

Grade 7 Pre-Algebra

Overview:

This curriculum is aligned to the 2005 Connecticut Mathematics Curriculum Frameworks and references the CMT 4th. Generation. It consists of 6 units, 4 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)

Grade 7 Pre-Algebra

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 predictions
- 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 (8) refers to collecting, organizing and displaying data. The .2 refers to the grade level expectation and will describe specific graphs that will be used and the (8) refers to an eighth grade expectation.

Grade 7 Pre-Algebra

Unit 1: Algebra and Integers This unit builds a foundation of basic understandings of numbers, operations and algebraic thinking and uses these understandings to solve problems and justify solutions.

Pre-Assessment for Unit 1

Grade level expectations: The student will be able to:

1.1.1 (8) Generalize the relationships in patterns in a variety of ways including recursive and explicit descriptions;

e.g., the pattern 1, 4, 7, 10... is represented as follows: recursively as “add 3 to the previous number”, explicitly as $3n + 1$

Activities:

- a. Students use pictorial patterns to develop an understanding of recursive and explicit representations of functions. (see appendix for lesson: Recursive vs. Explicit Representations)

Support using PA pgs. 26-31 (geometric patterns and number sequences)

Teacher note: explicit descriptions will be addressed during 1.3.9

Support using COACH Lesson 35 Rules for Extending Patterns pgs. 236-240

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

2.2.8(7) 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.**

Teacher note: Students may need a quick review of exponents. This can be done using examples of order of operations that contain exponents. See appendix.

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
- e. Students describe data by writing an equation. MS Raising Funds pgs. 190-191

Grade 7 Pre-Algebra

Support using PA pgs. 32-36 (numbers and expressions), pgs. 37-42 (variables and expressions), pgs 43-47 (properties).

Teacher note: The Distributive Property will be reviewed and applied when working with equations.

Support using COACH:

Lesson 1 Place Value of Whole Numbers and Decimals pgs. 42-46

Lesson 9 Adding and Subtracting Whole Numbers and Decimals pgs. 83-86

Lesson 10 Multiplying and Dividing whole Numbers and Decimals pgs. 87-91

Lesson 36 Order of Operations pgs. 241-244

Lesson 38 Representing Situations with Algebraic Expressions pgs. 250-253

Lesson 39 Evaluating Expressions and Using Formulas pgs. 254-259

Support using *Step by Step with Decimals*

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

Activities:

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

Support using PA pgs. 49-53 (variables and equations)

Use PA pgs. 54-60 (ordered pairs and relations) for Problem of the Day mini-lesson.

4.1.1 (8) Collect, organize and display data using an appropriate representation (including scatter plots) based on the size and type of data set and purpose for its use.

4.2.5(8) Make predictions from scatter plots by using or estimating a line-of-best-fit.

Activities:

a. Students construct and analyze scatterplots. PA pgs. 61-66

Teacher note: Students work with data that have a positive or negative association. One example would be to measure their height and hand span and graph the data. Determine the line of best fit and make predictions for their favorite actor, athlete, friends or family members. A virtual manipulative of this activity can be found at:

http://nlvm.usu.edu/en/nav/frames_asid_144_g_3_t_5.html?open=activities

NOTE: When typing in website, use _ for spaces.

Support using COACH

Lesson 27 Identifying and Interpreting Data from Bar and Line Graphs pgs. 192-196

Lesson 28 Stem-and-Leaf Plots pgs. 197-200

Grade 7 Pre-Algebra

2.2.17(7) Develop an understanding of absolute value using a number line while solving problems involving distance.

- a. Students create number lines with different scales for the board or overhead. Give students various integers to place on the number lines. **Teacher note:** when locating positive and negative numbers on number lines, use both horizontal and vertical formats.

Support using PA pgs. 78-83 (integers and absolute value)

Support using COACH

Lesson 5 Ordering Whole Numbers and Decimals pgs. 61-64

Lesson 8 Locating Numbers on a Number Line pgs. 76-79

2.2.16(7) 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. 96-97

- b. Students predict results of integer addition and subtraction. MS Counterexamples and Cube Combinations pgs. 98-99
Support using PA pgs. 84-91 (adding integers), pgs. 92-97 (subtracting integers)

- c. Students explore integer multiplication and division. MS More Cases to Consider pgs. 100-101
Support using PA pgs. 99-104 (multiplying integers), pgs. 105-110 (dividing integers)

- d. Students plot point on a coordinate plane (all 4 quadrants) MS Seeing Things Graphically pg. 194 and homework pg. 216
Support using PA pgs. 111-115 as Problem of the Day mini-lesson.

- e. Students use the Distributive Property to write equivalent numeric expressions and equivalent algebraic expressions
Support using PA pgs. 124-128
Use PA pgs. 129-133 (simplifying algebraic expressions) for Problem of the Day mini-lesson.

Support using COACH Lesson 12 Adding Integers pgs. 98-101

Grade 7 Pre-Algebra

1.3.9(7) 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.

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

b. 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

Support with Groundworks in Algebra Grade 7

Support using PA pgs. 136-140 (solving equations by adding and subtracting), pgs. 141-145 (solving equations by multiplying and dividing), pgs. 147-152 (solving two-step equations), pgs. 153-157 (writing two-step equations), pgs. 158-161 (sequences and equations)

Use PA pgs. 162-168 (using formulas) for Problem of the Day mini-lesson.

Support using COACH Lesson 37 Solving One-step and Two-step Equations pgs 245-249

Post Test Unit 1

Grade 7 Pre-Algebra

UNIT 1 VOCABULARY

Absolute value	x-axis
Additive inverse	x-coordinate
Algebra	y-axis
Algebraic expression	y-coordinate
Area	
Arithmetic sequence	
Coefficient	
Conjecture	
Constant	
Coordinate	
Coordinate plane	
Counterexample	
Defining variable	
Equation	
Equivalent equation	
Equivalent expression	
Formula	
Inequality	
Integers	
Inverse operations	
Like terms	
Numerical expression	
Open sentence	
Opposites	
Ordered pair	
Order of operations	
Origin	
Perimeter	
Properties	
Quadrants	
Scatter plot	
Sequence	
Simplest form	
Simplify	
Solution	
Term	
Variable	

CMT CONNECTION

1.1.1(8)

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

1.2.4(7)

23C Evaluate expressions or solve equations and use formulas

23D Represent situations with algebraic expressions

23E Write an expression to represent a situation

2.2.8(7)

23B Use order of operations

1.3.8(7)

25A Solve extended numerical, statistical and spatial problems

4.1.1(8)

19A Identify correct information from tables, graphs and charts

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

2.1.1(8)

4A Order whole numbers and decimals

1.3.9(7)

23A Solve simple 1- or 2-step algebraic equations

2.2.9(7)

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.

Grade 7 Pre-Algebra

Unit 2: Working with Rational Numbers. In this unit, students work with rational numbers, learn different ways of representing numbers, and solve problems using appropriate operations. They also find measures of central tendency using sets of data.

Pre-Assessment for Unit 2

Teacher note: students may need a review/ mini-lesson through Problem of the Day, on the following topics before beginning this unit. The extent of this review will be based on the results of the pre-assessment Unit 2.

- Prime factorization (PA pgs. 186-190)
- Greatest Common Factor (PA pgs. 191-195)
- Simplifying fractions (PA pgs. 196-200)

Grade level expectations: The student will be able to:

2.1.3 (8) Read and represent whole numbers and those between zero and one in scientific notation (and vice versa) and compare their magnitudes.

Activities:

a. Students work with scientific notation and explore a calculator's limits. MS(8) The Very Large and the Very Small pgs. 300-301

Technology: This site provides practice problems for scientific notation and has a self-checking feature.

www.edinformatics.com/math_science/scinota.htm NOTE: When typing in website, use _ for spaces.

Support using PA pgs. 214-218 (scientific notation)

Support using COACH Lesson 2 Scientific Notation pgs. 47-50

2.1.1(8) Compare and order rational and common irrational numbers; e.g., -5 , $\frac{1}{16}$, $-4\frac{1}{2}$, $\sqrt{2}$, π ; and locate them on number lines, scales and coordinate grids.

2.1.4(8) Represent fractions, decimals, mixed numbers and percentages in equivalent forms.

Activities:

a. Students practice using equivalent forms by playing a matching game. (see appendix)

Support using PA pgs. 228-233 (writing fractions as decimals), pgs. 234-238 (rational numbers)

Support using COACH

Lesson 3 Models for Fractions, Decimals, and Percents pgs. 51-55

Lesson 6 Ordering Fractions and Decimals pgs. 67-71

Lesson 30 Probability pgs. 206-210

Lesson 31 Predictions Based on Experimental Probability pgs. 211-214

Lesson 32 Arrangements pgs. 215-218

Grade 7 Pre-Algebra

2.2.9 (7) 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.

2.2.5(8) Compute (addition, subtraction, multiplication, division) and solve problems with positive and negative rational numbers.

Teacher note: This GLE is predominantly to ensure fluency in computation. Problems are presented in context throughout the text.

2.2.8(8) Estimate reasonable answers and solve problems in context involving rational and common irrational numbers, ratios and percentages (including percentage of increase and decrease) **and justify solutions in writing.**

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 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 using PA pgs. 239-244 (multiplying rational numbers), pgs. 245-249 (dividing rational numbers), pgs. 250-254 (adding and subtracting like fractions), pgs. 257-261 (least common multiple), pgs. 263-267 (adding and subtracting unlike fractions)

Support with: *Step-by-Step for Fractions*

Pizzazz for applications

CMT COACH

Lesson 7 Rounding Whole Numbers, Decimals and Fractions pgs. 72-75

Lesson 11 Adding, Subtracting, and Multiplying Fractions and Mixed Numbers pgs. 92-96

Lesson 13 Identifying Sentences to Match Story Problems pgs. 102-106

Lesson 14 Solving One-Step and Multi-Step Story Problems pgs. 107-110

Lesson 15 Estimation pgs. 113-116

Lesson 16 Reasonable Estimates pgs. 117-121

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.

Grade 7 Pre-Algebra

4.2.4(7) Find, use and interpret measures of central tendency and spread, including mean, median, mode, range and outliers.

4.2.5(7) Compare two sets of data based on their spread and measures of central tendency.

Activities:

- a. Students choose the appropriate measure of central tendency for a situation. PA pgs. 274-279
- b. Students compare 2 sets of data based on their measures of central tendency. See appendix Basketball Problem and Pizza Problem.

Support using COACH

Lesson 29 Mean, Median, Mode and Range pgs. 201-204

Lesson 33 Solving Problems with Venn Diagrams pgs. 220-224

Lesson 34 Using Data for Forecasting pgs. 225-229

Teacher note: for extended problem solving experiences (integrated understanding), use COACH Lesson 40 Solving Extended Statistical and Spatial Problems pgs. 264-267

Assessment: Post-Assessment for Unit 2

Grade 7 Pre-Algebra

UNIT 2 VOCABULARY

Bar notation
Base
Common multiples
Composite number
Exponent
Factor
Greatest common factor
Least common denominator
Least common multiple
Mean
Measures of central tendency
Median
Mixed number
Mode
Multiple
Multiplicative inverse
Power
Prime factorization
Prime number
Range
Rational number
Reciprocals
Repeating decimal
Scientific notation
Standard form
Terminating decimal

Grade 7 Pre-Algebra

CMT CONNECTIONS

2.1.3(8)

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.

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

2.1.1(8)

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.

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

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

2.1.4(8)

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.

2.2.9(7)

5A. Identify the appropriate operation or equation to solve a story problem.

5B. Write a story problem from an equation.

8A. Add and subtract fractions and mixed numbers with reasonable and appropriate denominators.

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

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.

2.2.5(8)

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.

2.2.8(8)

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

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.

4.2.4(7)

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.

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

Grade 7 Pre-Algebra

Unit 3: Ratio, Proportion, Percent. Students solve a variety of problems that involve ratios and proportions and connect the ideas to percentage problems. Students use the appropriate form of the number for given situations.

Pre-Assessment for Unit 3

Grade level expectations: The student will be able to:

2.2.10(7) Write ratios and proportions to solve problems in context involving rates, scale factors and percentages.

Activities:

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

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

Support using PA pgs. 292-296 (ratios and rates), pgs 302-307 (using proportions, include Capture-Recapture lab), pgs. 308-312 (scale drawings and models)

Support using COACH Lesson 17 Ratios and Proportions pgs. 122-126

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>.

2.1.4(8) Represent fractions, decimals, mixed numbers and percentages in equivalent forms.

Activities:

- a. Students express percents as fractions and decimals. PA pgs. 313-318

Support using COACH Lesson 4 Renaming Fractions as Decimals and Percents pgs. 56-60

Grade 7 Pre-Algebra

2.2.11(7) 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

Activities:

- a. Students use the percent proportion to solve problems. PA pgs. 322-326
- b. Students use mental math to find percents and to estimate percents. PA pgs. 327-331

Support using COACH Lesson 18 Using Percents pgs. 127-130

2.2.13(8) Solve percent problems in context that involve repetitive multiplication; e.g., compound interest, depreciation; using tables, spreadsheets and calculators to develop an understanding of exponential growth and decay.

Activities:

- a. Students work with large numbers and estimation to make a forecast. MS(8) Predicting World Population pgs. 138-139
- b. Students find the growth of a number. MS(8) Target Practice pgs. 140-141
- c. Students create a model for data that increases over time. MS(8) Made a Model pgs. 144-145

Teacher note: include discussions of large numbers to include examples such as

1.2 billion = $1.2 \times 10^9 = 1,200,000,000$ = one billion, two hundred million

Support using PA pgs. 332-337 (using percent equations, include Spreadsheet Lab on Compound Interest)

Technology: Demonstrate the difference between simple and compound interest by giving a problem that can be easily solved using a calculator for simple interest and a spreadsheet for compound interest. For example, compare \$20,000 invested for five years at 6 percent interest rate. Compute the simple interest first, and then see what would happen if the money were compounded monthly (0.5 percent per month) using a spreadsheet or graphing calculator.

Grade 7 Pre-Algebra

2.2.10(8) Solve a variety of problems in context involving percents, including the following types:

- Percentage of a number, e.g., If 65 percent of the 250 applicants will be accepted to the Arts Magnet School, how many students will be accepted?
- The percentage one number is of another number, e.g., Find the percent of students who play soccer if 39 students play soccer out of a total of 387 students.
- The percentage of a missing amount, e.g., 5 percent of the money from a fundraiser will be donated to a charity. If \$25 is donated to the charity, how much money was made from the fundraiser?
- Percentage increase/decrease, e.g., the number of music downloads have increased from 1,345 per minute to 1,567 per minute. What is the percentage increase?

Activities:

a. Students estimate percents. MS Team Spirit pgs. 26-27

b. Students interpret and create circle graphs to represent percents. MS Playing Around pgs. 28-39

c. 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.

d Students find percent of increase/decrease PA pgs. 338-342

Technology: Students solve a series of challenging problems involving percent of change. This site provides hints and a self-checking feature. <http://www.figurethis.org/challenges/c17/challenge.htm>

Support using PA pgs. 338-342 (percent of change)

Support using *Pizzazz*

Extension: Students calculate percents in real-life situations. MS Percent Smorgasbord pgs. 32-33

Assessment: Post-Assessment for Unit 3

Grade 7 Pre-Algebra

UNIT 3 VOCABULARY

Cross product
Discount
Interest
Percent
Percent of change
Proportion
Rate
Ratio
Scale factor
Unit rate

CMT CONNECTION

2.2.10(7)

12A. Solve problems involving ratios.

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

2.1.4(8)

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.

2.2.11(7)

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 Pre-Algebra

Unit 4: Geometry and Measurement. In this unit, students solve problems using both the customary and metric systems. They also analyze and classify two- and three-dimensional figures. They find areas of 2D figures and volumes and surface areas of 3D figures

Pre-Assessment for Unit 4

MEASUREMENT:

Grade level expectations: The student will be able to:

3.3.11(7) Write and solve problems in context involving conversions of customary or metric units and units of time.

Activities:

a. 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 with *Thinker Math*

Support with COACH Lesson 19 Choosing the Appropriate Tools and Measuring Units pgs. 136-142

3.3.8(8) Understand and describe in writing that measurement tools, measurements and estimates of measures are not precise and can affect the results of calculations.

Activities:

a. Students compare and contrast the terms precision and accuracy. PA pg. 614

Technology: The following site provides a performance task “Kilometers per Mile Problem”, student work samples, a scoring rubric, and resources for teachers [http:// palm.sri.com/tasks/6-8/Kilometers/index.html](http://palm.sri.com/tasks/6-8/Kilometers/index.html). (see appendix for hard copy)

Technology: Use *Geometer’s Sketchpad* (or paper/pencil or board) to demonstrate how being off by even 1 degree when measuring/drawing an angle with a protractor becomes a significant error when drawn farther out in a contextual problem. Relate it to an example such as on a map and how one could miss your target destination if off in measuring a travel angle.

Support with COACH Lesson 20 Estimating Angle Measures pgs. 143-147

3.3.10(8) Solve customary or metric measurement problems in context using Dimensional Analysis (The Unit Factor Method) and justify the results in writing.

Activities:

a. Students use dimensional analysis to solve problems in context. PA pgs. 241, 243, 247 (see appendix for Glacier Speeds)

Grade 7 Pre-Algebra

GEOMETRY:

Grade level expectations: The student will be able to:

2.1.1 (8) Compare and order rational and common irrational numbers; e.g., -5, $\frac{1}{16}$, $-4\frac{1}{2}$, $\sqrt{2}$, π ; and locate them on number lines, scales and coordinate grids

Activities:

- a. Students locate square roots on a number line. PA pgs. 462-468
- b. Students use a Venn diagram to classify numbers. PA pgs. 469-474

Use PA pgs. 476-481 (classifying triangles) for Problem of the Day mini-lesson.

3.1.1 (7) 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
- c. 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>.

Teacher note: use Venn diagrams with word bank to compare and write about relationships (see appendix)

Use PA pgs. 532-536 (classifying quadrilaterals) and pgs. 539-543 (classifying polygons) for Problem of the Day mini-lesson.

Support with Groundworks *Reasoning in Geometry*
Support with *Dot Paper Geometry*

Grade 7 Pre-Algebra

3.1.2(7) 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)

Technology: The following websites are suggested for rotational symmetry:

www.learner.org

www.analyzemath.com

www.mathisfun.com

www.pbs.org

3.1.3(8) Construct and/or examine right triangles and make and test conjectures about the relationships of the angles and sides and develop the Pythagorean theorem.

3.1.4(8) Apply side and angle relationships in geometric figures to solve problems including the Pythagorean theorem and similar figures.

Activities:

a. Students explore side relationships in right triangles. MS(8) Exploring the Pythagorean Theorem pgs. 236-237

b. Students apply side relationships in right triangles. MS(8) Using the Pythagorean Theorem pgs. 238-239

Teacher note: PA pg. 438-484 Algebra Lab – The Pythagorean Theorem may be substituted for the above activities.

Support using PA pgs. 485-490 (The Pythagorean Theorem)

Technology: Extension: Students explore other figures “built” on the sides of a right triangle at <http://balancedassessment.concord.org/docs/m021.doc> (see appendix for “Refiguring Pythagoras”)

Grade 7 Pre-Algebra

3.1.2 (8) Make and test conjectures about the angle and side relationships to determine that similar figures have congruent angles and corresponding sides proportional and congruent figures have congruent angles and sides.

3.1.5(7) 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:

Teacher note: Using any software program, display an image (can even be a piece of clip art in a word processing program). Duplicate the image to have two exactly the same. On one, stretch the image vertically or horizontally to distort the image. Discuss lack of similarity. Then take the image and enlarge by moving from the corner, where it increases horizontal and vertical aspects by the same ratio. Discuss that you have similar figures. You can use the “copy,” “paste” and “rotate” functions to demonstrate congruency by duplicating exact shape and simply changing position or orientation. Use graph paper or Geometer’s Sketchpad to construct angles and sides of various congruent and similar figures to discover these relationships.

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>
see appendix for hard copy – use Lessons 1 and 2

Support using PA pgs. 497-502 (similar figures and indirect measurement)

Support with COACH

Lesson 21 Two-Dimensional Figures pgs. 149-154

Lesson 23 Perimeter and Area pgs. 162-166

Grade 7 Pre-Algebra

3.1.3(7) Draw the result of transformations on polygons on coordinate planes including translations, rotations, reflections and dilations (reductions and enlargements)

3.1.4(7) Describe the effect of transformations; i.e., position and orientation from the original figure, size; on polygons that have line and/or rotational symmetry.

3.2.5(8) Use a coordinate plane to make and test conjectures about changes in the coordinates of the vertices of polygons as a result of a transformation (translation and/or reflection) and describe the results in writing.

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

d. Students examine polygons for congruence. MS Moving Polygons Around pgs. 288-289

Support using PA pgs. 524-531 (transformations on the coordinate plane)

Support with *Groundworks Reasoning in Geometry Grade 7*

Support with COACH Lesson 22 Congruent, Similar, and Symmetric Figures pgs. 155-161

Technology: Have students use *Geometer's Sketchpad* (or can be done on graph paper) to create a polygon on a coordinate grid and identify coordinates of each vertex. Use "translate" command to have students predict the effect first of a horizontal movement of five and then a vertical movement of four and then both together. Students should see shape move right and up. How do you do a left and down translation? (Enter negative numbers.) Repeat predictions for reflections, using different lines on the coordinate grid as the "mirror." Then ask students to predict the vertices of a translated or reflected polygon without drawing the transformation.

3.3.10(7) Use estimation and measurement strategies to solve problems involving area of irregular polygons and volumes of irregular solids and justify solutions in writing.

Activities:

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.

a. Students find areas of parallelograms. PA pgs. 545-550

b. Students find the circumference and areas of circles. PA pgs. 551-556

c. Students find area of composite figures. PA pgs. 558-562

Grade 7 Pre-Algebra

3.2.6(7) Identify and/or draw two-dimensional representations of three dimensional geometric solids using nets, cross-sections, front, side and top views to solve problems.

3.2.7(7) Use two-dimensional representations of rectangular prisms, pyramids and cylinders to determine surface area.

3.2.6(8) Develop and use formulas to determine the surface areas of rectangular prisms, cylinders and pyramids.

3.3.9(8) Use estimation and measurement strategies, including formulas, to solve surface area and volume problems in context.

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 use nets to represent solids. MS(8) Nets that Catch Cubes pgs. 94-95

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.

Support using PA pgs. 575-582 (three-dimensional figures) pgs. 597-601(surface area: prisms and cylinders), pgs. 602-606 (surface area: pyramids and cones)

Support using COACH Lesson 25 Three-Dimensional Figures and Their Nets pgs. 174-179
Lesson 26 Volume of Three-Dimensional Figures pgs. 180-185

Support through Tech. Ed. (multiple views)

3.2.7(8) Develop formulas using measurement strategies and concrete models; and use formulas to determine the volumes of pyramids, cones and spheres.

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. (You may substitute Geometry Lab: Similar Solids PA pgs. 607)

Activities:

a. Students find the volume and surface area of rectangular prisms. MS(8) All Boxed Up pgs. 104-105

b. Students find volumes of prisms and cylinders. PA pgs. 583-588

c. Students find volumes of pyramids, cones and spheres. PA pgs. 589-594

Extension: Find relationships of surface area/volume/ length of the edge of a cube (see appendix)

Post-Assessment for Unit 4

Grade 7 Pre-Algebra

UNIT 4 VOCABULARY

Acute angle	Regular polygon
Acute triangle	Rhombus
Adjacent angles	Right angle
Altitude (height)	Right triangle
Base	Scalene triangle
Circle	Solid
Circumference	Sphere
Complementary	Square root
Cone	Straight angle
Congruent	Surface area
Cylinder	Transformation
Diameter	Translation
Dilation	Trapezoid
Edge	Triangle
Equilateral triangle	Vertex
Face	Vertical angles
Hypotenuse	Volume
Irrational numbers	
Isosceles triangle	
Lets	
Line segment	
Nets	
Obtuse angle	
Obtuse triangle	
Parallel lines	
Parallelogram	
Perfect square	
Perpendicular lines	
Plane	
Prism	
Pyramid	
Quadrilateral	
Radical sign	
Radius	
Real numbers	
Reflection	

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CMT CONNECTIONS

3.3.11(7)
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.

3.3.8(8)
15A. Estimate lengths, areas and angle measures.

3.1.2(8)
17A. Identify, describe or classify two- and three-dimensional geometric shapes and figures.
17B. Draw, describe and classify two-dimensional geometric shapes and figures.
18C. Identify congruent and similar figures.
18D. Identify and explain congruent or similar figures.

3.1.3(7)
18B. Draw lines of symmetry.
18E. Locate and draw points on grids.
18F. Identify geometric transformations (reflections, rotations and translations).
18G. Draw geometric transformations (reflections and rotations).

3.1.4(7)
18A. Identify lines of symmetry.

3.2.6(7)
18H. Relate two- and three-dimensional representations and visa versa.

3.2.6(8)
16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.
16B. Determine perimeters, areas and volumes.

Grade 7 Pre-Algebra

Unit 5: Functions and Graphing: In this unit, students use multiple representations to make predictions and solve problems.

Pre-Assessment for Unit 5

Grade level expectations: The student will be able to:

1.2.6(7) Examine situations with constant or varying rates of change and know that a constant rate of change describes a linear relationship.

1.1.3(8) Write and solve problems involving proportional relationships (direct variation) using linear equations ($y = mx$).

1.2.7(8) Compare and contrast the slopes and the graphs of lines that have a positive slope, negative slope, zero slope, undefined slope, slopes greater than one and slopes between zero and one.

1.2.9(8) Interpret and describe slope and y -intercepts from contextual situations, graphs and linear equations.

Activities:

- a. Students define and give examples of a function. PA pgs. 359-363
- b. Students solve linear equations with two variables. PA pgs. 365-370
- c. Students solve problems involving rates of change. PA pgs. 371-375, pgs. 376-381 (direct variation)

Teacher note: Start with simple patterns, such as 1, 4, 7, 10 and have students determine the constant rate of change. Extend to problems such as plumbing repairs (e.g., \$65 flat fee plus \$50 per hour), taxi rides (e.g., \$1.50 once the meter starts plus \$.75 per half mile), running (15 minutes to stretch plus 8 minutes per mile), etc. Have students graph the patterns and see the relationship between the rate and the appearance of the line on the graph (i.e., the higher the rate, the steeper the line). Most familiar scenarios involve positive slopes. Ask students what would happen if the rate kept increasing more and more. Use a graphing calculator to graph equations and see how the graph changes as the coefficient of x gets progressively larger (e.g., $y = 2x$, $y = 5x$, $y = 10x$, $y = 50x$, etc.) Try to approximate a vertical line. An applet and lesson can be found at the following link: <http://standards.nctm.org/document/examples/chap6/6.2/index.htm>.

- c. Students investigate slope. Algebra Lab: It's All Downhill Pa pg. 383
- d. Students connect equations, slopes and intercepts. MS(8) What's in an Equation? Pgs. 282-283
- e. Students find the slope of a line. MS(8) A New Slant on Linear Functions pgs. 280-281

Grade 7 Pre-Algebra

- f. Students plot points on a coordinate plane. MS Seeing Things Graphically pgs. 194-195
- g. Students graph linear equations MS The Algebra Walk pgs. 196-197
- h. Students relate words, tables, equations and graphs. MS Putting it All Together pags. 198-199

1.3.8(7) Solve real world problems using a variety of algebraic methods including tables, graphs, equations and inequalities.

Activities:

- a. Students write and graph inequalities. PA pgs. 430-434
- b. Students solve problems in context using inequalities. PA pgs. 435-439 (addition and subtraction) and pgs. 441-445 (multiplying and dividing)

Assessment: Post-Assessment for Unit 5

UNIT 5 VOCABULARY

Constant rate of change
Function
Identity
Inequality
Line of best fit
Linear equation
Linear relationship
Null or empty set
Rate of change
Slope
y-intercept

Grade 7 Pre-Algebra

Unit 6: Probability and Statistics: In this unit, students use graphical representations to display and interpret data. Students will also investigate probability.

Pre-Assessment for Unit 6

STATISTICS:

Grade level expectations: The student will be able to

4.1.1(7and8) Collect, organize and display data using an appropriate representation (including tables and charts, line, bar and circle graphs, Venn diagrams, box-and-whisker plots, back-to-back stem and leaf plots, scatter plots, histograms) based on the size and type of data set and purpose for its use.

Activities:

a. Students create and interpret a stem and leaf plot. PA pgs. 626-631

b. Students interpret data using measures of variation. PA pgs. 633-637

c. Students explore a box and whisker plot. PA pgs. 638-642

Teacher note: Students may use a graphing calculator to create and compare two box and whisker plots.
Graphing Calculator Lab PA pg. 643

d. Students use a graphing calculator to construct and analyze a scatterplot. Graphing Calculator Lab PA pgs. 67-68

e. Students create and interpret histograms. PA pgs. 644-649

Teacher note: Students may use a graphing calculator to create histograms. Graphing Calculator Lab PA pg. 650

f. Students select an appropriate display for a set of data. PA pgs. 651-656

g. Students use a spreadsheet to construct a bar and line graph. PA pg. 657

4.2.7 (8) Describe in writing the accuracy of statistical claims, e.g., 4 out of 5 dentists prefer Brand X toothpaste, by recognizing when a sample is biased or when data is misrepresented.

Activities:

a. Students evaluate conclusions based on misleading graphs. PA pgs. 659-663

Use samples on PA pg. 344 (sample bias) for Problem of the Day mini-lesson.

Grade 7 Pre-Algebra

PROBABILITY:

4.3.6(7) Identifying all possible outcomes using models, tree diagrams, tables and/or organized lists to determine theoretical probabilities.

4.3.8(7) Compare and contrast experimental probability results to theoretical probabilities in writing.

4.3.9(7) Solve probability problems in familiar contexts including simple events (flipping a coin) and compound events (flipping a coin and rolling a number cube).

4.3.9(8) Determine when a situation is a permutation (changing the order results in a different outcome) or a combination (changing the order does not result in a different outcome).

4.3.11(8) Apply permutations and combinations to predict possible outcomes and find probabilities to solve problems in a variety of contexts.

Teacher note: Students work with probability using MS Chance Encounter Module

Support using PA pgs. 665-669 (simple probability), pgs. 670-674 (counting outcomes), pgs. 676-680 (combinations and permutations), pgs. 682-687 (composite events)

Post Assessment for Unit 6

Grade 7 Pre-Algebra

UNIT 6 VOCABULARY

Box-and-whisker plot
Combination
Dependent events
Experimental probability
Histogram
Independent events
Interquartile range
Mutually exclusive events
Outcomes
Outlier
Permutation
Probability
Quartiles
Range
Sample space
Simple event
Stem-and-leaf plot
Theoretical probability
Tree diagram

Grade 7 Pre-Algebra

POST UNIT 6

Extensions:

1. Order of operations with integers
2. Operations with rational numbers such as $-\frac{1}{2} \cdot \frac{2}{3}$
3. Review rules for operations with rational numbers
4. Revisit solving equations using integers