, bar graphs, pictographs, circle graphs and charts.
- 20B. State a conclusion and explain why a claim is or is not reasonable, based on the data.
- 24A. Solve logic, counting and classification problems involving the organization of data.
- 24B. Sort or classify objects, and draw logical conclusions from data including Venn diagrams and transitive reasoning questions.
- 25A. Solve extended numerical and statistical problems.

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### Unit 4: Working with fractions

Pacing: 33 days

In this unit, students continue to develop their fraction sense. They also develop an understanding of and fluency with addition and subtraction of fractions and mixed numbers.

#### Pre-Assessment for Unit 4

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

2.1.5 Classify numbers as prime, composite or perfect squares and identify factor pairs using rectangular arrays.

**2.1.6 Represent equivalent fractions, decimals, ratios and percents using models, pictures, number patterns and common factors.**

**2.1.7 Choose and use benchmarks to approximate locations, of fractions, mixed numbers and decimals, on number lines and coordinate grids.**

2.1.9 Use models and pictures to identify and compare ratios and represent ratios in equivalent fraction and decimal forms.

**2.2.15 Find fractional parts of a set by using estimation, counting, grouping of objects, number patterns, equivalent ratios and division.**

**2.2.16 Add and subtract fractions, decimals and mixed numbers using a variety of strategies, e.g., models, mental math, equivalence and substitution:  $\frac{1}{2} + \frac{3}{4}$  can also be solved using  $0.5 + 0.75$ .**

#### Activities:

1. Using area models, words and symbols, students represent division using fractions. MC 8-1. Complete H.O.T. #14,15 page 335.

See Ledyard CMT samples 2B, 2C

*Teacher note:* as an optional activity, see appendix for Fractional Parts of a Group

2. Using area models, students write improper fractions as mixed numbers. MC 8-2. Complete H.O.T. #36-37 page 341.

3. Using area models, students write mixed numbers as improper fractions. MC 8-4. Complete H.O.T. #31-33 page 348. See Ledyard CMT samples 3A, 3B

4. Students locate and compare fractions and mixed numbers on a number line. MC 8-5. Complete H.O.T. #34 page 353.

See Ledyard CMT samples 4B, 4D, 4G

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5. Students use the benchmarks of 0,  $\frac{1}{2}$  and 1 and number lines to round fractions. MC 8-6. Complete H.O.T. #33, 34 page 358. See Ledyard CMT samples 11A

*Teacher note:* Use a number line as a guide in estimating decimals. Write a four digit decimal number on the board, e.g. 4.0832. Choose a number which represents something that might be interesting to the children (size of an insect, price of gold or silver). Ask questions such as:

- Is this closer to four or five?
- Is it closer to 4.0 or 4.1?
- Is it closer to 4.08 or 4.09?
- Is it closer to 4.083 or 4.084?

6. Students identify common factors of a set of whole numbers. MC 9-1. Complete H.O.T. #29 page 375.

7. (Introduce) Students find prime and composite numbers and perfect squares. MC 9-2. Complete WiM #37 page 381.

*Teacher note:* Provide children with opportunities to configure arrays using different materials such as square tiles, cubes, or paper squares. Have them record the arrays and factor pairs on 11 x 18 paper so that the numbers can be classified as prime, composite, etc. For example, 29 is prime because it can only be configured in a 1 x 29 rectangle which yields one factor pair. 4 is a perfect square, because it has a factor pair that is the same, 2 x 2.

8. Using models, pictures and knowledge of common factors, students write a fraction that is equivalent to a given fraction. MC 9-3. Complete H.O.T. #32 and WiM #34 page 384.

9. Students write equivalent fractions in simplest form. MC 9-4. Complete H.O.T. #32 and WiM #33 page 388.

*Teacher note:* using the TI-Math Explorer or TI-15 calculator, have students use the  key to check fractions in simplest form.

See Ledyard CMT samples 3A, 3B

10. Using decimal squares, students relate fractions to decimals. MC 9-5. Complete WiM #30 page 393.

*Teacher note:* the following optional activities may be used

- Impact T44D Distance from School
- Impact T45-46 Equal Decimals and Fractions
- Impact T49-50 Money: decimals and fractions

11. Students use models and pictures to identify and compare ratios and represent ratios in equivalent fraction and decimal forms.

*Teacher note:* Give children opportunities to use different colored interlocking cubes to build and compare ratios. For example, use five cubes, two blue and three yellow so that students can see that the ratio of blue to yellow is 2 to 3. Have children build another set of five interlocking cubes to see that a ratio of 4 to 6 is equivalent. Children can record the ratio by coloring a column of five squares the appropriate colors on a hundredth square so that they can see the decimal equivalent.

12. Students identify common multiples of a set of whole numbers. MC 9-7. Complete H.O.T. #32 page 399.

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13. Students compare fractions using area models and common denominators. MC 9-9. Complete H.O.T. #32 page 407.
14. Using area models, then algorithms, students add like fractions. MC 10-1. Complete WiM #29 page 425.
15. Using area models, then algorithms, students subtract like fractions. MC 10-2. Complete H.O.T. #25-27 and WiM #28 page 431.
16. Using area models, then algorithms, students add unlike fractions. MC 10-3. Complete H.O.T. #32 and WiM #33 page 436.  
*Teacher note:* Optional activity: see appendix for Make a One by Marilyn Burns
17. Using area models, then algorithms, students subtract unlike fractions. MC 10-4. Complete H.O.T. #28, 29 page 441.
18. Using rounding, students estimate sums and differences of mixed numbers. MC 10-6. Complete H.O.T. #28-30 page 446.
19. Using area models, then algorithms, students add mixed numbers. MC 10-7. Complete H.O.T. #24 and WiM #25 page 450.
20. Using area models, then algorithms, students subtract mixed numbers. MC 10-8. Complete H.O.T. #31 page 454. See Ledyard CMT samples 8A

Complete **problem solving activities** 8-3 (use logical reasoning), 8-7 (choose the best strategy), 9-6 (look for a pattern), 9-8 (choose the best strategy), 10-5 (determine the reasonableness of an answer), 10-9 (choose the best strategy).

*Teacher notes:*

- Students should work with Venn diagrams to solve problems. More examples can be found in the appendix.
- more samples of the above strategies can be found in *The Problem Solver Grade 5*
- Post CMT: Sale Price (extended task) see appendix

### Post assessment Unit 4

#### Electronic Resources:

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=12> General resource for number and proportional reasoning, interactive

<http://illuminations.nctm.org/ActivityDetail.aspx?ID=80> Equivalent Fractions using diagrams and pictures, interactive

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### UNIT 4 VOCABULARY

Common factor  
Common multiple  
Demonimator  
Equivalent fractions  
Factor  
Fraction  
Greatest common factor  
Improper fraction  
Least common multiple  
Like fractions  
Mixed numbers  
Multiple  
Numerator  
Simplest form  
Unlike fraction

### CMT CONNECTIONS

- 2B.** Relate fractions and mixed numbers to pictures and vice versa.
- 2C.** Identify and/or shade fractional parts of regions, sets or mixed numbers in pictures.
- 3A.** Rename equivalent fractions.
- 3B.** Rename equivalent mixed numbers as improper fractions and vice versa.
- 4B.** Order mixed numbers, fractions and decimals.
- 4D.** Describe magnitude of mixed numbers and fractions.
- 4G.** Locate points (fractions, decimals and whole numbers) on number lines and scales

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### Unit 5: Measurement

**Pacing:** pre CMT 9 days, post CMT 5 days – see guide

In this unit, students use a variety of tools to measure length, weight, mass, capacity, time, and temperature using both customary and metric units.

#### Pre-Assessment for Unit 5

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

- 2.1.4 Investigate negative integers (values less than zero) using place value models, diagrams and number lines and represent negative integers in practical applications, e.g. temperatures, money and locations below sea level.
- 3.3.7 **Use calendars and clocks to plan and sequence events and to solve problems involving the conversion of measures of time and elapsed time using days, hours, minutes and seconds.**
- 3.3.8 **Estimate and measure to solve a variety of problems that involve angles, length, area, weight, mass, temperature, capacity and volume in either metric or customary units explain the reasoning used orally and in writing.**
- 3.3.9 **Solve length problems involving conversions of measure within the customary (inches, feet, yards and miles) or metric systems (millimeters, centimeters, meters and kilometers).**

#### Activities:

##### *Teacher notes:*

- Students should be able to describe what measureable attributes are associated with different objects and choose the appropriate tool to measure. For example, for an aquarium, one could measure length and width (using a ruler) and capacity (using gallons).
- Students should be actively involved in measuring.
- Students need to know how to estimate and measure attributes. **Only conversion for units for length are required on the CMT.**
- Developing perceptual anchors: A perceptual anchor is a quantity whose size is readily perceived in different settings. For example, a loaf of bread weighs about a pound, a drop of water is about 1 milliliter, the width of a doorway is about a yard, etc. Students need to develop these anchors as they work with estimation of measures.

1. Using customary units, students choose an appropriate unit for measuring length and convert units of length. MC 11-1. Complete H.O.T. #29 and WiM #31 page 480.

*Teacher note:* optional activity Impact T78D Grandpa's Knitting

2. Students choose appropriate tools and customary units to measure weight. MC 11-3. Complete WiM #28 page 486.

*Teacher note:* post CMT, students convert units of weight.

3. Students choose appropriate tools and customary units to measure capacity. MC 11-4. Complete WiM # 30 page 490.

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*Teacher note:* post CMT, students convert units of capacity.

4. Students convert units of time. MC 11-5. Complete H.O.T. #35-36 and WiM #37 page 495. See Ledyard CMT samples 14B
5. Students measure elapsed time. MC 11-7. Complete H.O.T. #24 and WiM #26 page 502. See Ledyard CMT samples 14A
6. Using metric units, students choose an appropriate unit for measuring length and convert units of length. MC 12-1. Complete H.O.T. #36-38 page 521. See Ledyard CMT samples 16A,16D
7. Students choose appropriate tools and units to measure mass. MC 12-3. Complete WiM #30 page 526.  
*Teacher note:* post CMT, students convert units of mass.
8. Students choose appropriate tools and metric units to measure capacity. MC 12-4. Complete H.O.T. #27 page 529. See Ledyard CMT samples 16C  
*Teacher note:* post CMT, students convert units of capacity.
9. Students use integers to represent real life situations and graph them on a number line. MC 12-5. Complete H.O.T. #26 page 535.
10. Students measure temperature in degrees Fahrenheit and Celsius. MC 12-6. Complete H.O.T. #41 page 541.

Complete **problem solving activities** 11-2 (draw a diagram), 11-6 (choose the best strategy), 12-2 (determine the reasonableness of an answer), 12-7 (choose the best strategy).

*Teacher note:* more samples can be found in *The Problem Solver Grade 5*

### Post assessment Unit 5

#### Electronic resources:

*National Library of Virtual Manipulatives* [http://nlvm.usu.edu/en/nav/grade\\_g\\_1.html](http://nlvm.usu.edu/en/nav/grade_g_1.html) General grade 3-5 site, interactive

*Math Forum* <http://mathforum.org/paths/fractions/e.fraclessons.html> General site for parents, students and teachers

*Illuminations* -<http://illuminations.nctm.org/> Excellent interactive site, good for students and teachers, lesson plans available

## Grade 5 Mathematics

### UNIT 5 VOCABULARY

Capacity  
Centimeter  
Cup  
Customary units  
Degrees  
Elapsed time  
Fluid ounce  
Foot  
Gallon  
Gram  
Inch  
Integer  
Kilogram  
Kilometer  
Length  
Liter  
Mass  
Meter  
Metric units  
Mile  
Ounce  
Pint  
Pound  
Quart  
Ton  
Weight  
Yard

### CMT CONNECTIONS

- 14A. Solve problems involving elapsed time (a.m. and p.m.).
- 14B. Solve problems involving conversions of measures of time (minutes, hours and days).
- 15A. Estimate lengths and areas.
- 16A. Measure lengths to the nearest quarter-inch or half-centimeter.
- 16C. Identify appropriate customary or metric units of measure (length, capacity and mass) for a given situation.
- 16D. Solve problems involving conversions of measures of length.
- 25A. Solve extended numerical and statistical problems.

## Grade 5 Mathematics

### Unit 6: Geometry

**Pacing:** pre-CMT 9 days, post-CMT 20 days

In this unit, students identify, describe, compare and classify geometric figures. They then measure perimeter, area and volume of geometric figures.

#### Pre-Assessment for Unit 6

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

3.1.1 Represent the surface of three-dimensional solids using two-dimensional nets.

**3.1.2 Develop formulas for finding the perimeter and area of squares, rectangles and triangles and use them to solve problems.**

**3.1.3 Use the attributes of parallel sides, perpendicular sides, congruent sides/angles, number and length of sides or faces and number and kinds of angles (right, acute or obtuse) to describe, classify and sort polygons and solids (cube, prism, pyramid and sphere).**

3.1.4 Make and test conjectures about polygons using geometric relationships

**3.3.8 Estimate and measure to solve a variety of problems that involve angles, length, area, weight, mass, temperature, capacity and volume in either metric or customary units explain the reasoning used orally and in writing.**

**3.3.9 Use cubic inch or cubic centimeter models to find the volume of rectangular solids.**

#### Activities:

1. Students connect vocabulary associated with geometry to models and drawings. MC 13-1. Complete H.O.T. #25-26 and WiM #27 page 560. *Teacher note:* include the terms lines of symmetry and congruent. See Ledyard CMT samples 18A, 18B, 18C

2. Students identify angles (acute, obtuse, right) and use attributes to describe and classify triangles. MC pgs.564-565, MC 13-3. Complete H.O.T. #22-23 page 569.

3. Students use attributes to describe and classify quadrilaterals. MC 13-4. Complete H.O.T. #27-28 page 573. See Ledyard CMT samples 17A, 17B

4. Students develop formula for finding the perimeter of geometric figures and use it to solve problems. MC pg. 607, MC 14-1. Complete H.O.T. #20 page 611.

5. Students find and estimate areas of figures by counting squares. MC 14-2. Complete WiM #15 page 615. See Ledyard CMT samples 15A, 16B

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6. Students develop formula for finding the area of rectangles and use it to solve problems. MC 14-3. Complete H.O.T. #27 page 619.

*Teacher notes:*

- For estimation of area, see Decks and Decks of Cards (see appendix)
- optional activity Impact T66 Make a Furniture Floor Plan (post CMT)

7. (Introduce) Students use models to find the areas of parallelograms. MC pg. 620-621, MC 14-3.

8. Students use attributes to describe and classify 3D figures. MC 14-4. Complete H.O.T. #15-17 page 626.

9. Students represent the surface of 3D solids using 2D nets. See appendix lesson from gr. 4 MC, also see Impact pg. 89

Teacher note: Begin with familiar three-dimensional objects such as empty cereal boxes or food containers. Provide numerous opportunities for children to investigate the relationship between the solid and the net which can be created by completely opening the box so that it can be laid flat on a desk or table. Have children open a cylindrical container such as an oatmeal box so that they can see the shapes made by the resulting net (circles and rectangle).

10. (Introduce) Students develop formula for finding the volume of rectangular prisms and use it to solve problems. MC pg. 630, MC 14-6.

11. Students select and use appropriate units and formulas to measure length, perimeter, area and volume. MC 14-8. Complete H.O.T. #13 and WiM #14 page 647.

*Teacher notes:*

- as an extension, see Impact T98D Tank (students may use a calculator)
- Optional activity Impact T106 Designing a Fish Aquarium

### Post assessment Unit 6

Complete **problem solving activities** 13-2 (logical reasoning), 13-5 (choose the best strategy), 14-5 (make a model), 14-9 (choose the best strategy)

*Teacher notes:*

- Integrated Understanding opportunities: see appendix for Value Designs and Garden Fence.
- more samples can be found in *The Problem Solver Grade 5 and Problem Solving Experiences Grade 5*

### Electronic Resources:

*National Library of Virtual Manipulatives* [http://nlvm.usu.edu/en/nav/grade\\_g\\_1.html](http://nlvm.usu.edu/en/nav/grade_g_1.html) General grade 3-5 site, interactive

*Math Forum* <http://mathforum.org/paths/fractions/e.fraclessons.html> General site for parents, students and teachers

*Illuminations* -<http://illuminations.nctm.org/> Excellent interactive site, good for students and teachers, lesson plans available

Shape Explorer. Exploring Area: <http://www.shodor.org/interactivate/lessons/area.html>

## Grade 5 Mathematics

### UNIT 6 VOCABULARY

Acute angle  
Angle  
Congruent  
Degree  
Intersecting lines  
Line  
Line segment  
Nets  
Obtuse angle  
Parallel lines  
parallelogram  
Perpendicular lines  
Plane  
Point  
Quadrilateral  
Ray  
Rectangle  
Rhombus  
Right angle  
Square  
Trapezoid  
Triangle  
Vertex

### CMT CONNECTIONS

- 15A. Estimate lengths and areas.
- 16B. Measure and determine perimeters and areas.
- 17A. Identify, describe and/or classify two-dimensional geometric shapes and figures.
- 17B. Draw, describe and/or classify two-dimensional geometric shapes and figures.
- 18A. Identify lines of symmetry.
- 18B. Draw lines of symmetry.
- 18C. Identify congruent figures.
- 18D. Locate points on grids
- 25A. Solve extended numerical and statistical problems.

## Grade 5 Mathematics

### Unit 7: Probability

**Pacing:** pre-CMT 8days, post-CMT 10 days

In this unit, students develop and apply concepts of probability. They express probabilities in several ways and use probabilities to make predictions.

#### Pre-Assessment for Unit 7

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

2.2.17 Use ratios and proportions to solve practical problems, e.g., interpreting scale drawings and maps and determining the probability of an event.

**4.3.5 Design and conduct probability experiments and simple games of chance to test predictions about outcomes and fairness.**

**4.3.6 Determine and describe possible outcomes and express the likelihood of events as a fraction.**

**4.3.7 Determine and describe possible outcomes using permutations, where order does matter, e.g., when there is a choice of vanilla (V), chocolate (C) or strawberry (S) ice cream for a three-scoop cone, there are two possible ways to have the chocolate scoop on top CVS or CSV.**

#### Activities:

1. Students determine the likelihood of an event using the terms certain, impossible and equally likely. MC 15-1.

Complete H.O.T. #21page 663.

2. Students conduct a probability experiment to make and test a prediction. MC pgs. 666-667. See Ledyard CMT samples 21A, 21B

*Teacher note:* for work with spinners, see *Groundworks* pgs. 72-79 see appendix

3. Students express probability as a fraction. MC 15-2. Complete H.O.T. #29-30 page 671.

*Teacher note:* Skittles activity: [UpElemStats/Skittles-activity.doc](#) or see appendix

4. Students determine and describe possible outcomes using combinations (where order does not matter.) MC 15-4.

Complete H.O.T. #20 page 680.

5. (Introduce) Students determine and describe possible outcomes using permutations (where order does matter)

*Teacher note:* see appendix for sample Permutation Problems.

Complete **problem solving activities** 15-3 (make an organized list), 15-5 (choose the best strategy)

*Teacher note:* more samples can be found in *The Problem Solver Grade 5*

#### Post assessment Unit 7

## Grade 5 Mathematics

### UNIT 7 VOCABULARY

Certain  
Equally likely  
Impossible  
Outcome  
Probability

### CMT CONNECTIONS

24A. Solve logic, counting and classification problems involving the organization of data.

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

## Grade 5 Mathematics

### Unit 8: Algebraic Thinking

**Pacing:** pre-CMT 5 days, post-CMT 10 days

In this unit, students represent, extend and compare patterns using words, tables and graphs. They evaluate expressions and solve equations.

#### Pre-Assessment for Unit 8

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

**1.1.1 Represent, extend and compare geometric and numeric patterns using words, tables, graphs and equations**

**1.1.2 Analyze patterns and data to make generalizations, make predictions and to identify trends.**

**1.2.3 Represent and describe mathematical relationships using variables or symbols in expressions, equations and inequalities**

1.2.4 Describe how a change in one variable relates to a change in a second variable in context. For example: If a recipe requires two cups of flour for eight servings, the flour must be doubled for 16 servings or increased by one-half for 12 servings.

**1.3.5 Replace variables or symbols in algebraic expressions with given values and evaluate or simplify the expression, e.g., If  $\square = 5$ , find the value of  $4x \square + 7$ .**

**1.3.6 Model, write and solve one-step equations by using appropriate concrete materials that model equivalence, e.g., If  $4x \square = 36$ , then  $\square$  equals 9.**

**3.2.5 Use an  $x, y$  coordinate system to plot points, to estimate the distance between points and to determine the horizontal or vertical distance between two points.**

#### Activities:

1. Using models, words and symbols, students write and evaluate addition expressions. MC 5-1. Complete H.O.T. #23 and WiM #24 page 195.  
*Teacher note:* OR you may use Impact A-1 pgs. 3-4 Understanding Expressions

2. Using models, words and symbols, students write and evaluate multiplication expressions. MC 5-3. Complete H.O.T. #28-30 and WiM # 31 page 200.

*Teacher note:* OR you may use Impact A-2 pgs. 5-6 Multiplication and Division Expressions

3. Using words and symbols, students evaluate algebraic expressions involving subtraction and division. MC 5-4. Complete H.O.T. #34-35 and WiM # 36 page 204.

*Teacher notes:*

- also use balance scales and the concept of balance when working with equations.
- Optional activity: Impact T-10 Make an Expression Card Game

## Grade 5 Mathematics

4. Students work with number patterns using words and tables (function tables). MC 5-6. Complete H.O.T. #13, 14 page 212.

*Teacher notes:*

- OR Impact T19-20 Finding the Function
  - additional number patterns can be found in COACH pgs. 235-238. Open-ended questions where students write to explain the rule for continuing the pattern, such as the one found on pg. 238, should be used.
5. (Introduce) Students are introduced to the order of operations. MC 5-7. Complete H.O.T. #18-19 and WiM #20 page 221.
6. Using models and real world examples, students write and solve addition and subtraction equations. MC 6-1. Complete H.O.T. #28-29 and WiM #30 page 239.
7. Using models and real world examples, students write and solve multiplication equations. MC 6-2. Complete H.O.T. #27-28 and WiM #29 page 247. See Ledyard CMT samples 23A
8. Students locate points on a co-ordinate grid. MC 6-4. Complete WiM #30 page 252. See Ledyard CMT samples 18D  
Teacher note: For practice naming and locating points on a grid, students can play games such as “Where’s My Line?” found on MC pg. 263.
9. (Introduce) Students graph points from a function table and analyze the patterns to make predictions. MC 6-5.  
Complete H.O.T. #26 page 257.
10. Students represent and extend geometric patterns. See Ledyard CMT samples 22A, 22B COACH 230, IMPACT A5-6

Complete **problem solving activities** 5-2 (solve a simpler problem), 5-5 (choose best strategy), 6-3 (make a table), 6-7 (choose best strategy),  
See Ledyard CMT samples 24A, 24B, 25A

*Teacher notes:*

- more samples can be found in *The Problem Solver Grade 5 and Problem Solving Experiences Grade 5*.
- Optional activity: see appendix for *The Hundredth Block*

### Post assessment Unit 8

## Grade 5 Mathematics

### UNIT 8 VOCABULARY

Coordinate grid  
Equation  
Expression  
Function table  
Graph  
Inequality  
Ordered pair  
Order of operations  
Origin  
Patterns  
Solution  
Solve  
Variable  
x-coordinate  
y-coordinate

### CMT CONNECTIONS

- 5 A. Identify the appropriate operation or number sentence to solve a story problem.
- 5B. Write story problems from multiplication or division number sentences, using one- and two-digit numbers.
- 19A. Identify correct information from tables, bar graphs, pictographs and charts.
- 20 A. Draw reasonable conclusions from data in tables, bar graphs, pictographs, circle graphs and charts
- 22A. Extend or complete patterns, or identify rules using numbers and attributes.
- 22B. Extend or complete patterns and state rules using numbers and attributes.
- 23 A. Solve simple one-step algebraic equations involving addition, subtraction, multiplication and fact families.
- 24A. Solve logic, counting and classification problems involving the organization of data.
- 25A. Solve extended numerical and statistical problems.