



ESL
SCIENCE
BUSINESS
BILINGUAL
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MATHEMATICS
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SOCIAL STUDIES
WORLD LANGUAGES
GIFTED & TALENTED
TECHNOLOGY EDUCATION
ENGLISH LANGUAGE ARTS
FINE & PERFORMING ARTS
FAMILY & CONSUMER SCIENCE
HEALTH & PHYSICAL EDUCATION

RAHWAY PUBLIC SCHOOLS

CURRICULUM & INSTRUCTION

Content Area: Mathematics

Course: College Prep Math

Grade Level: 9 - 12

This curriculum is part of the Educational Program of Studies of the Rahway Public Schools.

ACKNOWLEDGMENTS

James Fisher, Program Supervisor for Special Education

Jeffrey Kurczeski, Program Supervisor for Secondary Math and Science

The Board acknowledges the following who contributed to the preparation of this curriculum.

Steven Santner

RAHWAY PUBLIC SCHOOLS CURRICULUM

Dr. Tiffany Beer, Director of Curriculum and Instruction

Subject/Course Title:

**CP Mathematics
Grade 12**

Date of Board Adoptions:

**September 19, 2016
Revised August 27, 2024**

RAHWAY PUBLIC SCHOOLS CURRICULUM

College Prep Mathematics - Grade 12

Pacing Guide

Unit	Title	Pacing
1	Arithmetic Operations and Conversions [Non-Calculator Unit]	4 weeks
2	Vital Basics of Algebra	6 weeks
3	Advanced Algebraic Concepts	6 weeks
4	Geometric Applications	6 weeks
5	Operations with polynomials and rational functions	8 weeks
6	Composite, Inverse, and Logarithmic Functions	5 weeks
7	Permutations, Combinations, and Series	5 weeks

ACCOMMODATIONS

504 Accommodations:

- Provide scaffolded vocabulary and vocabulary lists.
- Provide extra visual and verbal cues and prompts.
- Provide adapted/alternate/excerpted versions of the text and/or modified supplementary materials.
- Provide links to audio files and utilize video clips.
- Provide graphic organizers and/or checklists.
- Provide modified rubrics.
- Provide a copy of teaching notes, especially any key terms, in advance.
- Allow additional time to complete assignments and/or assessments.
- Provide shorter writing assignments.
- Provide sentence starters.
- Utilize small group instruction.
- Utilize Think-Pair-Share structure.
- Check for understanding frequently.
- Have student restate information.
- Support auditory presentations with visuals.
- Weekly home-school communication tools (notebook, daily log, phone calls or email messages).
- Provide study sheets and teacher outlines prior to assessments.
- Quiet corner or room to calm down and relax when anxious.
- Reduction of distractions.
- Permit answers to be dictated.
- Hands-on activities.
- Use of manipulatives.
- Assign preferential seating.
- No penalty for spelling errors or sloppy handwriting.
- Follow a routine/schedule.
- Provide student with rest breaks.
- Use verbal and visual cues regarding directions and staying on task.
- Assist in maintaining agenda book.

IEP Accommodations:

- Provide scaffolded vocabulary and vocabulary lists.
- Differentiate reading levels of texts (e.g., Newsela).
- Provide adapted/alternate/excerpted versions of the text and/or modified supplementary materials.
- Provide extra visual and verbal cues and prompts.
- Provide links to audio files and utilize video clips.
- Provide graphic organizers and/or checklists.
- Provide modified rubrics.
- Provide a copy of teaching notes, especially any key terms, in advance.
- Provide students with additional information to supplement notes.
- Modify questioning techniques and provide a reduced number of questions or items on tests.
- Allow additional time to complete assignments and/or assessments.
- Provide shorter writing assignments.
- Provide sentence starters.
- Utilize small group instruction.
- Utilize Think-Pair-Share structure.
- Check for understanding frequently.
- Have student restate information.
- Support auditory presentations with visuals.
- Provide study sheets and teacher outlines prior to assessments.
- Use of manipulatives.
- Have students work with partners or in groups for reading, presentations, assignments, and analyses.
- Assign appropriate roles in collaborative work.
- Assign preferential seating.
- Follow a routine/schedule.

Gifted and Talented Accommodations:

- Differentiate reading levels of texts (e.g., Newsela).
- Offer students additional texts with higher lexile levels.
- Provide more challenging and/or more supplemental readings and/or activities to deepen understanding.
- Allow for independent reading, research, and projects.
- Accelerate or compact the curriculum.
- Offer higher-level thinking questions for deeper analysis.
- Offer more rigorous materials/tasks/prompts.
- Increase number and complexity of sources.
- Assign group research and presentations to teach the class.
- Assign/allow for leadership roles during collaborative work and in other learning activities.

ELL Accommodations:

- Provide extended time.
- Assign preferential seating.
- Assign peer buddy who the student can work with.
- Check for understanding frequently.
- Provide language feedback often (such as grammar errors, tenses, subject-verb agreements, etc...).
- Have student repeat directions.
- Make vocabulary words available during classwork and exams.
- Use study guides/checklists to organize information.
- Repeat directions.
- Increase one-on-one conferencing.
- Allow student to listen to an audio version of the text.
- Give directions in small, distinct steps.
- Allow copying from paper/book.
- Give student a copy of the class notes.
- Provide written and oral instructions.
- Differentiate reading levels of texts (e.g., Newsela).
- Shorten assignments.

- Read directions aloud to student.
- Give oral clues or prompts.
- Record or type assignments.
- Adapt worksheets/packets.
- Create alternate assignments.
- Have student enter written assignments in criterion, where they can use the planning maps to help get them started and receive feedback after it is submitted.
- Allow student to resubmit assignments.
- Use small group instruction.
- Simplify language.
- Provide scaffolded vocabulary and vocabulary lists.
- Demonstrate concepts possibly through the use of visuals.
- Use manipulatives.
- Emphasize critical information by highlighting it for the student.
- Use graphic organizers.
- Pre-teach or pre-view vocabulary.
- Provide student with a list of prompts or sentence starters that they can use when completing a written assignment.
- Provide audio versions of the textbooks.
- Highlight textbooks/study guides.
- Use supplementary materials.
- Give assistance in note taking
- Use adapted/modified textbooks.
- Allow use of computer/word processor.
- Allow student to answer orally, give extended time (time-and-a-half).
- Allow tests to be given in a separate location (with the ESL teacher).
- Allow additional time to complete assignments and/or assessments.
- Read question to student to clarify.
- Provide a definition or synonym for words on a test that do not impact the validity of the exam.
- Modify the format of assessments.
- Shorten test length or require only selected test items.
- Create alternative assessments.
- On an exam other than a spelling test, don't take points off for spelling errors.

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 1: Arithmetic Operations and Conversions [Non-Calculator Unit]

Target Course/Grade Level: Accuplacer Prep Math/ Grade 12

Unit Summary:

- Rational and irrational numbers
- Converting decimals to fractions and vice versa
- Ordering numbers from smallest to largest and vice versa
- Estimating operations with decimals and fractions
- Order of operations

Approximate Length of Unit: 4 weeks

LEARNING TARGETS

NJSLS Standards:

6.EE.A.2.c: Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations).

6.NS.C.7: Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation.

8.NS.A.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually and convert a decimal expansion which repeats eventually into a rational number.

8.NS.A.2: Use rational approximations of irrational numbers to compare the size of irrational numbers, locate them approximately on a number line diagram, and estimate the value of expressions (e.g., π^2). For example, by truncating the decimal expansion of $\sqrt{2}$, show that $\sqrt{2}$ is between 1 and 2, then between 1.4 and 1.5, and explain how to continue on to get better approximations.

8.EE.A.4: Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology.

F.IF.B.6: Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.

Primary Interdisciplinary Connections:

8.NS.A.1: Know that numbers that are not rational are called irrational. Understand informally that every number has a decimal expansion; for rational numbers show that the decimal expansion repeats eventually, and convert a decimal expansion which repeats eventually into a rational number.

RST.11-12.8: Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.

HS-ESS3-3: Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

21st Century Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- Rational numbers can be expressed as fractions, irrational numbers cannot.
- All fractions can be converted into decimals and most decimals can be converted to fractions.
- How to properly order decimals and fractions from largest to smallest or smallest to largest.
- How to complete operations with decimals and fractions without a calculator.
- How to properly follow order of operations in complex strings of arithmetic calculation.

Unit Essential Questions

- Write an example of a rational number.
- Write an example of an irrational number.
- Convert the fraction $\frac{2}{16}$ into decimal form.
- Can the number $\sqrt{2}$ be converted into fraction form? Why or why not?
- What is the product of $\sqrt{2} * \sqrt{15}$?
- Order the following numbers from smallest to largest: $\frac{-1}{3}$, $\frac{2}{3}$, $\frac{5}{6}$, $\frac{12}{13}$, $\frac{2}{27}$.
- Order the following numbers from largest to smallest: $-\pi$, 0, $\sqrt{7}$, $-\sqrt{2}$, $\frac{1}{5}$, $\frac{10}{6}$.
- What integer is closest to $27.8 * 9.6$?
- What is the end result of the following expression? $4^5 \times 6^2$
- What is the end result of the following expression? $\frac{2}{3} + 6 \div 2 \times 12 - 10$

Knowledge and Skills

Students will know...

Vocabulary

- Rational number, irrational number
- Integer

Students will know...

- How to convert decimals to fractions
- How to convert fractions to decimals
- How to estimate operations with decimals

Students will be able to...

- Order numbers from smallest to largest
- Converting fractions to decimals for efficiency

- Order numbers from largest to smallest
- Converting fractions to decimals for efficiency
- Identify rational numbers vs. irrational numbers
- Estimate operations with decimals
- Use order of operations correctly
- Use order of operations correctly in word problems

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Group presentation
- Homework

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Group puzzle project
- Use real-world scenarios to incorporate practical applications

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 2: Vital Basics of Algebra

Target Course/Grade Level: Accuplacer Prep Math/Grade 12

Unit Summary:

- Translating written phrases into algebraic expressions
- Simplifying algebraic expressions
- Solving single variable equations
- Solving equations with two variables
- Graphing equations with two variables
- Manipulating multi-variable equations to solve for one variable
- Operations with radicals
- Operations with exponents

Approximate Length of Unit: 6 weeks

LEARNING TARGETS

NJSLS Standards:

A.REI.1: Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.

A.REI.2: 2: Solve simple rational and radical equations in one variable, and give examples showing how extraneous solutions may arise.

8.EE.A.2.b: Simplify numerical radicals, limiting to square roots (i.e. nonperfect squares).

8.EE.C.7.a: Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms.

8.EE.C.8.c: Solve real-world and mathematical problems leading to two linear equations in two variables.

F.IF.B.4: Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $ax + b = c$, or results (where a and b are different numbers).

F.IF.C.7.a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

HS-ESS2-6: Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere.

MS-PS4-1: Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.

MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

9.2.8.CAP.20: Identify the items to consider when estimating the cost of funding a business.

9.2.12.CAP.22: Compare risk and reward potential and use the comparison to decide whether starting a business is feasible.

21st Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- How to evaluate and simplify algebraic expressions.
- The laws of exponents and how exponents interact with different operations.
- All equations can be solved for a single variable using the algebraic property of equality.
- All multi-variable equations can be solved for a single variable using a given combination of properties of equality.
- Any algebraic expression can be written in word form.
- Isolating a variable being multiplied by a fraction requires both sides of the equation being multiplied by the reciprocal of that fraction.
- The square root of any base is the same as that base raised to the one half power.
- All inequalities can apply the same properties of equality just as equations do to solve for a given variable.
- When inequalities use the multiplication and division properties of equality for a negative number the inequality sign flips one way or the other.
- Evaluating algebraic expressions and equations for given values of any number of variables.

Unit Essential Questions

- What is the value of the expression $2x^2 + 3xy - 4y^2$ when $x = 2$ and $y = -4$?
- Write an algebraic expression to represent 25% of n.
- $(3x - 2y)^2 = ?$
- What does $\frac{u}{x} + \frac{5u}{x} - \frac{u}{5x} =$, if $u \neq 0$?
- Graph the inequality $2x - 4 \geq -3$ on a number line.
- If $2x - 3(x + 4) = -5$, then what does x equal?
- $-3(5 - 6) - 4(2 - 3) = ?$
- Solve the formula $C = \frac{F - 32}{1.8}$ for F.
- $2^{\frac{5}{2}} - 2^{\frac{3}{2}} = ?$
- If $a \neq b$ and $\frac{1}{x} + \frac{1}{a} = \frac{1}{b}$, what does x equal?

Knowledge and Skills

Students will know...

Vocabulary

- Algebraic Expression
- Algebraic Equation
- Algebraic Inequality
- Reciprocal

Students will know...

- How to simplify algebraic expressions.
- How to evaluate algebraic expressions and equations for a given value of a variable.
- What the algebraic properties of equality are.
- Why the algebraic properties of equality are vital to manipulating algebraic equations and inequalities.
- How different operations affect algebraic equations and expressions that contain exponents.

Students will be able to...

- Define and provide examples of: Algebraic expressions, algebraic equations, Algebraic inequalities, and reciprocal.
- Simplify algebraic expressions.
- Evaluate single-variable algebraic equations for a given variable value.
- Evaluate multi-variable algebraic equations for given variable values.
- Solve single-variable equations.
- Define the different types of algebraic properties of equality.
- Apply the different types of algebraic properties of equality.
- Solve single-variable inequalities.
- Apply the various laws of exponents in attempts to solve equations and inequalities.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Use real-world scenarios to incorporate practical applications

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 3: Advanced Algebraic Concepts

Target Course/Grade Level: College Prep Math/ Grade 12

Unit Summary:

- Solving and graphing systems of inequalities
- Function notation
- Solving and graphing linear equations.
- Solving and graphing systems of linear equations
- Solving Quadratic functions

Approximate Length of Unit: 6 weeks

LEARNING TARGETS

NJSLS Math Standards:

N.CN.C.7: Solve quadratic equations with real coefficients that have complex solutions.

N.CN.C.9: Know the Fundamental Theorem of Algebra; show that it is true for quadratic polynomials.

A.CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A.REI.B.3: Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.

A.REI.B.4: Solve quadratic equations in one variable.

A.SSE.B.3.a: Factor a quadratic expression to reveal the zeros of the function it defines.

A.SSE.B.3.b: Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

A.SSE.B.3.c: Use the properties of exponents to transform expressions for exponential functions.

F.BF.A.1: Write a function that describes a relationship between two quantities.

F.BF.A.1.a: Determine an explicit expression, a recursive process, or steps for calculation from a context.

F.BF.A.1.b: Combine standard function types using arithmetic operations.

F.BF.A.1.c: Compose functions.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

MS-PS3-1: Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.

MS-PS3-2: Develop a model to describe that when the arrangement of objects interacting at a distance changes, different amounts of potential energy are stored in the system.

HSF-IF.C.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

21st Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- Solving a system of inequalities provides an infinite number of solutions within a given constraint.
- How to define and identify a function.
- All instances where one quantity varies directly or inversely with another can be expressed in the form of a linear function.
- All linear functions can be graphed.
- All systems of linear equations can be solved graphically and algebraically.
- Quadratic functions can be solved by factoring or using the quadratic formula.
- Some quadratic functions have imaginary roots.
- Imaginary roots to quadratic functions/equations can be simplified.

Unit Essential Questions

- List 3 possible solutions to the following system of inequalities: $x + y > 1$; $2x - y = 4$.
- Are the ordered pairs: $A = \{(1, 2), (3, -7), (0, 10), (4, -1), (1, 2)\}$ representative of a function?
- How many solutions does the following system of equations have: $2x + 6y = 5$; $x + 3y = 2$?
- Create a function of a line that is parallel to the line $f(x) = 2x$.
- Create the function of a line that is perpendicular to the line $g(x) = \frac{1}{3}x - 1$ and also passes through the point $(5, -1)$.
- Graph the linear equation: $2x + 3y = 9$.
- Factor the quadratic function: $p(x) = x^2 - 3x + 2$ into its two binomials.
- Determine the roots of the function $h(x) = 9x^2 + 3x + 10$ using the quadratic formula.
- Simplify the following result of a quadratic function: $q(x) = \frac{-4 \pm \sqrt{-144}}{6}$.
- How many real roots does the following function have: $r(x) = 10x^2 - x + 9$.
- What factor do the functions $q(x) = x^2 - x - 6$ and $t(x) = x^2 - 5x + 6$ have in common? _____

Knowledge and Skills

Students will know...

Vocabulary

- Function
- Systems
- Quadratics
- Imaginary roots
- Real roots

Students will know...

- How systems of inequalities and equations are similar and different.
- How to illustrate rate of change in the form of a linear function.
- The difference between linear and quadratic functions.
- Why certain systems have a solution, multiple solutions, or no solution at all.
- What roots are in relation to quadratic functions.
- What an imaginary root is, and why the root is referred to as imaginary.

Students will be able to...

- Solve and graph a linear equation.
- Convert a linear equation into a function.
- Solve a system of inequalities.
- List any number of solutions to a system of inequalities.
- Creating linear functions to meet certain criteria
- Solve and graph a system of linear equations.
- Factor a Quadratic function.
- Apply the quadratic formula to a quadratic function.
- Determine the number of solutions to a system of linear functions.
- Determine the number of real or imaginary solutions to any quadratic function.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Use real-world scenarios to incorporate practical applications
- Stock price activity

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 4: Geometric Applications

Target Course/Grade Level: College Prep Math/ Grade 12

Unit Summary:

- Angle addition postulate
- Segment addition postulate
- Triangle sum theorem
- Area of Polygons (regular and irregular)
- Manipulating area formulas to find a given length
- Determining area given unsubstantial information
- Perimeter of polygons
- Manipulating perimeter formulas to find a given length
- Determining perimeter given unsubstantial information

Approximate Length of Unit: 6 weeks

LEARNING TARGETS

NJSLS Math Standards:

G.CO.A.1: Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

G.GPE.B.6: Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

8.G.A.1.a: Lines are transformed to lines, and line segments to line segments of the same length.

G.GPE.B.7: Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.

G.SRT.B.4: Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

G.SRT.C.8: Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

G.MG.A.2: Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).

5.NF.B.4.b: Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles, and represent fraction products as rectangular areas.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

4-ESS2-1: Make observations and/or measurements to provide evidence of the effects of weathering or the rate of erosion by water, ice, wind, or vegetation.

RI.4.7: Interpret information presented visually, orally, or quantitatively (e.g., in charts, graphs, diagrams, time lines, animations, or interactive elements on Web pages) and explain how the information contributes to an understanding of the text in which it appears.

6.SP.B.4: Display numerical data in plots on a number line, including dot plots, histograms, and box plots.

8.F.A.3: Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.

HSS-ID.A.1: Represent data with plots on the real number line.

21st Life and Career Standard:

Career Ready Practices

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- The three angles of a triangle add up to 180° .
- Triangle sum theorem can be used to create and solve algebraic equations.
- Segment addition postulate can be used to create and solve algebraic equations.
- Angle addition postulate can be used to create and solve algebraic equations.
- The sum of the interior angles of any polygon can be calculated.
- The area of any regular polygon can be calculated.
- The area of any circle can be calculated.
- The area of one polygon or circle relative to another can be determined by finding the quotient of the two.
- Area and perimeter formulas can be manipulated to illustrate quantities in variable form.

Unit Essential Questions

- Jen wants to tile her kitchen. Her kitchen is rectangular and measures 12 feet by 8 feet. If tile costs \$2.50/square foot, how much will it cost to tile Jen's floor?
- Two of the angles in a right triangle measure up to 35° and 45° . How many degrees is the third angle?
- Two separate square plots of land have an area of 5 square yards, and 125 square yards respectively. How many feet of fencing will be required to fence in both plots of land?
- A small circle lies within a larger circle and they share the same center point. The larger circle has a radius R , and the smaller circle has a radius of three less than R . Apply what is known about the circles to develop an algebraic expression that accurately shows the area of the larger circle that is not covered by the smaller circle.
- Points T , U , and V are on the same line. Point U is between points T and V . Given the following measurements, solve for UV : $TU = 2x - 1$, $UV = 3x + 6$, and $TV = 45$ feet.
- An angle $\angle ABC$ contains BD such that $\angle ABD + \angle DBC = \angle ABC$. Given the following measurements solve for $\angle DBC$: $\angle ABD = 39^\circ$, $\angle DBC = 17x + 1$; $\angle ABC = 250 + 3x$

Knowledge and Skills

Students will know...

- When to apply the segment addition and angle addition postulates.
- The connection between triangle sum theorem, and all other interior angle sum theorems.
- The practical application behind area formulas
- How to manipulate an area or perimeter equation to solve for a variable, given unsubstantial information.

Students will be able to...

- Create an equation to determine an angle or variable value using triangle sum theorem.
- Create an equation to determine an angle or variable value using segment addition postulate.
- Create an equation to determine an angle or variable value using angle addition postulate.
- Use area formulas to determine the relative size of one circle or polygon to another circle or polygon.
- Apply area formula to practical application problems.
- Simplify a perimeter or area formula into an algebraic expression given unsubstantial information.
- Apply perimeter formula to determine a side length.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Use real-world scenarios to incorporate practical applications
- Create office floorplan activity

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 5: Operations with polynomials and rational functions

Target Course/Grade Level: College Prep Math/Grade 12

Unit Summary

- Operations with polynomials
- Operations with rational functions
- Synthetic division of polynomials
- Remainder Theorem
- Evaluating Quadratic, cubic, quartic, and rational functions for a given variable value.

Approximate Length of Unit: 9 weeks

LEARNING TARGETS

NJSLS Math Standards:

A.APR.A.1: Understand that polynomials form a system analogous to the integers, namely, they are closed under the operations of addition, subtraction, and multiplication; add, subtract, and multiply polynomials.

A.APR.B.3: Identify zeros of polynomials when suitable factorizations are available, and use the zeros to construct a rough graph of the function defined by the polynomial.

F.IF.C.7.c: Graph polynomial functions, identifying zeros when suitable factorizations are available, and showing end behavior.

F.LE.A.3: Observe using graphs and tables that a quantity increasing exponentially eventually exceeds a quantity increasing linearly, quadratically, or (more generally) as a polynomial function.

7.NS.A.2: Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers.

A.APR.D.7: Understand that rational expressions form a system analogous to the rational numbers, closed under addition, subtraction, multiplication, and division by a nonzero rational expression; add, subtract, multiply, and divide rational expressions.

7.NS.A.2.d: Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats.

N.RN.A.1: Explain how the definition of the meaning of rational exponents follows from extending the properties of integer exponents to those values, allowing for a notation for radicals in terms of rational exponents.

N.RN.A.2: Rewrite expressions involving radicals and rational exponents using the properties of exponents.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

MS-PS2-5: Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other even though the objects are not in contact.

8.1.5.AP.4: Break down problems into smaller, manageable sub-problems to facilitate program development.

RI.6.8: Trace and evaluate the argument and specific claims in a text, distinguishing claims that are supported by reasons and evidence from claims that are not.

RI.8.8: Trace and evaluate the argument and specific claims in a text, assessing whether the reasoning is sound and the evidence is relevant and sufficient to support the claims.

21st Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- Terms being multiplied the same number of a given variable are like terms
- In order to determine the sum or difference between any two rational functions they must share a common denominator.
- Determining the roots of a quadratic, cubic, or quartic expression within a rational function can be advantageous to simplifying any rational function.
- The remainder theorem or synthetic division can be used to rule out possible roots of a function.

Unit Essential Questions:

- If $x > 2$, then what does $\frac{(x^2 - x - 6x^2 - 4)}{x^2 - 4}$ equal?
- What does $\frac{10x^6 + 8x^4}{2x^3}$ equal?
- For what real values of x results in the function $x^2 - 6x + 9$ being negative?
- What is the sum of $(x^3 + 2x - 10)$ and $(4x^4 - 3x^2 + 11x + 23)$?
- What is the difference of $(12x^2 - 2)$ and $(19x^2 + 3x - 4)$?
- What is the domain of the rational function $\frac{x+2}{x^2-4}$?
- Create a rational function that has a vertical asymptote at $x = -1$.
- What is the product of $(x^3 + 2x^2 - 5x + 7)(x + 1)$?

Knowledge and Skills

Students will know...

Vocabulary

- Polynomial
- Rational Function
- Remainder Theorem
- Synthetic Division

Students will know...

- How to identify a rational function.
- Characteristics of polynomial operations
- Shapes of different types of functions when graphed
- Horizontal and Vertical asymptotes graphically and conceptually
- How polynomials of varying degree level interact when applying different operations.

Students will be able to...

- Add and subtract polynomials
- Multiply and divide polynomials
- Simplify rational functions
- Add and subtract rational functions
- Identify critical points in the graph of a rational function and polynomial functions.
- Evaluate a rational function for a given variable value.
- Evaluate a polynomial function for a given variable value.
- Draw conclusions about polynomial functions and rational functions using the remainder theorem.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Use real-world scenarios to incorporate practical applications

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 6: Composite, Inverse, and Logarithmic Functions

Target Course/Grade Level: College Prep Math/Grade 12

Unit Summary:

- Composite Functions
- Inverse Functions
- Logarithmic Functions

Approximate Length of Unit: 5 weeks

LEARNING TARGETS

NJSLS Math Standards:

A.CED.A.1: Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.

A.REI.D.11: Explain why the x -coordinates of the points where the graphs of the equations $y = f(x)$ and $y = g(x)$ intersect are the solutions of the equation $f(x) = g(x)$; find the solutions approximately, e.g., using technology to graph the functions, make tables of values, or find successive approximations. Include cases where $f(x)$ and/or $g(x)$ are linear, polynomial, rational, absolute value, exponential, and logarithmic functions.

A.SSE.B.3.c: Use the properties of exponents to transform expressions for exponential functions.

F.BF.A.1.c: Compose Functions.

F.BF.B.4: Find inverse functions.

F.IF.A.2: Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.

F.IF.A.3: 3. Recognize that sequences are functions, sometimes defined recursively, whose domain is a subset of the integers.

F.IF.C.7: Graph functions expressed symbolically and show key features of the graph, by hand in simple cases and using technology for more complicated cases.

F.IF.C.7.a: Graph linear and quadratic functions and show intercepts, maxima, and minima.

F.IF.C.7.b: Graph square root, cube root, and piecewise-defined functions, including step functions and absolute value functions.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

HS-PS1-4: Develop a model to illustrate that the release or absorption of energy from a chemical reaction system depends upon the changes in total bond energy

HS-PS1-6: Refine the design of a chemical system by specifying a change in conditions that would produce increased amounts of products at equilibrium.

8.2.12.NT.1: Explain how different groups can contribute to the overall design of a product.

8.2.12.NT.2: Redesign an existing product to improve form or function

21st Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Unit Understandings

Students will understand that...

- Definition of a composite function
- How to simplify a composite function
- Definition of an inverse function
- The relationship between inverse functions.
- Definition of a logarithmic function.
- The relationship between logarithmic functions and exponential functions.
- The similarities between logarithmic functions and inverse functions.

Unit Essential Questions

- If $f(x) = 2x + 1$ and $g(x) = \frac{x-1}{2}$ what does $f(g(x))$ equal?
- If $f(x) = 5x - 3$ and $g(x) = \frac{10x}{2}$ what does $g(f(1))$ equal?
- If $f(x) = \frac{3x-1}{2}$ what is the inverse of $f(x)$?
- If $h(x) = \frac{12x^2+3x}{2x^2}$, what is $f^{-1}(-3)$ equal to?
- If $x = 3$ then what does x equal?
- What is the relationship between a logarithmic function and an inverse function?
- Solve for x in the equation $7^x = 2$

Knowledge and Skills

Students will know...

Vocabulary

- Composite function
- Inverse function
- Logarithmic functions

Students will know...

- Practical applications for composite functions,
- How to identify a composite function graphically.
- Practical applications for inverse functions.
- How to identify an inverse function graphically.
- When applying knowledge of inverse functions is advantageous.
- What a logarithmic function is.
- The relationship between logarithmic functions, exponential functions, and inverse functions.
- How to use knowledge of the relationship between logarithms and exponents.

Students will be able to...

- Create a set of composite functions.
- Evaluate a composite function for a given variable value.
- Determine the inverse of a given function.
- Evaluate an inverse function for a given variable value.
- Solve a logarithmic equation for a variable.
- Evaluate a logarithmic function for a variable value.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework
-

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking
- Independent practice problems
- Use real-world scenarios to incorporate practical applications

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera

RAHWAY PUBLIC SCHOOLS CURRICULUM

UNIT OVERVIEW

Content Area: College Prep Math

Unit Title: Unit 7: Permutations, Combinations, and Series

Target Course/Grade Level: College Prep Math/Grade 12

Unit Summary:

- Apply permutation formula for real-world scenarios.
- Apply combination formula for real-world scenarios.
- Evaluating series for a given input.

Approximate Length of Unit: 5 weeks

LEARNING TARGETS

NJSLS Math Standards:

S.CP.B.9: Use permutations and combinations to compute probabilities of compound events and solve problems.

S.CP.A.1: Describe events as subsets of a sample space (the set of outcomes) using characteristics (or categories) of the outcomes, or as unions, intersections, or complements of other events (“or,” “and,” “not”).

S.IC.A.1: Understand statistics as a process for making inferences about population parameters based on a random sample from that population.

7.SP.A.1: Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

A.CED.A.3: Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.

S.MD.B.5.a: Find the expected payoff for a game of chance.

S.MD.B.5.b: Evaluate and compare strategies on the basis of expected values.

Primary Interdisciplinary Connections: Science, Consumer Science, Economics.

8.1.8.NI.3: Explain how network security depends on a combination of hardware, software, and practices that control access to data and systems.

8.1.12.AP.1: Design algorithms to solve computational problems using a combination of original and existing algorithms.

8.1.12.AP.2: Create generalized computational solutions using collections instead of repeatedly using simple variables.

HS-LS3-3: Apply concepts of statistics and probability to explain the variation and distribution of expressed traits in a population.

21st Life and Career Standard:

9.1.8.FP.1: Describe the impact of personal values on various financial scenarios.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FP.5: Determine how spending, investing, and using credit wisely contributes to financial well-being.

9.1.8.FI.1: Identify the factors to consider when selecting various financial service providers.

Knowledge and Skills

Students will know...

Vocabulary

- Permutation
- Combination
- Series

Students will know...

- In a permutation of a set of elements, the order of the elements matters.
- In a combination of a set of elements, the order of the elements does not matter.
- In a series, to determine any numbered term one must determine the term before the desired numbered term.
- All series can be expressed as functions.
- Permutations and combinations have numerous practical applications.

Students will be able to...

- Identify a permutation.
- Identify a combination.
- Apply the appropriate permutation formula to solve problems in real world scenarios.
- Apply the appropriate combination formula to solve problems in real world scenarios.
- Distinguish between permutation and combination as related to word problems
- Identify a series.
- Evaluate a series for a particular numbered term.
- Apply knowledge of what a series is and how it works to create a function from a series.
- Use a function created from a series to graph and predict trends.

EVIDENCE OF LEARNING

Assessment

What evidence will be collected and deemed acceptable to show that students truly “understand”?

- Unit tests, quizzes
- Open-ended problems that require detailed responses
- Daily student work
- Homework
-

Learning Activities

What differentiated learning experiences and instruction will enable all students to achieve the desired results?

- Guided note-taking.
- Independent practice problems.
- Use real-world scenarios to incorporate practical applications.
- Predicting cards in a deck activity.

RESOURCES

Teacher Resources:

- Bob Miller’s Math for the ACCUPLACER textbook
- Teacher developed worksheets and activities
- Math websites
- Kuta math software

Equipment Needed:

- Calculators
- Chromebooks
- LCD Projector / Interactive Board
- Document Camera