



Introduction to Algebra – Part 2

(Pre Algebra)

Michigan State Mathematics Content Expectations

Text Book

K. Elayne Martin-Gay. *Prealgebra, Fourth Edition*. Pearson Prentice Hall.

Unit 1 Description

This unit will focus on ratios and proportions.

Essential Content and Skills

The learner will:

- Write ratios as fractions.
 - Write ratios in simplest form.
 - Write ratios as fractions
 - Find unit rates and prices.
 - Find an unknown number in a proportion.
 - Solve problems by writing proportions.
 - Find the ratio of corresponding sides in similar triangles.
 - Find unknown lengths of sides in similar triangles.
 - Solve problems containing similar triangles.
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Unit 1 Michigan State Content Expectations

[Click here to view the Michigan DOE Curriculum Content Standards.](#)

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 1 Lesson 1: Ratios

State Standard	Description
N.ME.05.23	Express ratios in several ways given applied situations, e.g., 3 cups to 5 people, 3 : 5; recognize and find equivalent ratios. Find equivalent ratios by scaling up or scaling down.
N.ME.06.11	

Unit 1 Lesson 2: Ratios

State Standard	Description
N.ME.05.23	Express ratios in several ways given applied situations, e.g., 3 cups to 5 people, 3 : 5; recognize and find equivalent ratios. Find equivalent ratios by scaling up or scaling down.
N.ME.06.11	

Unit 1 Lesson 3: Rates

State Standard	Description
A.PA.06.01	Solve applied problems involving rates, including speed, e.g., if a car is going 50 mph, how far will it go in 3 hours? Calculate rates of change including speed. Convert ratio quantities between different systems of units, such as feet per second to miles per hour. Solve problems involving ratio units, such as miles per hour, dollars per pound, or persons per square mile.*
N.FL.07.03	
N.MR.07.04	
N.FL.08.11	

Unit 1 Lesson 4: Rates

State Standard	Description
A.PA.06.01	Solve applied problems involving rates, including speed, e.g., if a car is going 50 mph, how far will it go in 3 hours? Calculate rates of change including speed. Convert ratio quantities between different systems of units, such as feet per second to miles per hour. Solve problems involving ratio units, such as miles per hour, dollars per pound, or persons per square mile.
N.FL.07.03	
N.MR.07.04	
N.FL.08.11	

Unit 1 Lesson 5: Proportions

State Standard	Description
N.FL.07.05	Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables. observations, predictions, concepts, procedures, generalizations, ideas and results

Unit 1 Lesson 6: Proportions

State Standard	Description
N.FL.07.05	Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables. observations, predictions, concepts, procedures, generalizations, ideas and results

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 1 Lesson 7: Proportions and Problem Solving

State Standard	Description
N.FL.07.05	Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables. observations, predictions, concepts, procedures, generalizations, ideas and results

Unit 1 Lesson 8: Proportions and Problem Solving

State Standard	Description
N.FL.07.05	Solve proportion problems using such methods as unit rate, scaling, finding equivalent fractions, and solving the proportion equation $a/b = c/d$; know how to see patterns about proportional situations in tables. observations, predictions, concepts, procedures, generalizations, ideas and results

Unit 1 Lesson 9: Congruent and Similar Triangles

State Standard	Description
G.TR.07.03	Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.
G.TR.07.04	Solve problems about similar figures and scale drawings.
G.TR.07.05	Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.

Unit 1 Lesson 10: Congruent and Similar Triangles

State Standard	Description
G.TR.07.03	Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal; understand the concepts of similar figures and scale factor.
G.TR.07.04	Solve problems about similar figures and scale drawings.
G.TR.07.05	Show that two triangles are similar using the criteria: corresponding angles are congruent (AAA similarity); the ratios of two pairs of corresponding sides are equal and the included angles are congruent (SAS similarity); ratios of all pairs of corresponding sides are equal (SSS similarity); use these criteria to solve problems and to justify arguments.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Description

This unit will focus on percents.

Essential Content and Skills

The learner will:

- Write percents as decimals.
- Write decimals as percents.
- Write percents as fractions.
- Write fractions as percents.
- Convert percents, decimals and fractions.
- Write percent problems as equations.
- Solve percent problems.
- Write percent problems as proportions.
- Solve percent problems.
- Solve applications involving percent.
- Find percent increase and percent decrease.
- Calculate sales tax and total price.
- Calculate commissions.
- Calculate discount and sale price.
- Calculate simple interest.
- Use a compound interest table to calculate compound interest.
- Calculate monthly payments on loans.

Unit 2 Michigan State Content Expectations

Unit 2 Lesson 1: Percents, Decimals, and Fractions

State Standard	Description
N.ME.05.09	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.
N.MR.05.22	
N.FL.06.12	
N.MR.06.13	

Unit 2 Lesson 2: Solving Percent Problems with Equations

State Standard	Description
N.ME.05.09	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.
N.MR.05.22	
N.FL.06.12	
N.MR.06.13	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Lesson 3: Solving Percent Problems with Equations

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 4: Solving Percent Problems with Proportions

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 5: Solving Percent Problems with Proportions

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 6: Applications of Percent

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 7: Applications of Percent

State Standard	Description
N.ME.05.09 N.MR.05.22 N.FL.06.12 N.MR.06.13	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage. Express fractions and decimals as percentages and vice versa. Calculate part of a number given the percentage and the number. Solve contextual problems involving percentages such as sales taxes and tips.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 2 Lesson 8: Percent and Problem Solving

State Standard	Description
N.ME.05.09	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.
N.MR.05.22	Express fractions and decimals as percentages and vice versa.
N.FL.06.12	Calculate part of a number given the percentage and the number.
N.MR.06.13	Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 9: Percent and Problem Solving

State Standard	Description
N.ME.05.09	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.
N.MR.05.22	Express fractions and decimals as percentages and vice versa.
N.FL.06.12	Calculate part of a number given the percentage and the number.
N.MR.06.13	Solve contextual problems involving percentages such as sales taxes and tips.

Unit 2 Lesson 10: Percent and Problem Solving

State Standard	Description
N.ME.05.09	Understand percentages as parts out of 100, use % notation, and express a part of a whole as a percentage.
N.MR.05.22	Express fractions and decimals as percentages and vice versa.
N.FL.06.12	Calculate part of a number given the percentage and the number.
N.MR.06.13	Solve contextual problems involving percentages such as sales taxes and tips.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Description

This unit will focus on geometry and measurement.

Essential Content and Skills

The learner will:

- Identify lines, line segments, rays, and angles.
- Classify angles as acute, right, obtuse, or straight.
- Identify complementary and supplementary angles.
- Find measures of angles.
- Use mixed units of length.
- Perform arithmetic operations on U.S. units of length.
- Define metric units of length and convert from one unit to another.
- Perform arithmetic operations on metric units of length.
- Use formulas to find perimeter and circumferences.
- Find the area and volume of geometric figures.
- Perform arithmetic operations on units of weight and mass.
- Perform arithmetic operations on U.S. and metric units of capacity.
- Convert between the U.S. and Metric systems.

Unit 3 Michigan State Content Expectations

Unit 3 Lesson 1: Lines and Angles

State Standard	Description
G.GS.03.01 G.TR.05.01	Identify points, line segments, lines, and distance. Associate an angle with a certain amount of turning; know that angles are measured in degrees; understand that 90° , 180° , 270° , and 360° are associated respectively, with 14 , 12 , and 34 , and full turns.
G.GS.05.02	Measure angles with a protractor and classify them as acute, right, obtuse, or straight.
G.GS.05.03	Identify and name angles on a straight line and vertical angles.
G.GS.05.04	Find unknown angles in problems involving angles on a straight line, angles surrounding a point, and vertical angles.
G.GS.05.05	Know that angles on a straight line add up to 180° and angles surrounding a point add up to 360° ; justify informally by “surrounding” a point with angles.
G.GS.05.06	Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 2: Linear Measurement

State Standard	Description
M.TE.04.05	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Understand that for polygons, congruence means corresponding sides and angles have equal measures.
G.GS.06.02	

Unit 3 Lesson 3: Perimeter

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas. Understand why the sum of the interior angles of a triangle is 180° and the sum of the interior angles of a quadrilateral is 360° , and use these properties to solve problems. Solve problems about geometric shapes Find unknown angles and sides using the properties of: triangles, including right, isosceles, and equilateral triangles; parallelograms, including rectangles and rhombuses; and trapezoids. Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.
G.GS.05.06	
G.GS.05.07	
G.SR.08.03	

Unit 3 Lesson 4: Area and Volume

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas. Understand and know how to use the area formula of a triangle: $A = \frac{1}{2}bh$ (where b is length of the base and h is the height), and represent using models and manipulatives. Understand and know how to use the area formula for a parallelogram: $A = bh$, and represent using models and manipulatives. Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas. Know the volume formulas for generalized cylinders (area of base) x height), generalized cones and pyramids ($\frac{1}{3}$ (area of base) x height), and spheres ($\frac{4}{3}\pi r^3$ (radius)) and apply them to solve problems. Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.
M.TE.05.06	
M.TE.05.07	
M.TE.06.03	
G.SR.08.06	
G.SR.08.07	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 5: Area and Volume

State Standard	Description
M.TE.04.06	Know and understand the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas.
M.TE.05.06	Understand and know how to use the area formula of a triangle: $A = \frac{1}{2}bh$ (where b is length of the base and h is the height), and represent using models and manipulatives.
M.TE.05.07	Understand and know how to use the area formula for a parallelogram: $A = bh$, and represent using models and manipulatives.
M.TE.06.03	Compute the volume and surface area of cubes and rectangular prisms given the lengths of their sides, using formulas.
G.SR.08.06	Know the volume formulas for generalized cylinders (area of base) \times height), generalized cones and pyramids ($\frac{1}{3}$ (area of base) \times height), and spheres ($\frac{4}{3}\pi r^3$) and apply them to solve problems.
G.SR.08.07	Understand the concept of surface area, and find the surface area of prisms, cones, spheres, pyramids, and cylinders.

Unit 3 Lesson 6: Weight and Mass

State Standard	Description
M.TE.04.5	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations).
M.UN.05.04	Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers.
M.UN.06.01	Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.

Unit 3 Lesson 7: Weight and Mass

State Standard	Description
M.TE.04.5	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations).
M.UN.05.04	Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers.
M.UN.06.01	Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 3 Lesson 8: Capacity

State Standard	Description
M.TE.04.5	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers. Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.
M.UN.05.04	
M.UN.06.01	

Unit 3 Lesson 9: Capacity

State Standard	Description
M.TE.04.5	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers. Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.
M.UN.05.04	
M.UN.06.01	

Unit 3 Lesson 10: Conversions Between the U.S. and Metric Systems

State Standard	Description
M.TE.04.5	Carry out the following conversions from one unit of measure to a larger or smaller unit of measure: meters to centimeters, kilograms to grams, liters to milliliters, hours to minutes, minutes to seconds, years to months, weeks to days, feet to inches, ounces to pounds (using numbers that involve only simple calculations). Convert measurements of length, weight, area, volume, and time within a given system using easily manipulated numbers. Convert between basic units of measurement within a single measurement system, e.g., square inches to square feet.
M.UN.05.04	
M.UN.06.01	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Description

This unit will focus on graphing, statistics, and polynomials.

Essential Content and Skills

The learner will:

- Read pictographs and line graphs.
- Read and construct bar graphs and histograms.
- Read and draw circle graphs.
- Plot points on a rectangular coordinate system.
- Determine whether ordered pairs are solutions of equations.
- Complete ordered pair solutions of equations
- Graph linear equations by plotting points.
- Find the mean of a list of numbers.
- Find the median of list of numbers.
- Find the mode of a list of numbers.
- Add polynomials.
- Subtract polynomials.
- Evaluate polynomials at given replacement values.
- Use the product and power rule for exponents.
- Multiply a monomial and any polynomial.
- Multiply two binomials.
- Multiply any two polynomials.

Unit 4 Michigan State Content Expectations

Unit 4 Lesson 1: Reading Pictographs, Bar Graphs, and Line Graphs

State Standard	Description
D.RE.04.01 D.RE.05.01	Construct tables and bar graphs from given data. Read and interpret line graphs, and solve problems based on line graphs, e.g., distance-time graphs, and problems with two or three line graphs on same axes, comparing different data.
D.RE.05.02	Construct line graphs from tables of data; include axis labels and scale.

Unit 4 Lesson 2: Reading Circle Graphs

State Standard	Description
D.RE.07.01	Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions. Represent and use numbers in equivalent forms (e.g., integers, fractions, decimals, percents, exponents, scientific notation, square roots).

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 3: The Rectangular Coordinate System

State Standard	Description
A.RP.06.02	Plot ordered pairs of integers and use ordered pairs of integers to identify points in all four quadrants of the coordinate plane. Understand that relationships between quantities can be suggested by graphs and tables. Solve problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers, e.g., given c chairs, the "leg function" is $4c$; if you have 5 chairs, how many legs?; if you have 12 legs, how many chairs?*
A.RP.06.08	
A.PA.06.09	
A.RP.06.10	

Unit 4 Lesson 4: Graphing Linear Equations

State Standard	Description
A.FO.06.11	Relate simple linear equations with integer coefficients, e.g., $3x = 8$ or $x + 5 = 10$, to particular contexts and solve. Solve equations of the form $ax + b = c$, e.g., $3x + 8 = 15$ by hand for positive integer coefficients less than 20, use calculators otherwise, and interpret the results. Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship. Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations. From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions.
A.FO.06.14	
APA.07.01	
A.RP.07.02	
A.FO.07.13	

Unit 4 Lesson 5: Graphing Linear Equations

State Standard	Description
A.FO.06.11	Relate simple linear equations with integer coefficients, e.g., $3x = 8$ or $x + 5 = 10$, to particular contexts and solve. Solve equations of the form $ax + b = c$, e.g., $3x + 8 = 15$ by hand for positive integer coefficients less than 20, use calculators otherwise, and interpret the results. Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship. Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations. From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions. Create and interpret scatter plots and find line of best fit; use an estimated line of best fit to answer questions about the data. Construct a scatterplot for a bivariate data set with appropriate labels and scales. Given a scatterplot, identify patterns, clusters, and outliers. Recognize no correlation, weak correlation, and strong correlation.
A.FO.06.14	
APA.07.01	
A.RP.07.02	
A.FO.07.13	
D.AN.7.02	
S2.1.1 S2.1.2	

Course Name - Part

Michigan State Curriculum Content Standards (continued)

Unit 4 Lesson 6: Mean, Median, and Mode

State Standard	Description
D.AN.05.03	Given a set of data, find and interpret the mean (using the concept of fair share) and mode. Determine which measure of central tendency (mean, median, mode) best represents a data set, e.g., salaries, home prices, for answering certain questions; justify the choice made.
D.AN.08.01	

Unit 4 Lesson 7: Adding and Subtracting Polynomials

State Standard	Description
A.FO.07.12	Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., $(92x + 8y) - 5x + y$, or $x(x+2)$ and justify using properties of real numbers.* From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions. Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address specific questions. Write the symbolic form and sketch the graph of simple polynomial functions.
A.FO.07.13	
D.RE.07.01	
A3.5.1	

Unit 4 Lesson 8: Multiplication Properties of Exponents

State Standard	Description
N.ME.06.16	Understand and use integer exponents, excluding powers of negative bases; express numbers in scientific notation. Calculate fluently with numerical expressions involving exponents; use the rules of exponents; evaluate numerical expressions involving rational and negative exponents; transition easily between roots and exponents. Know the properties of exponents and roots and apply them in algebraic expressions.
L2.1.2	
A1.1.2	

Unit 4 Lesson 9: Multiplying Polynomials

State Standard	Description
A.FO.07.12	Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., $(92x + 8y) - 5x + y$, or $x(x+2)$ and justify using properties of real numbers.* From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions. Write the symbolic form and sketch the graph of simple polynomial functions.
A.FO.07.13	
A3.5.1	

Unit 4 Lesson 10: Multiplying Polynomials

State Standard	Description
A.FO.07.12	Add, subtract, and multiply simple algebraic expressions of the first degree, e.g., $(92x + 8y) - 5x + y$, or $x(x+2)$ and justify using properties of real numbers.* From applied situations, generate and solve linear equations of the form $ax + b = c$ and $ax + b = cx + d$, and interpret solutions. Write the symbolic form and sketch the graph of simple polynomial functions.
A.FO.07.13	
A3.5.1	

Course Name - Part

Michigan State Curriculum Content Standards (continued)
