MATHEMATICS
GRADE 7

THE EWING PUBLIC SCHOOLS
2099 Pennington Road
Ewing, NJ 08618

Board Approval Date: January 27, 2020
Revised by: District Math Staff

Michael Nitti
Superintendent

In accordance with The Ewing Public Schools' Policy 2230, Course Guides, this curriculum has been reviewed and found to be in compliance with all policies and all affirmative action criteria.

Table of Contents

	Page
Course Description and Rationale	3
21st Century Skills	4
Unit 1: The Number System (40 Days)	7
Unit 2: Expressions and Equations (40 Days)	10
Unit 3: Ratios and Proportions (40 Days)	14
Unit 4: Statistics and Probability (30 Days)	18
Unit 5: Geometry (30 Days)	22
Sample Standards Integration	26

Course Description and Rationale

In Grade 7, mathematics instructional time will focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume; and (4) drawing inferences about populations based on samples.

While students will utilize a constructivist approach to investigate relationships in math, this approach will be balanced with a level of practice needed to attain skill mastery. Throughout the course, students will be actively engaged in problem solving through reasoning. Students will be expected to communicate their reasoning and problem solving on a daily basis through written and verbal formats.

In the end, the goal of this course is to develop young mathematicians with the habits of mind enabling them to meet the vision shared above, enabling their future success in mathematics.

The Ewing Public Schools' Math Vision

The Ewing Public Schools will deliver an instructional program in mathematics where students are actively engaged in the discovery of math concepts and are applying these concepts in ways that they find meaningful and relevant.

Ewing students will be mathematical thinkers who can reason, communicate and solve problems.

Ultimately, Ewing students will master and will be able to utilize these math concepts and skills throughout their lives.

21st Century Skills - During this course, students will work on developing, to an age appropriate level, the following 21st century skills:

Career Readiness Pathways:

- CRP2. Apply appropriate academic and technical skills.
- CRP4. Communicate clearly and effectively and with reason.
- CRP6. Demonstrate creativity and innovation.
- CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
- CRP12. Work productively in teams while using cultural global competence.

Learning and Innovation Skills

Creativity and Innovation

Think Creatively

- Elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts

Work Creatively with Others

- View failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes

CRITICAL THINKING AND PROBLEM SOLVING

Reason Effectively

- Use various types of reasoning (inductive, deductive, etc.) as appropriate to the situation

Use Systems Thinking

- Analyze how parts of a whole interact with each other to produce overall outcomes in complex systems

Make Judgments and Decisions

- Effectively analyze and evaluate evidence, arguments, claims and beliefs
- Synthesize and make connections between information and arguments
- Interpret information and draw conclusions based on the best analysis

Solve Problems

- Identify and ask significant questions that clarify various points of view and lead to better solutions

COMMUNICATION AND COLLABORATION

Communicate Clearly

- Articulate thoughts and ideas effectively using oral, written and nonverbal communication skills in a variety of forms and contexts
- Listen effectively to decipher meaning, including knowledge, values, attitudes and intentions
- Use communication for a range of purposes (e.g. to inform, instruct, motivate and persuade)
- Utilize multiple media and technologies, and know how to judge their effectiveness a priori as well as assess their impact
- Communicate effectively in diverse environments (including multi-lingual)

Collaborate with Others

- Assume shared responsibility for collaborative work, and value the individual contributions made by each team member

Information, Media, and Technology Skills

Informational Literacy:

Access and Evaluate Information

- Evaluate information critically and competently

Use and Manage Information

- Use information accurately and creatively for the issue or problem at hand

Life and Career Skills

Social and Cross-Cultural Skills:

Interact Effectively with Others

- Know when it is appropriate to listen and when to speak

Work Effectively in Diverse Teams

- Respond open-mindedly to different ideas and values

Be Responsible to Others

- Act responsibly with the interests of the larger community in mind

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 collaborate and create and communicate knowledge.

ELA Integration:

RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.7.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.

RI.7.8. 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.

SL.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

A. Come to discussions prepared having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
B. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
D. Acknowledge new information expressed by others and, when warranted, modify their own views.

SL.7.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

SL.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

Unit 1: The Number System (40 Days)

Why Is This Unit Important?

In the middle grades, students are introduced to fractions and decimals. The next major hurdle is building a greater understanding of rational numbers; i.e., integers, fractions and terminating and non-terminating decimals. Students have experienced these kinds of numbers informally in their everyday world. For example, temperatures drop below zero in the winter or soar above 90 degrees in the summer and sports teams are said to be ahead or behind by so much. Students have intuitively used operations on rational numbers to make sense of these situations. This unit explores situations that require representation with rational numbers. These situations motivate more formal ways to add, subtract, multiply and divide these numbers. Students formalize algorithms for operating using rational numbers. They also consider the order of operations and selected properties. The big ideas in this unit are:

- Apply and extend previous understandings of operations with fractions to add, subtract, multiply and divide rational numbers.

Enduring Understandings:

- Describe and model, on a horizontal and vertical number line, real-world situations in which rational numbers are combined.
- Apply the additive inverse property to subtraction problems and develop the argument that the distance between two points is the absolute value of the difference between their coordinates.
- Explain why a divisor cannot be zero and why division of integers results in a rational number.
- Model the multiplication and division of signed numbers using real-world contexts, such as taking multiple steps backwards.
- Convert a rational number to a decimal using long division and explain in oral or written language why the decimal is either a terminating or repeating decimal.
- Apply properties of operations as strategies to add, subtract, multiply and divide rational numbers.
- Solve mathematical and real-world problems involving addition, subtraction, multiplication and division of rational numbers.
- Interpret sums of rational numbers by describing real-world contexts.
- Show that a number and its opposite have a sum of 0 (are additive inverses).

Essential Questions:

- How do rational numbers help in describing a situation?
- What will addition, subtraction, multiplication or division of rational numbers tell about the problem?
- What model(s) for rational numbers would help in showing the relationships in the problem situation?
- What does the location of a number on the number line tell you about that number?

Acquired Knowledge:

- Explore the use of and appropriate notation for positive and negative numbers in applied settings.
- Understand the relationship between a positive or negative number and its opposite (additive inverse).
- Develop and use both a number line and a chip model for representing addition and subtraction.
- Develop and use algorithms for adding and subtracting integers.
- Observe that the Commutative Property holds for addition of rational numbers but not for subtraction of rational numbers.
- Understand and use the relationship between addition and subtraction to simplify computation.
- Develop and use algorithms for multiplying and dividing integers.
- Examine number patterns to confirm the algorithm for multiplication.
- Explore division of rational numbers using the relationship between multiplication and division found in fact families.
- Develop and use the Distributive Property of multiplication over addition and subtraction.
- Understand $p + q$ as the number located a distance $|q|$ from p, in the positive or negative direction depending on whether q is positive or negative.
- Determine absolute value of a number as the numbers distance from zero in either a positive or negative direction.

Acquired Skills:

- Interpret and write mathematical sentences.
- Locate rational numbers on a number line and compare and order them.
- Write number sentences to reflect the actions and results of changes in situations and find missing values.
- Model addition and subtraction of integers using distance/direction on a number line and a chip model.
- Recognize and solve problems involving addition and subtraction of rational numbers. (Including sums equaling 0 and using additive inverse)
- Recognize and solve problems involving multiplication and division of rational numbers.
- Use the relationship between multiplication and division to solve the division of rational numbers.
- Use the Distributive Property/Commutative Property to solve problems.
- Use of the order of operations to order computation in problems involving rational numbers.
- Use long division to convert a rational number to a terminating or repeating decimal.

Differentiation:

Enrichment:

- Comparing and Contrasting the Applications of all Properties

Supplement:

- *Special Needs Handbook* Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Addition & Subtraction
- Assessment Checklist for Multiplication & Division
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks:

- Unit 1 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.7.NS.A.1
- NJSLS.7.NS.A.2
- NJSLS.7.NS.A.3
- NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Extending the Number System
- Adding and Subtracting Integers
- Multiplying and Dividing Integers
- Properties of Operations

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
  http://www.mathgametime.com/grade/7th-grade

Unit 2: Expressions and Equations (40 Days)

Why Is This Unit Important?

Functions and the equations that represent them are invaluable tools for quantitative reasoning throughout the physical, biological, social and management sciences. In applying algebra to problem-solving tasks, a critical step is representing relationships in symbolic form so that the tools of algebra can be applied effectively. In some situations, the stated problem conditions can be used to write algebraic equations for functions directly and precisely. In other cases, relationships between key variables are only suggested by data patterns. Such relationships can be approximated by mathematical functions, but cannot be precisely described by them. When algebraic equations are used to represent patterns in data from experiments or surveys, the resulting functions are called mathematical models of the underlying relationships. The models can be used to make calculations and to estimate answers to questions about the relationships. One of the central goals is to develop student understanding of and skill with elementary aspects of the modeling process. The big ideas in this unit are:

- Use properties of operations to generate equivalent expressions.
- Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

Enduring Understandings:

- Apply the properties of operations as strategies to add, subtract, factor and expand linear expressions with rational coefficients (including additive and multiplicative inverse, distributive, commutative and associative properties).
- Use equivalent expressions to demonstrate the relationship between quantities and determine simpler solutions to a problem.
- Solve multi-step real life and mathematical problems with rational numbers in any form (fractions, decimals, percents) by applying properties of operations and converting rational numbers between forms as needed and then assess the reasonableness of results using mental computation and estimation strategies.
- Use variables to represent quantities in a real-world or mathematical problem by constructing simple equations and inequalities to represent problems.
- Fluently solve equations and inequalities and graph the solution set of the inequality; interpret the solutions in the context of the problem.

Essential Questions:

- What are the variables in the problem?
- Do the variables in the problem have a linear relationship to each other?
- What patterns in the problem suggest that it is linear?
- How can the linear pattern be represented in a problem, in a table, in a graph or with an equation?
- How do changes in one variable affect changes in a related variable?
- How are these changes captured in a table, graph or equation?

- How can tables, graphs and equations of linear relationships be used to express and answer questions?
- What is the pattern relating the variables?
- What kind of equation will express the relationship?
- How can I use the equation to answer questions about the relationship?

Acquired Knowledge:

- Compare and contrast linear and nonlinear relationships.
- Fit a line to data that show a linear trend.
- Use mathematical models to answer questions about linear relationships.
- Practice effective strategies for writing linear equations from verbal, numerical or graphical information.
- Develop skill in solving linear equations with approximation and exact reasoning methods.
- Use equations to represent questions about problem situations and interpret the solutions in the context of the problem.

Acquired Skills:

- Make tables and graphs to represent data.
- Describe relationships between independent and dependent variables.
- Write verbal expressions/equations given an algebraic expression/equations and vice versa.
- Use data patterns to make predictions.
- Write inequalities to represent “at most” and “at least” situations.
- Write equivalent expressions using the Distributive and Commutative Properties.
- Model situations with symbolic statements.
- Change rational numbers to different forms (fraction, decimal, percent).
- Identify when to use fraction, decimal or percents in a given situation and then apply to a problem.
- Use estimation to assess reasonableness of results.
- Solve multi-step equations and inequalities, and then graph their solutions on a number line.

Differentiation:

Enrichment:

- Representing Data with Equations

Supplement:

- *Special Needs Handbook* Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Linear Functions
- Assessment Checklist for Equations
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks:

- Unit 2 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.7.EE.A.1
- NJSLS.7.EE.A.2
- NJSLS.7.EE.B.3
- NJSLS.7.EE.B.4
- NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Analyzing Graphs and Tables 2
- Rules and Equations 2
- Calculator Tables and Graphs
- Walking Rates
- Developing Linear Functions From Graphs and Tables
- Solving Equations 2
- Exploring Slope

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- http://www.mathgametime.com/grade/7th-grade

Unit 3: Ratios and Proportions (40 Days)

Why Is This Unit Important?

Many important mathematical applications involve comparing quantities of one kind or another. In some cases, the problem is simply deciding which of two quantities is greater and describing how much greater it is. In such instances, we subtract to find a difference. This is what students deal with in elementary school. In fact, comparison by addition or subtraction comes first in students' mathematics experiences. This way of thinking becomes inappropriately pervasive in any situation requiring comparison.

There are many standard ways to make quantitative comparisons for example, fractions, ratios, rates, differences and percents. One of the fundamental goals of school mathematics, especially middle-grades mathematics is to help students develop flexible understanding, skill and disposition in using strategies for comparing quantities. This unit confronts students with a series of mathematical tasks that encourage them to make decisions about the quantities relevant to each task, how those quantities can be compared most usefully and what information is provided by various quantitative comparisons. The big ideas in this unit are:

- Analyze proportional relationships and use them to solve real-world and mathematical problems.
- Draw, construct and describe geometrical figures and describe the relationships between them.

Enduring Understandings:

- Calculate and interpret unit rates of various quantities involving ratios of fractions that contain like and different units using real world examples such as speed and unit price. For example, if a person walks $^1/_2$ mile in each $^1/_4$ hour, compute the unit rate as the complex fraction $^1/_2/^1/_4$ miles per hour, equivalently 2 miles per hour.
- Determine if a proportional relationship exists between two quantities e.g. by testing for equivalent ratios in a table or graph on the coordinate plane and observing whether the graph is a straight line through the origin.
- Identify the constant of proportionality (unit rate) from tables, graphs, equations, diagrams and verbal descriptions.
- Use equations to model proportional relationships in real world problems.
- Represent real world problems with proportions on a graph and describe how the graph can be used to explain the values of any point (x, y) on the graph including the points (0, 0) and (1, r), recognizing that r is the unit rate.
- Solve multi-step ratio and percent problems using proportional relationships, including scale drawings of geometric figures, simple interest, tax, markups and markdowns, gratuities and commissions and fees.

Essential Questions:

- How could you use fractions, decimals and percents to express data?
- What is a useful way to compare data? Why?
- What are some different ways that quantities can be written?
- How is a ratio different from a percent and from a fraction?
- If you know two shapes are similar, how do you use that information to find the values of two sets of corresponding parts when the value of one is missing?

Acquired Knowledge:

- Informally explore various strategies for presenting quantitative comparison information.
- Make judgments and choices on given comparative statements about quantities.
- Examine and connect the idea of unit rates to what students already know about ratios and about linear relationships.
- Further develop understanding of unit rates and how to compute and interpret them.
- Introduce and formalize the meaning of unit rate and computation strategies for computing unit rates.
- Relate unit rate to the slope of the line representing the equation of the underlying relationship.
- Apply proportional reasoning to solve for the unknown part when one part of two equal ratios is unknown.
- Use ratios and scaling up or scaling down (finding equivalent ratios) to find the missing value in a proportion.
- Develop insight and flexibility in choosing strategies for solving problems requiring proportional reasoning.

Acquired Skills:

- Find equivalent ratios.
- Use equivalent ratios to determine scale factor.
- Analyze and create comparison statements from given data.
- Determine if two ratios form a proportional relationship.
- Use proportions to find unknown quantities.
- Determine unit rate (constant of proportionality).
- Use unit rate to create tables, graphs and equations.
- Use equations to model proportional relationships in real world problems.
- Use a graph to find the unit rate (slope).
- Use proportions to solve problems involving scale factor and percents (geometric figures, simple interest, tax, markups/markdowns, gratuities and commissions and fees).

Differentiation:

Enrichment:

- Introduction to 3-Dimensional Graphing

Supplement:

- *Special Needs Handbook* Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Proportions
- Assessment Checklist for Rates
- Assessment Checklist for Similar Figures
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks:

- Unit 3 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.7.RP.A.1
- NJSLS.7.RP.A.2
- NJSLS.7.RP.A.3
- NJSLS.7.G.A.1
- NJSLS.7.G.A.2
- NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Making Comparisons 2
- Comparing and Scaling Rates 2
- Making Sense of Proportions 2
- Enlarging and Reducing Shapes
- Similar Figures
- Similar Polygons
- Similarity and Ratios
- Using Similar Triangles and Rectangles

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- http://www.mathgametime.com/grade/7th-grade

Unit 4: Statistics and Probability (30 Days)

Why Is This Unit Important?

The intent of this unit is to help students explore ways to compare data sets, to consider the use of sample data as a way to make estimates about a population and develop an understanding that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. The big ideas in this unit are:

- Use random sampling to draw inferences about a population.
- Draw informal comparative inferences about two populations.
- Investigate chance processes and develop, use and evaluate probability models.
- Explore the influence of sample size on the variability of the distribution of sample means or medians.
- Applying the process of statistical investigation to pose questions, identify ways data are collected, determine strategies for analyzing data and interpreting the analysis in order to answer the question posed.
- Explaining variability in categorical and numerical data.
- Explaining the difference between collecting numerical data by counting or by measuring.
- Exploring ways to select samples, including using random sampling techniques

Enduring Understandings:

- Distinguish between valid and invalid samples from a population by determining if the sample is representative of the subgroups within the population (e.g. if the class had 50% girls and the sample had 25% girls, then the number of girls was not representative of the whole population).
- Use random sampling to produce a representative sample, develop valid inferences about a population with an unknown characteristic of interest and compare the variation in estimates using multiple samples of the same and different size.
- Visually and numerically compare the means and variations of two distinct populations (such as the mean height of different sports teams) to draw informal comparative inferences about measures of center and variability using graphical representations and statistical calculations.
- Interpret and express the likelihood of a chance event as a number between 0 and 1, relating that the probability of an unlikely event happening is near 0, a likely event is near 1 and 1/2 is neither likely nor unlikely.
- Conduct experimental probability events that are both uniform (rolling a number cube multiple times) and non-uniform (tossing a paper cup to see if it lands up or down) to collect and analyze data to make predictions for the approximate relative frequency of chance events.
- Develop uniform and non-uniform theoretical probability models by listing the probabilities of all possible outcomes in an event, for instance, the probability of the number cube landing on each number being 1/6. Then, conduct an experiment of the event using frequencies to determine the probabilities of each outcome and use the results to explain possible sources of discrepancies in theoretical and experimental probabilities.

- Design a simulation of a compound probability event and determine the sample space using organized lists, tables and tree diagrams, calculate the fractional probabilities for each outcome in the sample space and conduct the simulation using the data collected to determine the frequencies of the outcomes in the sample space.

Essential Questions:

- What is the population?
- What is the sample?
- What kinds of comparisons or relationships can I explore using data from the sample?
- Can I use my results to make predictions or generalizations about the populations?
- How do the measures of central tendency help compare data sets?
- What are the possible outcomes for the event(s) in this situation?
- Can I compute the theoretical probabilities or do I conduct an experiment?
- How can I determine the probability of the outcome of one event followed by a second event?
- How can I use expected value to help me make decisions?
- What makes a situation a binomial situation?
- As you increase the number of actions for a binomial situation what happens to the total number of outcomes?

Acquired Knowledge:

- Distinguish between a sample and a population.
- Consider various ways to develop a sampling plan.
- Use data from a sample to make predictions about a population.
- Select a random sample from a population.
- Use sampling distribution, measures of center, measures of variability and data displays that group data to describe and compare samples.
- Use data from samples to estimate a characteristic of a population.
- Apply probability to choosing random samples of data.
- Explain the relationship between experimental and theoretical probability.
- Understand the difference between the probability of an outcome and the long-term average of many trials in a situation.

Acquired Skills:

- Develop strategies for organizing and comparing data.
- Determine if a sample is representative of a population.
- Draw inferences and gauge variation about a population based on a sample.
- Make comparative inferences from data displays.
- Make comparative inferences using measures of center and measures of variability.
- Evaluate the likelihood of an event given the probability (based on a scale from 0 to 1).
- Approximate expected value based on theoretical or experimental probability.
- Develop probability models and use them to find probability of events.
- Construct tables, tree diagrams, organized lists to determine probability of an event.
- Find the probability of independent and dependent compound events.
- Create the sample space for compound events.

Differentiation:

Enrichment:

- Binomial Outcomes

Supplement:

- *Special Needs Handbook* Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Probability
- Assessment Checklist for Measures of Central Tendency
- Assessment Checklist for Sampling
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks:

- Unit 4 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.7.RP.A.3
- NJSLS.7.SP.A.1
- NJSLS.7.SP.A.2
- NJSLS.7.SP.B.3
- NJSLS.7.SP.B.4
- NJSLS.7.SP.C.5
- NJSLS.7.SP.C.6
- NJSLS.7.SP.C.7
- NJSLS.7.SP.C.8
- NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Evaluating Games of Chance
- Analyzing Situations Using an Area Model
- Expected Value
- Theoretical Versus Experimental
- Making Sense of Variability
- Making Sense of Measures of Center
- Comparing Distributions: Equal Numbers of Data Values
- Comparing Distributions: Unequal Numbers of Data Values
- Sampling and Populations

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- http://www.mathgametime.com/grade/7th-grade

Unit 5: Geometry (30 Days)

Why Is This Unit Important?

Geometry is the study of size, shape and position of two and three dimensional figures. In geometry, one explores spatial sense and geometric reasoning. Geometry is found everywhere; in art, architecture, engineering, robotics, etc. When taking geometry, spatial reasoning and problem-solving skills will be developed. As students move through this unit, their abstract thinking will be developed through analysis and reasoning. The big ideas in this unit are:

- Draw, construct and describe geometrical figures and describe the relationships between them.
- Solve real-life and mathematical problems involving angle measure, area, surface area and volume.

Enduring Understandings:

- Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- Use freehand, mechanical (i.e. ruler, protractor) and technological tools to draw geometric shapes with given conditions (e.g. scale factor), focusing on constructing triangles.
- Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms.
- Write and solve simple algebraic equations involving supplementary, complementary, vertical and adjacent angles for multi-step problems and finding the unknown measure of an angle in a figure.
- Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- Describe, using drawings or written descriptions, the 2-dimensional figures that result when 3-dimemsional figures (right rectangular prisms and pyramids) are sliced from multiple angles given both concrete models and a written description of the 3-dimensional figure.

Essential Questions:

- How can I find the area of an irregular shape?
- How do simple polygons work together to make more complex shapes?
- What are the important properties of triangles, quadrilaterals and circles?
- How can you determine the measure of the angles created by lines intersecting parallel lines?
- What methods can you use to find the surface area of prisms?
- What are the properties of intersecting lines?
- What is the difference between a pair of supplementary and a pair of complementary angles?
- How can you differentiate between a linear pair and vertical angles?
- What do alternate interior angles and alternate exterior angles have in common?
- What do same-side interior angles and same-side exterior angles have in common?

Acquired Knowledge:

- Develop and employ reasonable strategies for estimating the area of triangles and quadrilaterals.
- Visualize a net as a representation of the surface area of a rectangular prism.
- Connect the area of the net to the surface area of a rectangular prism.
- Understand that the volume of a rectangular prism is the total number of unit cubes needed to fill it.
- Understand the relationship between the dimensions of a rectangular prism and its surface area.
- Connect the dimensions of a rectangular prism to its volume and surface area.
- Understand that rectangular prisms may have the same volume but quite different surface areas.
- Predict which rectangular prism of those with a common volume will have the smallest surface area.
- Explore a volume relationship between pyramids and prisms.

Acquired Skills:

- Apply techniques for finding the areas of triangles, quadrilaterals and circles to a variety of problem situations.
- Find area and circumference of circles in terms of π
- Find area of compound figures.
- Memorize the formula for the circumference and area of a circle.
- Apply techniques for finding the volumes of rectangular prism to a variety of problem situations.
- Write and solve an algebraic formula for an unknown given the volume of a prism.
- Determine which two-dimensional objects will result by slicing plane figures from three-dimensional objects.
- Write and solve simple algebraic equations involving supplementary, complementary, vertical and adjacent angles for multi-step problems.
- Find the unknown measure of an angle in a polygon.

Differentiation:

Enrichment:

- Designing Visual Models of Volume Formulas

Supplement:

- *Special Needs Handbook* Activities

Assessments:

Formative Assessments:

- Assessment Checklist for Volume
- Assessment Checklist for Scaling
- Teacher's observation of students at work; anecdotal records
- Individual conferences and group discussions
- Students' recording sheets

Summative Assessments:

- Teacher's observation of students at work
- Individual conferences
- Chapter Assessments

Benchmarks:

- Unit 5 Mathematics Assessment

Alternative Assessments:

- Modified tasks and assessment rubrics
- Performance-based assessment tasks

List of Applicable New Jersey Student Learning Standards Covered in This Unit:

- NJSLS.7.EE.B.3
- NJSLS.7.EE.B.4
- NJSLS.7.G.A.3
- NJSLS.7.G.B.4
- NJSLS.7.G.B.5
- NJSLS.7.G.B.6
- NJSLS.MP.1-8

Suggested Learning Experiences and Instructional Activities:

- Nets to Boxes
- Building Boxes
- Designing Rectangular Boxes
- Prisms and Cylinders
- Cones, Spheres and Pyramids
- Scaling Boxes

Technology:

- http://calculationnation.nctm.org/
- www.ixl.com/math
- http://www.mathgametime.com/grade/7th-grade

Sample Standards Integration

21st Century Skills & Career Readiness Practices

Career Readiness:

- In unit 4 students skype with a market research analyst. They discuss the use of statistics, probability and algebra in their work. They discuss the courses in high school and the courses and majors in college which are needed to enter into their career successfully.

CRP4. Communicate clearly and effectively and with reason.

For example, in Unit 1 students will use and defend their choice of models of operations of signed numbers un real world contexts.

CRP6. Demonstrate creativity and innovation.

For example, in Unit 5, students will utilize scale drawings as solution models for real wprld problems.

CRP7. Employ valid and reliable research strategies.

For example, in Unit 4 students will analyze population samples determining their validity.

CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.

For example, in Unit 2 students will use reasoning and perseverance to solve multi-step real world problems.

CRP12. Work productively in teams while using cultural global competence.

For example, in Unit 3 students will work collaboratively to seek optimum solutions for real world problems involving multi-step ratio and percent problems.

8.1 Educational Technology

All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

For example, in Unit 4 students will access, manage, evaluate, and synthesize information to collect, analyze, and interpret sampling data.

Interdisciplinary Connections

RI.7.1. Cite several pieces of textual evidence and make relevant connections to support analysis of what the text says explicitly as well as inferences drawn from the text.

RI.7.4. Determine the meaning of words and phrases as they are used in a text, including figurative, connotative, and technical meanings; analyze the impact of a specific word choice on meaning and tone.

RI.7.8. 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.

These standards are met throughout the course. For example, in Unit 4 students will write data sources to produce a population sampling poll.

SL.7.1. Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grade 7 topics, texts, and issues, building on others' ideas and expressing their own clearly.

A. Come to discussions prepared having read or researched material under study; explicitly draw on that preparation by referring to evidence on the topic, text, or issue to probe and reflect on ideas under discussion.
B. Follow rules for collegial discussions, track progress toward specific goals and deadlines, and define individual roles as needed.
C. Pose questions that elicit elaboration and respond to others' questions and comments with relevant observations and ideas that bring the discussion back on topic as needed.
D. Acknowledge new information expressed by others and, when warranted, modify their own views.

SL.7.3. Delineate a speaker's argument and specific claims, evaluating the soundness of the reasoning and the relevance and sufficiency of the evidence.

SL.7.4. Present claims and findings, emphasizing salient points in a focused, coherent manner with pertinent descriptions, facts, details, and examples; use appropriate eye contact, adequate volume, and clear pronunciation.

These standards are met throughout the course. For example, in Unit 2 students will discuss their solutions to a variety of complex multi-step problems with multiple possible solution pathways, justifying their approach to their solution.