Board Approved August 2017

DEPARTMENT: Mathematics COURSE: Pre-Algebra

Week	Marking Period 1	Week	Marking Period 3
1	Variables, Expressions and Integers	21	Ratios, Proportions, and Percents
2	Variables, Expressions and Integers	22	Ratios, Proportions, and Percents
3	Variables, Expressions and Integers	23	Ratios, Proportions, and Percents
4	Variables, Expressions and Integers	24	Geometric Concepts
5	Solving Equations and Inequalities	25	Geometric Concepts
6	Solving Equations and Inequalities	26	Geometric Concepts
7	Solving Equations and Inequalities	27	Geometric Concepts
8	Solving Equations and Inequalities	28	Geometric Concepts
9	Solving Equations and Inequalities	29	Geometric Concepts
10	Solving Equations and Inequalities	30	Geometric Concepts
Week	**Marking Period 2**	**Week**	**Marking Period 4**
11	Solving Equations and Inequalities	31	Probability and Data Analysis
12	Factors, Fractions, Exponents, and Rational Numbers	32	Probability and Data Analysis
13	Factors, Fractions, Exponents, and Rational Numbers	33	Probability and Data Analysis
14	Factors, Fractions, Exponents, and Rational Numbers	34	Probability and Data Analysis
15	Factors, Fractions, Exponents, and Rational Numbers	35	Probability and Data Analysis
16	Ratios, Proportions, and Percents	36	Probability and Data Analysis
17	Ratios, Proportions, and Percents	37	Graphing Functions
18	Ratios, Proportions, and Percents	38	Graphing Functions
19	Ratios, Proportions, and Percents	39	Graphing Functions
20	Ratios, Proportions, and Percents	40	Graphing Functions

PreAlgebra

Time Frame	**Weeks 1-4**

Topic

Variables, Expressions and Integers

Essential Questions

- How would you use exponents to write large and small numbers more efficiently?
- What would be a situation in which order of the steps is important?
- How do the high and low temperature records of various states compare with each other?
- How can you determine the rule of an equation given an input/output table?
- What trend do you notice when plotting data from a table on a coordinate plane?
- How do you decide which inverse operation should be used first when solving a twostep equation?
- How can algebraic symbols be used to efficiently express mathematical situations?

Enduring Understandings

- Students will explore algebraic concepts in an informal way by using physical models data, graphs and other mathematical representations.
- Students will learn to generalize number patterns to model, represent, or describe observed patterns, regularities, and problems.
- Students will understand that multiplying a variable by itself relates to multiplying a number by itself which results in the variable being squared.

Alignment to NJSLS

7.EE.1, 7.EE.2, 7.EE.3, 7.EE.4

Key Concepts and Skills

- Variable expressions
- Exponential notation
- Order of operations
- Evaluation of algebraic expressions
- Basic knowledge of integers
- Operations with integers
- Evaluate and write variable expressions
- Recognize and use exponential notation
- Use order of operations to evaluate expressions
- Compare and order integer
- Understand the meaning of opposites and absolute values
- Perform all operations with integers
- Write and evaluate algebraic expressions
- Apply properties of operations (add, subtract and factor) to expand linear expressions with rational coefficients
- Rewrite expressions in different forms to describe the quantity relationships (distributive property)
- Solve real life algebraic equations and expressions
- Multi-step problems incorporating positive and negative numbers (whole numbers, fractions and decimals) using appropriate tools

- Apply properties of operations to calculate with numbers in any form
- Assess reasonableness of answers using mental computations and estimate strategies
- Use variables as representation of real world quantities
- Solve world problems using problems modeled as $px + q = r$ and $p(x + q) = r$
- Solve problems fluently with understanding of variables
- Identify sequence of operations used
- Attention to points (0,0) and (1,r) when graphing on a coordinate plane to explain relationship between variables

Learning Activities

- Accentuate the negative activities
- Integer chips
- Algebra tiles and communicators
- Low and high temperature tracking
- Variables and patterns
- Calculator activities

Assessments

- Completing exercise questions
- Quiz on addition and subtraction of integers
- Quiz on multiplication and division of integers
- Quiz on writing and simplifying expressions
- Quiz on evaluating expressions and order of operations (including exponents) • Test on variables, expressions, and integers

21st Century Skills

	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills		Information Literacy		Media Literacy		

Interdisciplinary Connections

Business, Science, and Computer Science

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

Time Frame	**Weeks 5-11**

Topic

Solving Equations and Inequalities

Essential Questions

- What story or situation would fit a given equation? (i.e. $-3 + y = -5$)?
- In making a purchase, how would you determine your monthly payment having made a down payment?
- How is the solution to an equation different than the solution to an inequality?

PreAlgebra

Enduring Understandings
• Students will understand how to combine like terms and use the distributive property using their knowledge of order of operations. • Students will understand that when solving an equation, division is done in the last step in order to give the variable a coefficient of positive one. • Students will understand that if variables cancel out when solving an equation and a false statement remains, then there is no solution. If a true statement remains, then there are infinite solutions. • Students will know the mathematical symbols that are used to represent English words. • Students will understand that if an ordered pair is a solution to an equation, then it must be on the graph of the equation. • Students will understand that a solution to an equation is the value of the variable that makes the equation true. • Students will understand that a solution to an inequality equation is the set of values of the variable that make the inequality true. • Students will understand that equations can be used to model and interpret real world data.
Alignment to NJSLS
7.EE.1, 7.EE.2, 7.EE.3, 7.EE.4
Key Concepts and Skills
• Properties of addition and multiplication • Distributive property of multiplication over addition • Reading and writing variable expressions and equations • Solving one-step equations using the additive and multiplicative inverse • Solving multi-step equations • Solving equations with fraction and decimal coefficients • Strategies for simplifying and solving equations • Apply the properties of addition and multiplication • Translate verbal expressions and sentences to algebraic expressions and equations • Write and solve equations based on verbal expressions • Solve real-life situations by setting up and solving equations • Solve equations with variables on both sides including those with no solution and all real numbers as solutions • Solve single-step and multi-step inequalities and graph the solution on the number line • Solve real world problems leading to inequalities
• Interpret inequality solutions
Learning Activities
• Variables and patterns • Modeling equations with algebra tiles • Connect-the-dots coordinate plane activity • School play project • Algebraic expression jigsaw • Discussion of real-life activities that must be done in a certain order (i.e. cooking, construction etc.) • Calculator activities (i.e. guess my rule and find the pattern)
Assessments

- Completing exercise questions
- Quiz on number properties
- Quiz on simplifying expressions
- Quiz on translating verbal sentences to expressions and equations
- Quiz on solving one-step equations
- Quiz on solving multi-step equations
- Quiz on solving and graphing inequalities
- Test on solving equations and inequalities

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Business, Science, Computer Science, Social Studies

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Geometer's Sketchpad
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

Time Frame	**Weeks 12-15**

Topic

Factors, Fractions, Exponents, and Rational Numbers

Essential Questions

- Why is the number 2 the only even prime?
- Could a prime number be a multiple of another number?
- What would be the least number of packages of hotdog buns (8 in a package) and hotdogs (10 in a package) that would have to be purchased to ensure that none is left over?
- How does a millisecond compare to a nanosecond?
- What are some advantages of using decimals instead of fractions?
- What is the first step you should take when dividing mixed numbers?

Enduring Understandings

- Students will demonstrate number sense.
- Students will be able to perform numerical operations and estimations on rational numbers and whole numbers with exponents.
- Students will be able to select and apply various computational methods including mental math, estimation, paper-and-pencil techniques, and the use of calculators.
- Students will be able to multiply or divide by powers of ten without using a calculator.
- Students will be able to simplify operations with scientific notation without converting to standard form first.

PreAlgebra

Alignment to NJSLS

7.NS.1, 7.NS.2, 7.NS.3, 7.EE.1, 7.EE.2, 7.EE.3, 7.EE.4, 8.NS.1, 8.NS. 2, 8.EE.1, 8.EE.2, 8.EE.3, 8.EE.4

Key Concepts and Skills

- Order and compare fractions and decimals
- Negative and zero exponents
- Scientific notation
- Find the prime factorization of a number using a factor tree and/or a step diagram
- Find the greatest common factor of two or more numbers
- Find the least common multiple of two or more numbers
- Use basic rules of multiplication of exponents
- Understand the difference between rational and irrational numbers
- Convert between fractions and decimals
- Perform operations on rational numbers
- Understand repeating and terminating decimals

Learning Activities

- Comparing and ordering rational numbers
- Perfect, abundant and deficient numbers
- Asteroid project
- Human number line
- Hiking trail project
- Weight and gravity
- Calculator activities

Assessments

- Completing exercise questions
- Quiz on prime factorization, greatest common factor and least common multiple
- Quiz on converting fractions and decimals
- Quiz on simplifying numerical and algebraic fractions
- Quiz on basic use of exponents, negative, and zero exponents
- Quiz on comparing and ordering fractions and decimals, and scientific notation
- Test on factors, fractions, exponents, and rational numbers

21st Century Skills

	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Business, Science, Computer Science, Social Studies, and Consumer Science

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

PreAlgebra

Time Frame	**Weeks 16-23**

Topic

Ratios, Proportions, and Percents

Essential Questions

- What does it mean for ratios to be proportional?
- When is it appropriate to reason proportionally?
- In what three ways can you express the ratio of students to adults if one adult chaperone is required to accompany every six students on a class trip?
- If you travel at 55 mph, how many minutes will it take you to travel 1 mile?
- How can you find the height of the flagpole in front of the school based on the shadow cast by the flagpole?
- How does ½% compare with ½?
- What are two strategies for finding a sale price?
- Does the order of discount and sales tax matter?
- Is a discount of 10% followed by a discount of 20% the same as an initial discount of 30%?
- How many years would it take to double the balance of an account earning 5% interest?

Enduring Understandings

- Students will be able to understand the relationship between fractions, decimals, and percents.
- Students will apply their knowledge of proportions to real-world situations.
- Students will select and apply various computational methods including mental math, estimation, paper-and-pencil techniques, and the use of calculators.

Alignment to NJSLS

7.RP.1, 7.RP.2, 7.RP.3

Key Concepts and Skills

- Ratios and rates
- Solving proportions
- Scale drawings
- Identify, write, and compare ratios and rates
- Write and solve proportions
- Identify similar figures as having proportional corresponding sides
- Find unknown side length of similar figures
- Use proportions with scale drawings
- Application of percent in real-life contexts such as discounts, sales tax, sales price, markup, tips, percent of change, simple interest, and compound interest
- Express the equivalence between fractions, decimals, and percents
- Use proportions to find the base, part of the base, or percent of the base • Use percents to determine weighted averages

Learning Activities

- Calculator activities

• Assessments

- Completing exercise questions
- Quiz on writing and comparing ratios and rates
- Quiz on solving proportions
- Quiz on similar figures and scale drawings
- Test on ratio and proportion

- Quiz on percent, fractions and decimal equivalence
- Quiz on using proportions to solve percent problems
- Quiz on sales tax, discount, sales price, markup and tips (Percent applications)
- Quiz on percent of change
- Quiz on simple and compound interest
- Test on percents

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Science, Computer Science, Social Studies, Art, Physical Education, Consumer Science

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Geometer's Sketchpad
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

Time Frame	**Weeks 24-30**

Topic

Geometric Concepts

Essential Questions

- How does the distance around a circle compare to the distance across the circle?
- How many times would you have to run around our gym in order to run a mile?
- How much paint is needed to cover the walls of our classroom?
- How many cubic feet of space is in our classroom?
- Which capital letters in the English alphabet appears the same when viewed in a mirror?
- How are a line of reflection and a line of symmetry alike? How are they different?
- What happens when you reduce or enlarge a picture or document on a copy machine?

Enduring Understandings

- Students will develop a strong spatial sense from classroom activities using a wide variety of activities organized around physical models, modeling, mapping, and measuring.
- Students will discover geometric relationships, and use mathematical procedures such as drawing, sorting, classifying, finding patterns, and solving geometric problems.
- Students will be able to understand that geometric shapes maintain relationships when scales are used and that construction of a shape is dependent on side and angle measurements.

Alignment to NJSLS

7.G.1, 7.G.2, 7.G.3, 7.G.4, 7.G.5, 7.G.6
8.G.1, 8.G.2, 8.G.3, 8.G.4, 8.G.5, 8.G.9

Key Concepts and Skills

- Understanding angle relationships for supplementary, complementary, and vertical angles
- Apply the understanding of angle relationships to solve equations
- Develop and apply a variety of strategies for determining the perimeter and area of polygons, circles and irregular shapes
- Develop and apply a variety of strategies for determining surface area of prisms and cylinders
- Develop and apply a variety of strategies for determining volume of prisms, pyramids, cylinders, cones, and spheres.
- Translation, reflection, rotation, dilation of figures in a coordinate plane

Learning Activities

- Filling and wrapping activities
- Discovering Pi
- Nets
- Categorizing quadrilaterals
- Geoboard exercises
- Tangrams
- Stretching and shrinking activities
- Creating a wall border design
- Tessellation mural

- Calculator activities

Assessments

- Completing exercise questions
- Quiz on perimeter and area
- Quiz on surface area
- Quiz on volume
- Test on measurement, area and volume
- Quiz on translations, reflections and rotations
- Quiz on dilations and enlargements
- Test on transformations

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections

Science and Art

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Geometer's Sketchpad
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

PreAlgebra

Time Frame	**Weeks 31-36**

Topic

Probability and Data Analysis

Essential Questions

- Which is better, taking a test of 20 questions with true-false or multiple choice answers?
- Why is the number seven considered lucky when rolling two fair dice?
- Why should a combination lock really be called a permutation lock?
- How can experimental and theoretical probabilities be used to make predictions and draw conclusions?
- What does the word "average" mean?
- What information can you get from a box-and-whisker plot that you cannot get from a histogram?

Enduring Understandings

- Students will understand that theoretical probability is based on theory while experimental probability is the based on observations.
- Students will understand that probability is the ratio of the number of favorable outcomes of an event to the number of total possible outcomes of an event.
- Students will know that the number of outcomes of an event can be determined by either listing (such as with a tree diagram) or by using the fundamental counting principle.
- Students will understand how to interpret data presented through various formats.
- Students will understand how to measure central tendencies as well as dispersion of data.

Alignment to NJSLS

7.SP.1, 7.SP.2, 7.SP.3, 7.SP.4, 7.SP.5, 7.SP.6, 7.SP.7, 7.SP.8

Key Concepts and Skills

- Experimental and theoretical probability
- Use tree diagrams to determine the number of possible outcomes.
- Use the fundamental counting principal to determine the number of possible outcomes
- Permutations using the fundamental counting principle
- Determine the probability of a simple event
- Determine the probability of independent and dependent events
- Model situations involving probability using simulations and theoretical models
- Use models of probability to predict events based on actual data
- Finding and interpreting measures of central tendency (mean, mode, median)
- Determine the mean of a weighted data set
- Organize and analyze data using bar graphs, circle graphs, line graphs, histograms, frequency tables, stem-and-leaf plots, box-and-whisker plots, and Venn diagrams
- Make inferences, formulate and evaluate arguments based on displays and analysis of data
- Use of central tendency and frequency to compare the relationship between two populations.
- Compare the means of two or more data sets
- Mean absolute deviation
- Measures of variability (quartile ranges)
- Display data using a variety of distribution models (dot plots, histograms, etc.)

Learning Activities

- What do you expect? activities
- Use of spinners, dice, playing cards, dominoes, and other models
- Addition game using two number cubes
- Multiplication game using two number cubes
- Data around us activities
- Conduct a survey and display data

- Paper airplanes
- Weather project
- Finding the shortest network, route, or circuit • Calculator activities

Assessments

- Completing exercise questions
- Quiz on measures of central tendency – mean, median, mode, and range
- Quiz on interpreting various representations of data (i.e. circle graphs, line graphs, histograms, stem-and-leaf plots, box-and-whisker plots, and Venn diagrams)
- Quiz on probability of simple and compound events
- Test on probability and data analysis

21st Century Skills

X	Creativity	X	Critical Thinking	X	Communication	X Collaboration
X	Life & Career Skills	X	Information Literacy	X	Media Literacy	

Interdisciplinary Connections

Business, Science, Computer Science, Social Studies, Consumer Science

Technology Integration

8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge.

- Calculators
- Khan Academy (http://www.khanacademy.org/)
- NCTM Illuminations website (http://illuminations.nctm.org/)
- National Library of Virtual Manipulatives (http://nlvm.usu.edu/)
- SMART Notebook
- SMART Response Interactive Response System

Time Frame	**Weeks 37-40**

Topic

Graphing Functions

Essential Questions

- Which representation of a pattern more clearly shows whether or not the pattern is linear: a table of values or a graph of the pattern?
- What does the intersection of a graph on the x-axis or y-axis mean in real-life terms?
- How would you expect a graph to look showing the relationship between hours of homework completed plotted against marking period grades?
- How can you determine the rule of an equation given an input-output table.

Enduring Understandings

- Students will model real-life data with equations and graphs and will be able to interpret what is shown.
- Students will compare graphs and analyze the corresponding tables to understand why the graphs appear as they do.
- Students will be able to make predictions about graphs based on the equations and tables that correspond with them.

Alignment to NJSLS

8.F.2, 8.F.3, 8.F.4, 8.F.5

PreAlgebra

Key Concepts and Skills
• Rectangular coordinate plane • Descriptions using verbal expressions, symbolic rules, tables, and graphs • Graphs of input-output tables • Graphs of linear equations on a graphing calculator • Graph a function by generating a table of values • Understand and use the four quadrants of the rectangular coordinate plane to plot points • Construct simple symbolic expressions, rules, tables, and graphs that describe a pattern of change • Understand how to use input-output table and graph the related equations • Graph linear equations using a graphing calculator • Understand and sketch positive, negative, zero, and undefined slopes • Understand intercepts
Learning Activities
• Variables and patterns activities • Battleship • Graphing equations using a graphing calculator • Sight and distance project: a scatter plot activity • Calculator activities
Assessments
• Completing exercise questions • Quiz on graphing patterns in the coordinate plane • Quiz on constructing and graphing input-output tables • Quiz on the interpreting slopes and intercepts • Test on graphing functions

21 Century Skills							
X	Creativity	X	Critical Thinking	X	Communication	X	Collaboration
X	Life & Career Skills	X	Information Literacy		Media Literacy		

Interdisciplinary Connections
Science, Computer Science, Social Studies, and Physical Education

Technology Integration
8.1 Educational Technology- All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaboratively and to create and communicate knowledge. • Calculators • Geometer's Sketchpad • Khan Academy (http://www.khanacademy.org/) • NCTM Illuminations website (http://illuminations.nctm.org/) • National Library of Virtual Manipulatives (http://nlvm.usu.edu/) • SMART Notebook • SMART Response Interactive Response System