

Grade 8 Mathematics

Overview:

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

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

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

Vocabulary:

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

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

Connections to Connecticut Mastery Test:

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

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Key to Coding:

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

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

Algebraic Reasoning: Patterns and Functions

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

Numerical and Proportional Reasoning

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

Geometry and Measurement

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

Working with Data: Probability and Statistics.

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

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

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

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Unit 1: Patterns in Number. This unit begins with a review of operations with integers. Students then explore patterns and use properties of numbers to develop algebraic reasoning and make generalizations.

Pre-Assessment for Unit 1

Grade level expectations: The student will be able to:

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

Teacher note: This GLE builds on the Grade 7 GLE with the inclusion of common irrational numbers.

Activities:

- Students identify and classify numbers in the real number system and locate them on number lines. MC pgs. 155-159
- Students graph irrational numbers. Geometry Lab, MC pg. 172
- Students compare and order rational numbers. MC pgs. 91-95
- Students create number lines with different scales for the board or overhead. Give students various rational and common irrational numbers to place on the number lines. **Teacher note:** when locating positive and negative numbers on number lines, use both horizontal and vertical formats.

Extension: Students work in groups of four for a game. Provide two rational numbers to start play. The first student to begin play must name a rational number between the two given numbers. The next student must then name a rational number between the two lowest numbers of the three named. The next student must then name a rational number between the two lowest numbers previously named. Play continues until a mistake is made. Groups might then demonstrate for the class the numbers used in play.

Intervention: For disputed answers, have students write down the decimal equivalent, using a calculator. Write the three decimal answers vertically on graph paper to facilitate easier comparisons of each decimal place.

Support with CMT COACH pgs 57-61, 62-65, 169-174

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- 2.2.5 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.

Activities:

- a. Students use Algebra Tiles to model computation with numbers.
 - b. Students work with integers and find absolute value. MC pgs. 35-39
 - c. Students use colored tiles to model addition with integers. Algebra Lab MC pg. 40
 - d. Students add integers. MC pgs. 40-45
 - e. Students use colored tiles to model subtraction with integers. Mini-lab MC pg. 46
 - f. Students subtract integers. MC pgs. 47-49
 - g. Students multiply and divide integers. MC pgs. 51-56 **Teacher note:** see TEACH note on pg. 51
 - h. Students multiply positive and negative fractions. MC pgs. 96-101
 - i. Students divide positive and negative fractions. MC pgs. 102-107
 - j. Students add and subtract like fractions. MC pgs. 108-112
 - k. Student add and subtract unlike fractions. MC pgs. 114-118
- Support using CMT COACH pgs. 78-81, 82-86, 87-90, 114-118*

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2.2.13 Solve 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 Predicting World Population pgs. 138-139
- b. Students find the growth of a number. MS Target Practice pgs. 140-141
- c. Students create a model for data that increases over time. MS Made a Model pgs. 144-145
Teacher note: include discussions of large numbers to include examples such as
 $1.2 \text{ billion} = 1.2 \times 10^9 = 1,200,000,000 = \text{one billion, two hundred million}$
- d. Students solve problems involving simple interest. MC pgs. 290-293
- e. Students solve problems involving compound interest. Spreadsheet Lab MC pg. 294

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.

2.1.2 Identify perfect squares and their square roots; e.g., squares 1, 4, 9, 16... to corresponding roots 1, 2, 3, 4 ...; and use these relationships to estimate other square roots.

Activities:

- a. Students find square roots of perfect squares. Mini Lab MC pg. 144-147 **Teacher note:** reinforce with models see MC pg. 144a
- b. Students estimate square roots. Mini Lab MC pgs 148-151

2.2.6 Calculate the square roots of positive integers using technology.

Activities:

- a. Students investigate various squares by drawing them and subdividing each square to provide insight into square roots. (See appendix for lesson Exploring Squares and Square Roots.)

Technology: *Geometer's Sketchpad* may be used for this lesson.

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2.2.11 Use the rules for exponents to multiply and divide with powers of 10 and extend to other bases.

e.g., $10^2 \times 10^3 = 10^5$ add exponents, $2^5 \div 2^7 = 2^{-2}$ subtract exponents

Activities:

- Students discover rules by writing multiplication out in expanded form. Ex. $10^2 \times 10^3 = (10 \times 10) \times (10 \times 10 \times 10) = 10^5$
- Students use powers and exponents to solve problems. MC pgs. 126-129. **Teacher note:** see chart at top of pg. 127

Power of 10 Day October 10th. Video – Powers of 10 (see appendix for activities)

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

2.2.12 Estimate answers to problems in context containing numbers expressed in scientific notation.

Activities:

- Students investigate exponential functions. MS Folds and Regions pgs. 296-297
- Students work with scientific notation and explore a calculator's limits. MS The Very Large and the Very Small pgs. 300-301
- Students express numbers in scientific notation. Mini Lab MC pgs. 130-133
Technology: This site provides practice problems for scientific notation and has a self-checking feature.
www.edinformatics.com/math_science/scinota.htm

Support with CMT COACH pgs. 44-4

2.2.7 Develop and use strategies for multiplying and dividing with numbers expressed in scientific notation using the commutative and associative properties.

Teacher note: Link to commutative and associative properties, but do not spend a lot of time on this.

$$(3.2 \times 10^7) \times (4 \times 10^5) = (3.2 \times 4) \times (10^7 \times 10^5) \text{ OR } \frac{3.2 \times 10^7}{4 \times 10^5} = \frac{3.2 \times 10^7}{4 \times 10^5} = 0.8 \times 10^2 \\ = 8 \times 10^1 = 80$$

Activities:

Teacher note: for sample in context, see MC pg. 70b, Word Problem Practice pg. 68

Assessment: Post-Assessment for Unit 1

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CMT CONNECTION

2.1.1

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

18C. Locate and draw points on four-quadrant coordinate grids.

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

4B. Describe magnitude or order of mixed numbers, fractions and decimals in context.

2.2.5

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

5B. Write a story problem from an equation.

7A. Add and subtract three-, four- and five-digit whole numbers, money amounts and decimals.

7B. Multiply two- and three-digit whole numbers, money amounts and decimals by one- or two-digit numbers and decimals. Divide two- and three- digit whole numbers, money amounts and decimals by one-digit whole numbers and decimals.

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

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

8C. Add or multiply positive and negative integers.

9A. Solve multistep problems involving fractions, mixed numbers, decimals and money amounts with or without extraneous information.

9B. Solve multistep problems involving whole numbers, mixed numbers, money amounts and decimals.

9C. Solve multistep problems involving whole numbers, fractions, mixed numbers, decimals or money amounts, and explain how the solution was determined.

2.2.13

6B. Multiply two- and three-digit whole numbers, money amounts and decimals by one- or two-digit numbers and decimals. Divide two- and three- digit whole numbers, money amounts and decimals by one-digit whole numbers and decimals

2.2.11

6C. Multiply and divide whole numbers and decimals by 10, 100, 1,000, 0.1 and 0.01.

2.1.3

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

UNIT 1 VOCABULARY

Absolute value

Base

Compound interest

Exponent

Integer

Irrational number

Negative number

Perfect square

Principal

Positive number

Power

Rational number

Real number

Reciprocal

Repeating decimal

Scientific notation

Simple interest

Terminating decimal

$\sqrt{\quad}$

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Unit 2: Patterns in Algebra. This unit connects the idea of number patterns to representations with algebraic expressions and equations and leads to furthering students' ability to write and solve equations while using their knowledge of number and order of operations from Unit 1.

Pre-Assessment for Unit 2

Grade level expectations: The student will be able to:

1.1.1 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:

- Students use pictorial patterns to develop an understanding of recursive and explicit representations of functions. (see appendix for lesson: Recursive vs. Explicit Representations)
- Students use toothpicks to model a pattern then explain in writing how to extend the pattern. Mini Lab MC pgs. 24-28
Support with CMT COACH pgs. 224-229, 230-233
- Students write algebraic expressions to determine any number in an arithmetic sequence. MC pgs. 464-468

1.3.10 Evaluate and simplify algebraic expressions, equations and formulas including those with powers using algebraic properties and the order of operations.

Activities:

- Students evaluate expressions and identify properties. Mini Lab MC pgs. 29-34
- Students write algebraic expressions (using integers) for contextual situations. MC pgs. 57-61
- Students solve equations using properties. MC pgs. 65-73
- Students solve equations using rational numbers. MC pgs. 119-123

Teacher note: skip work with Pythagorean Theorem at this time.

Support using CMT COACH pgs. 234-237, 238-241, 242-245, 246-249

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1.3.12 Write and solve multi-step equations using various algebraic methods including the distributive property, e.g., $3(x + 2) = 10$, combining like terms, e.g., $3x + 2x = 15$, and properties of equality and justify the solutions.

Activities:

- Students use the distributive property to simplify algebraic expression. Mini Lab MC pgs. 416-421
- Students solve two-step equations. MC pgs. 422-426
- Students write two-step equations. MC pgs. 427-431, also see appendix for activity “Dinner Date”
- Students use algebra tiles to solve equations with variables on both sides. Algebra Lab MC pgs. 432-433

Support using CMT COACH pgs. 250-253

Assessment: CMT COACH Progress Check pgs. 254-256

Assessment: Post-Assessment for Unit 2

UNIT 2 VOCABULARY

Additive inverse
Algebraic expression
Coefficient
Constant
Equation
Equivalent expression
Evaluate
Inverse operation
Like terms
Multiplicative inverse
Order of operations
Simplest form
Solution
Solve
Term
2-step equation
variable

CMT CONNECTIONS

1.1.1
22A. Identify the missing terms in a pattern, or identify rules for a given pattern using numbers and attributes.
22B. Extend or complete patterns and state rules for given patterns using numbers and attributes.

1.3.10
23E. Write an expression or equation to represent a situation.
23C. Evaluate expressions or solve equations and use formulas.

1.3.12
23A. Solve simple equations, including two-step equations.
23B. Solve multistep problems using algebraic concepts.

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Unit 3: Side and Angle Relationships. This unit relies on students to use previous knowledge to make and test conjectures about side and angle relationships in polygons to formalize their understanding of geometry and connect to algebra.

Pre-Assessment for Unit 3

Grade level expectations: The student will be able to:

3.1.1 Determine the effect of scale factors (resulting in similar figures) on the perimeters and areas of two-dimensional shapes and the surface areas.

Activities:

- a. Students explore the effect of scale factors on area and volume. (see appendix for lesson “Exploring the Effect of Dimension Change on Area and Volume”)
- b. Students draw an enlargement and look for relationships in measurements of sides. Mini Lab Mc pgs. 225-230
- c. Students use a spreadsheet to enlarge and reduce polygons. Spreadsheet Lab MC pg. 231

Technology: For a cluster of lessons to further introduce and develop this concept, see

<http://illuminations.nctm.org/LessonDetail.aspx?id=U98>

Support using CMT COACH pgs. 129-136

3.3.8 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 measure the slope of an angle. MS Slopes and Slope-o-meters pgs. 226-227
- b. Students compare and contrast the terms accuracy and precision and relate to measurement. MC pg. 376

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 using CMT COACH pgs. 142-146

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3.1.2 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.

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.

- a. Students identify similar polygons by examining congruent angles and proportional sides. MC. Pgs. 218-223

3.2.5 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 identify lines of symmetry and rotational symmetry. MC pgs. 327-331
- b. Students graph reflections on a coordinate plane. MC pgs. 332-336
- c. Students graph translations on a coordinate plane. MC pgs. 337-341

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.

Support using CMT COACH pgs. 175-182

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

Teacher note: review triangle vocabulary on MC pg. 737

Activities:

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

b. Students use the Pythagorean theorem. MC pgs. 162-166

Technology: SuccessMaker – Math Investigations

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

Activities:

a. Students apply side relationships in right triangles. MS Using the Pythagorean Theorem pgs. 238-239

b. Students solve problems using the Pythagorean Theorem. MC pgs. 167-171

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”)

Teacher note: provide students with the CMT formula chart and find location of the formula for the Pythagorean Theorem.

Assessment: Post-Assessment for Unit 3

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UNIT 3 VOCABULARY

Accuracy
Congruent
Corresponding parts
Dilation
Enlarge
Hypotenuse
Leg
Line of symmetry
Polygon
Precision
Pythagorean Theorem
Reduce
Reflection
Rotational symmetry
Scale drawing
Scale factor
Similar
Transformation
Translation

CMT CONNECTION

3.1.1

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

3.3.8

15A. Estimate lengths, areas, volumes and angle measures.

3.1.2

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

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

18A. Identify congruent and similar figures.

18B. Draw, classify, describe and/ or explain why figures are similar.

3.2.5

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

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

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

18E. Draw geometric transformations (reflections, rotations and translations).

3.1.4

25A. Solve extended numerical and statistical problems.

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Unit 4: Ratio, Proportion and Percentage. This unit focuses on the application of rational numbers and operations to solve practical problems.

Pre-Assessment for Unit 4

Grade level expectations: The student will be able to:

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

Activities:

- a. Students write ratios as percents and vice versa. MC pgs. 252-255
- b. Students write percents as fractions and decimals and vice versa. MC pgs. 256-261
- d. Students practice using equivalent forms by playing I Have, Who Has (see appendix)

Support using CMT COACH pgs. 49-54

2.2.9 Use proportional reasoning to write and solve problems in context.

Activities:

- a. Students predict fish population using proportional reasoning (see appendix for lesson: Tag, Replace, Recapture; note: you can also use lima beans)
- b. Students write slopes as ratios. MS Stairs and Ratios pgs. 242-243
- c. Students use proportional reasoning to solve problems. MS The 12-Inch Tread pgs. 244-245
- d. Students determine unit rates. MC pgs. 190-193
- e. Students identify proportional and non-proportional relationships. MC pgs. 194-196
- f. Students find rate of change. MC pgs. 198-203
- g. Students find a constant rate of change. MC pgs. 204-209
- h. Students use proportions to solve problems in context. MC pgs. 210-214

Support using CMT COACH pgs. 97-105

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

Activities:

a. Students express volume in many ways. MS Does the Unit Fit? Pgs. 118-119

b. Students use dimensional analysis to solve problems in context. MC pgs. 98 and 744-745

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

Support using CMT COACH pgs. 124-128

2.2.10 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?

2.2.8 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:

a. Students connect slope ratios and percent grade. MS 7% Grade Ahead! Pgs. 246-247

b. Students compare data using difference, ratio, and percent. MC pg. 262

c. Students solve problems in context using the percent proportion. MC pgs. 263-267

d. Students compute mentally with percents. MC pgs. 268-271

e. Students estimate by using equivalent fractions and percents. MC pgs. 275-278

f. Students solve problems in context using a percent equation. MC pgs. 279-283

g. Students find and use the percent of increase of decrease. MC pgs. 284-289

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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>

Teacher note: Have students choose a stock to watch for 5 days. Calculate percent of change.

Support using CMT COACH pgs. 66-69,106-109, 110-113

Assessment: Post-Assessment for Unit 4

UNIT 4 VOCABULARY

Compatible number
Constant of proportionality
Constant rate of change
Cross products
Discount
Dimensional analysis
Equivalent ratios
Linear relationship
Mark up
Non-proportional
Percent
Percent of change
Percent of decrease
Percent equation
Percent of increase
Percent proportion
Proportion
Rate
Rate of change
Ratio
Slope
Unit rate

CMT CONNECTIONS

2.1.4
3A. Rename fractions and mixed numbers as equivalent decimals and vice versa.
3B. Rename fractions and decimals as equivalent percents and vice versa.
3C. Identify and/or shade decimals, fractions or percents of regions or sets.

2.2.9
12A. Solve problems involving ratios.
12B. Solve problems involving proportions in context.
12C. Solve multistep problems involving ratio or proportion, and explain how the solution was determined.

3.3.10
16C. Solve problems involving conversions and/or operations within customary or metric units of measure.

2.2.10
13A. Find percents of whole numbers or the percent a given number is of another number.
13B. Solve problems involving percents in context.

2.2.8
4C. Round mixed numbers, fractions and decimals in context.
11A. Determine a reasonable estimate, and describe the strategy used to arrive at the estimate.
11B. Given an estimate as a solution for problems involving whole numbers, mixed numbers, decimals and percents, judge its reasonableness and justify the decision.

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Unit 5: Surface Area and Volume. This unit relies on students' prior knowledge to extend and formalize their understanding of two- and three-dimensional measurement. Students make connections to algebra by moving from concrete understandings to the application of formulas.

Pre-Assessment for Unit 5

Grade level expectations: The student will be able to:

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

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

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

Activities:

- a. Students use nets to represent solids. MS Nets that Catch Cubes pgs. 94-95
- b. Students find the volume and surface area of rectangular prisms. MS All Boxed Up pgs. 104-105
- c. Students find surface area of other prisms. MS Wrapping Up Prisms pgs. 106-107
- d. Students explore surface and area of prisms. MS Outside and Inside pgs. 108-109
- e. Students find the surface area and volume of cylinders. MS Pyramid Tips pgs. 114-115
- f. Students investigate cones. MS Cutting the Cone pgs. 116-117
- g. Students find the circumference and area of circles. MC pgs. 352-357
- h. Students estimate areas of irregular figures. Measurement Lab MC pg. 362
- i. Students find the area of composite figures. MC pgs. 363-367
- j. Students identify and draw 3 dimensional figures. MC pgs. 368-372
- k. Students find the volumes of prisms and cylinders. MC pgs. 373-378

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l. Students find the volumes of pyramids and cones. MC pgs. 380-384

m. Students find the surface area of cylinders using nets. Measurement Lab MC pgs. 385-391

n. Students find the surface area of pyramids. MC pgs. 393-396

Teacher note: provide students with the CMT formula chart and find location of the formulas needed when solving problems in context.

Technology: Students review the areas of polygons and then build 3-D figures. <http://illuminations.nctm.org/ActivityDetail.aspx?ID=21>

Technology: Conservation of volume problems are explored in this virtual manipulative:
http://nlvm.usu.edu/en/nav/frames_asid_275_g_3_t_3.html

Support using CMT COACH pgs. 98-99, 137-141, 153-157, 158-169

Assessment: Post-Assessment for Unit 5

UNIT 5 VOCABULARY

Base
Circle
Circumference
Composite figure
Cone
Cylinder
Diameter
Edge
Face
Net
Pi
Polyhedron
Prism
Pyramid
Surface area
Vertex
Volume

CMT CONNECTION

3.2.6
18F. Relate two- and three-dimensional representations and vice versa.
16A. Measure and determine perimeters, areas and volumes. Explain or show how the solution was determined.
25A. Solve extended numerical and statistical problems.

3.3.8
15A. Estimate lengths, areas, volumes and angle measures.
25A. Solve extended numerical and statistical problems.

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Unit 6: Patterns and Functions. This unit focuses on the nature of linear relationships. Students compare situations and their tables and graphs to write and manipulate equations and vice versa. A formal understanding of slope, intercepts and graphing lines from equations are developed.

Pre-Assessment for Unit 6

Grade level expectations: The student will be able to

1.1.2 Determine whether relationships are linear or nonlinear.

Activities:

a. Students represent linear functions using tables and graphs. MC pgs. 475-480

Technology: Extension: This activity uses a real-world situation to illustrate linear functions.

<http://math.rice.edu/~lanius/Algebra/rentacar.html>

b. Students determine whether relationships are linear or nonlinear. MC pgs. 528-533

1.2.5 Represent linear and nonlinear mathematical relationships with verbal descriptions, tables, graphs and equations (when possible).

1.1.4 Examine and make comparisons in writing between linear and non-linear mathematical relationships including $y = mx$, $y = mx^2$ and $y = mx^3$ using a variety of representations. **Teacher note:** Students should be exposed to this concept at this level. It will be further developed through algebra 1 and 2.

Activities:

a. Students graph linear equations using slope and y intercept. MC pgs. 495-499

b. Students represent nonlinear relationships with tables, graphs and equations. see appendix -Activity from Graphing Calculator Book

c. Students create a story to match a graphical representation. See appendix for “The Hot Tub”, “The Toilet Problem”

d. Have students generate data for perimeter and area of a square ($p = 4s$, $p = s^2$) and the volume of a cube ($v = s^3$) as the length of side changes. Graph by hand and/or with a graphing calculator and describe the similarities and differences in the table, graph and situation.

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

Activities:

a. Students use direct variation to solve problems. MC pgs. 487-492

Grade 8 Mathematics

1.2.6 Determine the constant rate of change in a linear relationship and recognize this as the slope of a line.

Activities:

- a. Students find the slope of a line. MC pgs. 481-486
- b. Students use a motion detector and a graphing calculator to check for linear behavior. Graphing Calculator Lab MC pgs. 500-501

1.2.7 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.

Activities:

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/eexamples/chap6/6.2/index.htm>.

- a. Graphing calculator activity with star (see appendix)
- b. Students find the slope of a line. MS A New Slant on Linear Functions pgs. 280-281
- c. Geometers Sketch pad Activity (see appendix)
- d. Students compare the graphs representing travel distance and travel time for two cars, a Ford and a Ferrari and solve problems based on the graph. See appendix "Ford and Ferrari"

1.2.8 Compare and contrast the slopes and graphs of lines to classify lines as parallel, perpendicular or intersecting.

Activities:

- a. Students compare the cost of two competing services, and then extend their investigation to situations that produce parallel lines and lines with no slope and undefined slope. See appendix for lesson Linear Functions and Slope.

Grade 8 Mathematics

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

Activities:

- a. Students connect equations, slopes and intercepts. MS What's in an Equation? Pgs. 282-283
- b. Students solve problems in context using slope intercept. See MC resource master #45

Technology: The following site provides a performance task "Height of Bounce", student work samples, a scoring rubric, and resources for teachers. See appendix for a copy of the task.

1.3.11 Examine systems of two linear equations in context that have a common solution, i.e. point of intersection, using tables, graphs and substitution and interpret the solution.

Activities:

- a. Compare various competing consumer plans as in the lesson above or, for other examples, phone plans, video game rental plans, etc., when one business has a higher fixed rate but lower price per unit and the other business has a lower fixed rate but a higher price per unit. Determine when one company is a better buy and when the other company is a better value, depending on usage.

Assessment: Post-Assessment for Unit 6

UNIT 6 VOCABULARY

Direct variation
Linear
Negative slope
Non –linear
Positive slope
Rise
Run
Slope
Slope intercept form
Undefined slope
Y intercept
Zero slope

CMT CONNECTION

1.2.5
23D. Represent situations with algebraic expressions or equations.
23E. Write an expression or equation to represent a situation.

1.1.3
12C. Solve multistep problems involving ratio or proportion, and explain how the solution was determined.

1.3.11
25A. Solve extended numerical and statistical problems.

Grade 8 Mathematics

Unit 7: Making Decisions with Statistics: This unit focuses on analyzing sets of data and statistical claims as related to real world contexts.

Pre-Assessment for Unit 7

Grade level expectations: The student will be able to

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

4.2.8 Explain the effects of sample size and sampling techniques (convenience sampling, voluntary response sampling, systematic sampling and random sampling) on statistical claims.

4.2.7 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.

4.2.4 Use descriptive statistics, including range, mode, median, mean, quartiles and outliers to describe data and support conclusions in writing.

4.1.3 Identify where measures of central tendency and spread are found in graphical displays including box-and-whisker plots, stem and leaf plots, scatter plots and histograms.

4.1.2 Use appropriate representations to compare and analyze large data sets.

4.2.6 Make observations and inferences and evaluate hypotheses based on collected and/or experimental data.

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

Activities:

Teacher note: use line of best fit to make predictions, not equations.

a. Students construct and interpret scatterplots. MC pgs. 510-515

b. Using a graphing calculator, students create a scatterplot and calculate line of best fit. Graphing Calculator Lab MC pgs. 516-517

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.

Grade 8 Mathematics

- c. Students display and interpret data using histograms. MC pgs. 576-580
- d. Students use a graphing calculator to make a histogram. Graphing Calculator Lab MC pg. 581
- e. Students construct and interpret circle graphs. MC pgs. 582-588
- f. Students use a spreadsheet to create different types of graphs. Spread Sheet Lab MC pgs. 589-590
- g. Students display and interpret data in a box-and-whiskers plot. MC pgs. 605-610
- h. Students use a graphing calculator to make a box-and-whiskers plot. Graphing Calculator Lab MC pg. 611
Technology: Box-and-whisker plots can also be explored at this site:
http://nlvm.usu.edu/en/nav/frames_asid_200_g_4_t_5.html?open=instructions
- i. Students display and interpret data in a stem-and-leaf plot. MC pgs. 612-616
- j. Students select the appropriate graph to use for a given set of data. MC pgs. 617-621
- k. Students use means, percents and graphs to analyze data. MS Sports Opinions and Facts pgs. 6-7
- l. Students find the mean, median, mode and range of a set of data. MC pgs. 591-596
- m. Students find mean, median and mode in a basketball scenario and use this information to justify a decision. MS Who's the Best? pgs. 8-9
- n. Students work backwards with statistics. MS Mystery Data pgs. 10-11
- o. Students use a spreadsheet to find the mean, median and mode. Spreadsheet Lab MC pg. 597
- p. Students find the measures of variation of a set of data. MC pgs. 599-604

Technology: Students identify measures of central tendency and spread on different types of graphs such as histograms at http://nlvm.usu.edu/en/nav/frames_asid_145_g_3_t_5.html?open=instructions, box plots T <http://illuminations.nctm.org/ActivityDetail.aspx?ID=160> or scatterplots. Students should make and test conjectures about how the measures change as data are added or changed.
- q. Students analyze large data sets based on the 50 U S states and use appropriate representations.
<http://illuminations.nctm.org/ActivityDetail.aspx?ID=151>.

Grade 8 Mathematics

Technology: The effect of sample size on experimental probability can be explored using this virtual coin tossing: http://nlvm.usu.edu/en/nav/frames_asid_305_g_3_t_5.h.

Performance Assessment: MS The Mysterious Footprint pgs. 22-23

Support with CMT COACH pgs. 188-191, 192-196, 197-200, 206-210

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

UNIT 7 VOCABULARY

Box-and-whiskers plot
Circle graph
Histogram
Line of best fit
Lower quartile
Mean
Measures of central tendency
Median
Mode
Outlier
Prediction
Quartiles
Range
Scatterplot
Stem-and-leaf plot
Upper quartile

CMT CONNECTIONS

4.1.1

19B. Create graphs from data in tables and charts. 24B. Sort or classify objects, and draw logical conclusions from data including Venn diagrams, combinations, permutations and transitive reasoning questions.

4.2.4

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

4.1.3

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

4.2.6

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

4.2.5

20A. Draw reasonable conclusions from data in tables, graphs and charts.
25A. Solve extended numerical and statistical problems.

Grade 8 Mathematics

Unit 8: Permutations and Combinations. This unit focuses on the exploration of open-ended problems involving permutations and combinations in order to determine outcomes and probabilities.

Pre-Assessment for Unit 8

Grade level expectations: The student will be able to

4.3.9 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).

4.3.10 Use tree diagrams, lists or the Counting Principle to determine all possible outcomes in permutations and combinations.

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

Activities:

a. Give students different examples of permutations and combinations and have students determine in which scenarios order is important. For example, a combination problem: How many different fruit salads can be made using three of the following fruits: apple, grapes, pears and bananas? A permutation problem: How many different three letter passwords can be created with the letters A, B, C and D?

b. Students investigate combinations of menu items. MS Lunch Specials pgs. 28-29

c. Students investigate permutations. MS The Battle of the Bands pgs. 30-31

d. Students apply probability, combinations and permutations. MS The Demo CD pg. 32
Assessment: MS pg. 33

e. Students use tree diagrams or the Fundamental Counting Principle to count outcomes. MC pgs. 632-636

f. Students determine the probability of independent and dependent variables. MC pgs. 637-642

g. Students find experimental and theoretical probabilities and use them to make predictions. MC pgs. 643-649

Support with CMT COACH pgs. 201-205, 215-218

Assessment: Post-Assessment for Unit 8

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Grade 8

Grade 8 Mathematics

UNIT 8 VOCABULARY

Combination
Experimental probability
Factorial
Fundamental counting principle
Outcome
Permutation
Probability
Theoretical probability
Tree diagram

CMT CONNECTION

4.3.9

24A. Solve problems involving the organization of data

4.3.10

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

4.3.11

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

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

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

25A. Solve extended numerical and statistical problems.