

COMPENSATORY MATHEMATICS

The *Compensatory Mathematics* course is designed to give specialized mathematics instruction adjusted to the needs of a student who does not perform satisfactorily with regular mathematics instruction. The course must allow flexible adjustment of materials and methods for individual differences. This course can be taken as an elective. It cannot be counted as one of the required mathematics courses. This is a one-half credit or one-credit course.

This course will be activity-based, allowing students to explore and investigate mathematics concepts to build a stronger foundation of basic skills. Such explorations should emphasize physical models and other mathematical representations in appropriate situations that facilitate the learning process.

The competencies are printed in bold face type and are required to be taught. The competencies combine the content strands: **patterns/algebraic thinking, data analysis/prediction, measurement, geometric concepts, and number sense**, and the process strands: **problem solving/reasoning, estimating, incorporating technology, communicating, and making connections/applications**. The competencies may relate to one, many, or all of the mathematics curriculum strands and may be combined and taught with other competencies throughout the school year. Competencies are not listed in order of importance; rather the sequence of competencies relates to the broader K-12 framework. Competencies provide a general guideline of ongoing instruction, not isolated units, activities, or skills.

The suggested teaching objectives are optional. Objectives indicate concepts that enable fulfillment of competencies, describe competencies in further detail, or show the progression of concepts throughout the grades. School districts may adopt the objectives, modify them, and are encouraged to write their own objectives to meet the needs of students in their school district.

COMPENSATORY MATHEMATICS

CONTENT STRANDS:

Patterns/Algebraic Thinking (P)
Data Analysis/Prediction (D)
Measurement (M)

Geometric Concepts (G)
Number Sense (N)

COMPETENCIES and Suggested Teaching Objective(s):

- 1. Model and apply concepts and perform basic operations using decimals, fractions, and mixed numbers. (P, D, G, N)**
 - a. Use a number line and other models to compare, order, round, and estimate fractions and decimals.
 - b. Model and perform addition, subtraction, multiplication, and division of rational numbers to include decimals and fractions.
 - c. Solve real-life problems involving the four basic operations of decimals, fractions, and mixed numbers.
 - d. Use powers of ten to multiply and divide decimals.
 - e. Convert among decimals, fractions, and mixed numbers.

- 2. Apply and use basic principles of number sense and perform operations involving exponents, scientific notation, and order of operations. (P, M, N)**
 - a. Use patterns and models to review the concept of exponents.
 - b. Find the greatest common factor (GCF) and least common multiple (LCM) using prime factorization.
 - c. Convert between standard form and scientific notation.
 - d. Apply patterns to the concepts of roots of perfect squares and evaluate/estimate powers, squares, and square roots with and without a calculator.
 - e. Apply the order of operations to solve real-life problems.

- 3. Convert and use standard units (English and metric) of measurement. (P, D, M, G, N)**
 - a. Convert within a standard measurement system.
 - b. Use standard units of measurement to solve application problems.
 - c. Convert temperature using Fahrenheit and Celsius formulas.
 - d. Measure and find dimensions of given figures using standard measurements.

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COMPETENCIES and Suggested Teaching Objective(s):

4. Collect, organize, and interpret data using concepts of probability and statistics. (P, D, M, G, N)

- a. Interpret and construct frequency tables and charts from given data and student collected data.
- b. Interpret and construct histograms, bar, line, and circle graphs (when given degrees) from given data.
- c. Interpret and construct stem-and-leaf, scatter plots, and line plots from given data.
- d. Find and compare mean, median, mode, and range of given or collected sets of data.
- e. Make predictions based on given data.
- f. Solve problems using simple permutations and combinations.
- g. Calculate and apply probability of a single event.

5. Apply concepts of geometry to angles, polygons, and two and three-dimensional figures. (P, M, G, N)

- a. Identify and name two and three-dimensional figures.
- b. Classify, draw, and measure acute, obtuse, right, and straight angles.
- c. Classify and compare the properties of quadrilaterals.
- d. Classify triangles by sides and angles.
- e. Find the perimeter and area of polygons and circumference and area of circles.
- f. Perform rotations, reflections, and translations on plane figures.
- g. Apply the Pythagorean Theorem to solve real-life problems.

6. Model and apply the four basic operations of integers. (P, M, G, N)

- a. Recognize and write integers and determine their absolute value and additive inverse.
- b. Use models including the number line to compare and order integers.
- c. Add, subtract, multiply, and divide integers with and without manipulatives.
- d. Graph ordered pairs on a coordinate plane.

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COMPETENCIES and Suggested Teaching Objective(s):

7. Create and simplify algebraic expressions and solve linear equations and inequalities. (P, G, N)

- a. Convert among word phrases or sentences and algebraic expressions.
- b. Simplify and/or evaluate numerical and algebraic expressions.
- c. Solve linear equations with and without manipulatives.
- d. Write and solve equations that represent problem-solving situations.
- e. Write corresponding real-life situations from an algebraic expression or equation.
- f. Graph simple linear equations with and without a calculator.

8. Use concepts of ratio, proportion, and percent to solve application problems. (P, D, G, N)

- a. Convert between ratio and percents.
- b. Solve problems involving proportions.
- c. Determine unit rates, discounts, sale prices, sales tax, and simple interest.
- d. Determine the percent of a number.
- e. Solve problems for rate, base, and part.
- f. Find the percent of increase and decrease.
- g. Write and use percents to solve application problems.

Course: Compensatory Mathematics
Unit Theme: Basic Operations

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
1	a	Have each group member write a decimal or fraction of his/her choice on an index card. Have group members work together to arrange the numbers in ascending or descending order.	<ul style="list-style-type: none"> Peer evaluation; Teacher observation
1	a, b, c	Use liquid measuring cups to illustrate operations with fractions. Pour water in various amounts into a small cup and then into a larger cup. For example: $\frac{3}{4}$ cup + $\frac{1}{2}$ cup = $1\frac{1}{4}$ cups. Show subtraction by pouring water back into the small cup.	<ul style="list-style-type: none"> Teacher observation
1	a, b, c	Use quarters to demonstrate that only the numerators are added when adding like fractions. For example: $1 \text{ quarter } (\frac{1}{4}) + 3 \text{ quarters } (\frac{3}{4}) = 4 \text{ quarters } (\frac{4}{4})$ $\text{NOT } 4 \text{ eighths } (\frac{4}{8})$	<ul style="list-style-type: none"> Teacher observation
1	a, b	Fold a piece of paper in half and shade one-half of it. Unfold and fold again into thirds and shade two-thirds of it with a different color. The product is represented by the area shaded with both colors: For example: $\frac{1}{2} \times \frac{2}{3} = \frac{2}{6} \text{ or } \frac{1}{3}$	<ul style="list-style-type: none"> Teacher observation; Self-evaluation
1	c	Convert a recipe that feeds 4-6 people to feed 12 people. For example: Cherry Cream Parfaits—1 cup of whip cream, 3 tablespoons of sugar, 1 teaspoon of vanilla extract, 1 cup of sour cream, 1 can (21 ounces) of cherry pie filling (serves 6).	<ul style="list-style-type: none"> Rubric
1 2 3	c, d a a	Relate multiplication and division by powers of ten to conversion within the metric system. For example: $3 \text{ meters} = 3 \times 10^3 \text{ millimeters} = 3000\text{mm}$ $4 \text{ centimeters} = 4 \div 10^2 \text{ meters} = .04 \text{ meters}$	<ul style="list-style-type: none"> Teacher test
1	d	Give students several problems to work on the calculator. Allow them to discover the rule for multiplication and division by powers of ten.	<ul style="list-style-type: none"> Self-assessment using technology
1	e	Working in groups, have the leader determine the decimal value of a given fraction, then tell the group the denominator of the fraction and its decimal value. The first person to find the correct numerator with or without a calculator, scores a point. The group should take turns being the leader. The first person to score 5 points is the winner.	<ul style="list-style-type: none"> Peer evaluation

Course: Compensatory Mathematics
Unit Theme: Exponents, Scientific Notation, and Order of Operations

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
2	a	Cut out two boxes on grid paper to represent 2^1 , 4 boxes to represent 2^2 , etc. Glue these models on construction paper and have students continue the pattern to the left and right of 2^1 to illustrate the concept of exponents.	<ul style="list-style-type: none"> Rubric
2	b	Write a pair of prime factorizations which have several common factors on the board. Have students write an explanation describing how to find the greatest common factor (GCF).	<ul style="list-style-type: none"> Rubric; Journal
2	c	Play "Concentration" with a set of cards containing decimal numbers and their match written in scientific notation.	<ul style="list-style-type: none"> Peer evaluation
2	d	Use a square to model the relationship between the area (perfect square) and the length of its side (square root).	<ul style="list-style-type: none"> Teacher observation
2	d	Attempt to arrange 17 small tiles into a square. It will be discovered that this cannot be done, implying that 17 is NOT a perfect square. To estimate its square root, form the largest square possible from the 17 tiles. The square will contain 16 tiles with one left over. The length of the side of this square (square root) is 4. Next, add tiles until you have the next larger square. This square will contain 25 tiles and will have a length (square root) of 5. Therefore the $\sqrt{17}$ is between 4 and 5.	<ul style="list-style-type: none"> Teacher observation
2	e	<p>Prepare a set of seven cards using the numbers and symbols shown below for each group. Have each group use the number cards along with two operation cards to form an expression having each listed value.</p> <p style="text-align: center;">16, 8, 4, +, -, ÷, ×</p> <p>a) 8 b) 14 c) 18</p>	<ul style="list-style-type: none"> Peer evaluation

Course: Compensatory Mathematics
Unit Theme: Measurement

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
3	a d	Provide to each group rulers and yardsticks or metersticks. Measure the length of several objects and express each measure using 2 different units within the same measurement system.	<ul style="list-style-type: none"> • Teacher observation; Teacher test
3	b	Measure the classroom floor. Determine the amount of carpet needed to cover the floor. Use local advertisements to estimate the total cost.	<ul style="list-style-type: none"> • Project checklist; Teacher observation; Rubric
3 4	c b	Use the Internet to access local high and low Fahrenheit temperatures for one week. Convert them to Celsius. Graph both Celsius and Fahrenheit temperatures and compare and contrast the graphs.	<ul style="list-style-type: none"> • Rubric
3	c	Measure the classroom temperature, the temperature outside a classroom window, the temperature of a hot cup of coffee, and the temperature of a cup of ice water using a Celsius thermometer. Using the formula, $F = \frac{9}{5}C + 32$, convert these temperatures to degrees Fahrenheit. Check answers with a Fahrenheit thermometer.	<ul style="list-style-type: none"> • Peer evaluation
3	d	Find the density of water by measuring the mass in grams and the volume in milliliters of a small quantity of water. Use the formula $D = \frac{m}{v}$. Check answer by finding the density of water in a chemistry book or other reference.	<ul style="list-style-type: none"> • Self-assessment

Course: Compensatory Mathematics
Unit Theme: Probability and Statistics

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
4	a, b	Conduct a class survey on favorite foods, television shows, etc. Construct frequency tables, bar, line, and circle graphs from the gathered data.	<ul style="list-style-type: none"> Project checklist; Rubric
4	b	In pairs, roll two number cubes 100 times, keeping a tally of the sums. Make a histogram of the results.	<ul style="list-style-type: none"> Rubric
4	c, d	Have each student write the total number of siblings they have on an index card. Make a human line plot of this data. From the line plot, determine the range and mode of the data.	<ul style="list-style-type: none"> Teacher observation
4	a, b, d e, g	Use a graphing calculator program to generate random numbers simulating rolling a number cube 50 times. Use the data to create a table of results and find the mean, median, mode, and range. Ask the question: "Do you think that each number on a number cube has an equal chance of occurring when you throw the cube?"	<ul style="list-style-type: none"> Self-evaluation using technology
4	f	Model permutations using a penny, nickel, dime, and quarter. How many different ways can these coins be arranged?	<ul style="list-style-type: none"> Teacher observation
4	a, g	In groups, sort a bag of M&M's by color and record the data in a table. Compile the class data and determine the probability of selecting a particular color from any given bag.	<ul style="list-style-type: none"> Teacher observation

Course: Compensatory Mathematics
Unit Theme: Geometry

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
5	a	Conduct a "Geometry Treasure Hunt." Have students locate geometric figures on the school campus, identify them, and state how they are used in real-life.	<ul style="list-style-type: none"> • Project checklist
5	b, c	Use a Venn Diagram to visually compare and contrast the properties of quadrilaterals.	<ul style="list-style-type: none"> • Teacher observation; Constructed response
5	d	Using a pre-cut triangle with angles labeled A,B, and C, fold each angle to meet at a common side to illustrate that angles of a triangle have a sum of 180 degrees.	<ul style="list-style-type: none"> • Teacher observation
5	e	Cut out all possible rectangular arrangements of 12 squares from grid paper. Compare perimeters and areas of the arrangements.	<ul style="list-style-type: none"> • Rubric; Constructed response
5	f	Research M.C. Escher and locate examples of his work that illustrates how he used rotations, reflections, and translations in his art. Extension: Create original tessellations.	<ul style="list-style-type: none"> • Project
5	g	Measure two adjacent walls of the classroom and apply the Pythagorean Theorem to determine length of the diagonal. Measure the diagonal to verify the solution.	<ul style="list-style-type: none"> • Teacher observation; Rubric

Course: Compensatory Mathematics
Unit Theme: Integers

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
6	a, b	Locate several examples of integers from the newspaper. Determine the absolute value and additive inverse of each. Then put the integers in ascending or descending order.	<ul style="list-style-type: none">• Teacher test
6	c	Use two-sided counters to model basic operations with integers.	<ul style="list-style-type: none">• Teacher observation
6	d	Use a square pegboard to create a model of a coordinate plane. Use golf tees to plot ordered pairs on the pegboard.	<ul style="list-style-type: none">• Teacher observation

Course: Compensatory Mathematics
Unit Theme: Expressions, Equations, and Inequalities

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
7	a	Make a set of "Go Fish" cards where each matching set consists of a word phrase or sentence and an algebraic expression, equation, or inequality. In turn, each player should request from the person to the left the card he/she needs to complete a set. The game ends when one player runs out of cards. The player with the most matching sets wins the game.	<ul style="list-style-type: none"> • Peer evaluation
7	b	Give students several numerical and algebraic expressions to evaluate using pencil and paper. After completing, evaluate using a graphing calculator. Compare results.	<ul style="list-style-type: none"> • Self-assessment using technology
7	c, f	Use graphing calculators to graph and verify solutions to linear equations.	<ul style="list-style-type: none"> • Self-assessment using technology
7	c	Use Algebra Tiles or other manipulatives to model solving linear equations.	<ul style="list-style-type: none"> • Rubric
7	d, e	Write several equations on the board. Have each group write a problem-solving situation for each equation. Then, have each group read one of their word problems and have the class try to determine which equation matches the situation.	<ul style="list-style-type: none"> • Peer evaluation
7	e	Work in pairs to create word problems that can be solved by writing and solving an equation. Exchange problems and solve.	<ul style="list-style-type: none"> • Teacher observation; Peer evaluation

Course: Compensatory Mathematics
Unit Theme: Ratio, Proportion, and Percent

Comp.	Obj.	Suggested Teaching Strategies	Suggested Assessments
8	a	Shade part of a 10 by 10 grid. From the grid, tell what fraction, decimal, and percent this represents.	<ul style="list-style-type: none"> • Constructed response
8	b	Create a scale drawing of the classroom.	<ul style="list-style-type: none"> • Project checklist
1 8	a, b c c	Use grocery store advertisements to determine unit rates of various sizes of the same product. Determine the better buy.	<ul style="list-style-type: none"> • Teacher test
1 8	d, c d, f, g	Use newspaper advertisements to go on a shopping spree. Determine the total cost of the shopping spree including sales tax. Determine amount and percent saved on sale items.	<ul style="list-style-type: none"> • Checklist
8	e	Find a graph or newspaper article that involves the use of percents. Write a problem that involves finding either the rate, base, or part.	<ul style="list-style-type: none"> • Rubric