

Course Overview

Name of Course: Math 7

Name of Department: Mathematics

Course Summary:

This course is designed so that all students will become better problem solvers by interweaving skills, concepts, and word problems. It will prepare students for standardized tests with questions that are aligned in format, content, and design to those found on today's high stakes assessments. It will also strengthen their ability to work in a collaborative way and reinforce basic math skills while building higher level mathematical concepts. Students will be required to participate in tests, quizzes, daily homework, and projects towards this goal.

Course Description:

Grade 7 units were created and organized in line with the areas of focus as identified by the New Jersey Student Learning Standards and the PARCC Model Content Frameworks. Each unit is comprised of standards that are considered major content along with standards that are supporting and/or additional content. The fluency standards for grade 7 are presented in units one and two and will be assessed for student accuracy. However, the expectation is that students will have many opportunities to develop fluency, defined as speed and accuracy, with rational number arithmetic and solving multi-step problems (including those involving positive and negative rational numbers and word problems leading to one variable equations) throughout the school year.

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Course Expectation:

The Math 7 course expectation is that students will have many opportunities to develop fluency, defined as speed and accuracy, with rational number arithmetic and solving multistep problems (including those involving positive and negative rational numbers and word problems leading to one variable equations) throughout the school year. The standards presented in unit 1 combine rational number arithmetic and linear expressions and equations concepts to build on the work from grade 6. These standards require the students to analyze proportional relationships and use them in problem solving. The geometry standards will provide opportunities for the students to use proportional reasoning in context. In unit 1 the students will continue to use ratios and proportional reasoning in multi-step ratio and percent problems. The standards from the Statistics and Probability domain will support the use of proportional reasoning in context.

Unit 2 builds on the students' understanding of rational numbers concepts presented in grade 6 to develop fluency with addition, subtraction, multiplication and division of rational numbers and to use these skills in a problem solving context. Success with problem solving and developing fluency with rewriting linear expressions and solving linear equations presented in unit 3 will be dependent upon the completion of the work with rational numbers in unit 2.

The fluency standards in unit 1 and 2 are repeated in units 4 and 5 with the opportunity to extend the understandings to statistics and geometry concepts.

Course Essential Questions (Big Ideas):

- How can learning Math 7 concepts broaden your understanding of the world and self?
- How does knowledge of mathematical skills correlate to real-life experiences?

Unit 1: This unit focuses on extending the ratio reasoning of Grade 6 to recognizing and representing proportional relationships in verbal descriptions, tables, equations, and graphs. Students will extend ratio concepts to solve multi-step problems involving ratios, rates, and proportional relationships. By the end of this unit students should be able to answer the following questions: How are equivalent ratios and unit rates used to compare ratios and solve problems? How can a unit rate be easier to use to solve problems than a ratio of fractions? How can quantities in a proportional relationship be described by equivalent ratios? How can equations be used to represent proportional relationships and solve problems in the form of $y=kx$, where k is the constant of proportionality? How can real-world problem situations be represented with a mathematical model and may not represent a real-world situation exactly? Is the graph a proportional relationship if it is a straight line through the origin? How can recognizing proportional quantities help identify what you know about proportional relationships to solve problems?

Unit 2: This unit focuses on applying the number sense learned in Grade 6 to extending operations with integers and fractions. Students will analyze problems to determine which operations should be used. They will solve the problem by extending their knowledge of writing and solving expressions for a given scenario. By the end of this unit students should be able to answer the following questions: What is the relationship between an integer and its opposite from 0 on a number line and have the sum of 0? How are rational numbers expressed as fractions and be written as decimal form? How can knowledge of absolute value aid you in adding and subtracting integers? How is subtracting a number similar to adding that number's additive inverse? How is adding and subtracting integers related to adding and subtracting other rational numbers? How is the sign of a product determined by the signs of the factors in a multiplication expression? How are the same properties used to multiply integers also apply when multiplying rational numbers? How can the relationship between multiplication and division be useful when dividing positive and negative integers? How are dividing rational numbers similar to dividing integers? How does the sign of the quotient depends on the signs of the dividend and divisor? How do problems involving rational numbers be solved by making sense of the quantities and their relationships to each other?

Unit 3: This unit focuses on extending the use of properties of operations from writing and evaluating algebraic expressions to analyzing equivalent expressions. It also focuses on extending the students' understanding of the relationship between the independent and dependent variables, the coefficient, and the constant to lead students into writing and solving equations and inequalities, including graphing the solutions of inequalities. By the end of this unit students should be able to answer the following questions: How can equations with more than one operation be used to represent a situation? How can one and two-step problems be solved using the properties of equality? How can the Distributive Property be used to solve equations in the form $p(x + q) = r$? How is solving inequalities with addition, subtraction, multiplication and division similar to solving equations? Why do we reverse the inequality symbol when multiplying or dividing by a negative value? How can real-world situations be represented with a mathematical model? How can using properties of inequalities aid in solving multi-step equations and inequalities?

Unit 4: This unit focuses on extending the ratio reasoning of Grade 6 to representing proportional relationships in scale drawings. It also extends students' understanding of area from Grade 6 to include solving problems involving circumference and area of circles, as well as finding surface area and volume of two-dimensional and three-dimensional figures. By the end of this unit students should be able to answer the following questions: How can using scale drawings help calculate measurements and reproduce proportional scale drawings? How can side lengths and angle measures determine unique quadrilaterals? Triangles? How can the measure of angles that are formed by intersecting lines determine different types of angles? What is the relationship between the circumference and diameter of a circle? How can using the formula for area of a circle be used to solve problems? How can real-world problem situations be represented by a mathematical model? What 2-D figure is formed by slicing a 3-D figure by a 2-D figure? What is the difference and how do we find surface area and volume of 3-D figures using formulas and mathematical processes?

Unit 5: This unit focuses on applying the data analysis learned in Grade 6 to extend an understanding of how data is used to determine the probability of an event occurring. It also extends students' understanding of how to display, describe, and summarize numerical data by introducing the concepts of populations and samples, making inferences about a population using a sample, and how to informally compare two populations. By the end of this unit students should be able to answer the following questions: How can representative samples reflect the entire population? What is the best way to determine a representative sample? How can data from random samples be used to make valid inferences about a population? How can data displays, such as box plots, be used to make informal comparisons? What can the shape of the data tell us? How can dot plots be used to compare populations? How can the use of statistical measures, such as mean and MAD, be used to make inferences and predictions about populations? How can real-world problems be represented with a mathematical model? How can probability be expressed as the likelihood that an event will occur through ratios? How does theoretical and experimental probabilities compare and contrast? How can a probability model be used to evaluate a chance process? How can using tree diagrams, tables, or an organized list show possible outcomes of an event?

Alignment with New Jersey Student Learning Standards:

Unit #1: 7.RP.A.1; 7.RP.A.2.a.; 7.RP.A.2.b.; 7.RP.A.2.c.; 7.RP.A.2.d; 7.RP.A.3

Unit #2: 7.NS.A.1.; 7.NS.A.1a.; 7.NS.A.1b.; 7.NS.A.1c.; 7.NS.A.1d.; 7.NS.A.2.; 7.NS.A.2a. 7.NS.A.2b.; 7.NS.A.2c.; 7.NS.A.2c.; 7.NS.A.2d.; 7.NS.A.3.

Unit #3: 7.EE.A.1.; 7.EE.B.3.; 7.EE.B.4.; 7.EE.B.4a.; 7.EE.B.4b.; 7.EE.A.2.

Unit #4: 7.EE.B.4.; 7.EE.B.4a.; 7.EE.B.4a.; 7.RP.A.3.; 7.G.B.4; 7.G.B.5.; 7.G.B.6.; 7.G.A.2.; 7.G.A.3.

Unit #5: 7.SP.A.1.; 7.SP.A.2.; 7.SP.B.3.; 7.SP.B.4.; 7.SP.C.5.; 7.SP.C.6.; 7.SP.C.7.; 7.SP.C.7a.; 7.SP.C.7b.; 7.SP.C.8.; 7.SP.C.8a.; 7.SP.C.8b.; 7.SP.C.8c.

NJSLS 21st Century Life and Career Skills & Standards

- **CRP1:** Act as a responsible and contributing citizen and employee.
- **CRP2:** Apply appropriate academic and technical skills.
- **CRP3:** Attend to personal health and financial well-being.
- **CRP4:** Communicate clearly and effectively and with reason.
- **CRP8:** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP11:** Use technology to enhance productivity.

9.1 Personal Financial Literacy

This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially-secure, and successful careers.

9.2 Career Awareness, Exploration, and Preparation

This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

9.3 Career and Technical Education

This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

NJSLS Technology Content Standard(s):

- **8.1. Educational Technology:** All students will use digital tools to access, manage, evaluate, synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.
 - **B. Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
 - **C. Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
 - **E. Research and Information Fluency:** Students apply digital tools to gather, evaluate, and use information.
 - **F. Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.
- **8.2 Technology Education, Engineering, Design and Computational Thinking -** All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.
 - **E. Computational Thinking:** Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Primary Interdisciplinary Connections:

Infused within the units are connections to the NJSLS for ELA and Science

Course Requirements and Major Assignments:

- Must maintain an overall grade of 70%
- Must adhere to attendance regulation
- Maintain a organized notebook/ binder
- Complete class and homework assignments
- Assessments: Chapter Tests and Quizzes, Benchmark Assessments, and Projects

Course Content Outline/Pacing Guide

Unit #	Unit Title/Major Concepts	Duration: Weeks & School Calendar
1	Ratios and Proportional Relationships	35 days (7 weeks)
2	The Number System	40 days (8 weeks)
3	Expressions and Equations	45 days (9 weeks)
4	Geometry	20 days (4 weeks)
5	Statistics and Probability	30 days (6 weeks)

Course Unit 1

Unit Title: Ratios and Proportional Relationships

Date/Duration: 35 days (7 weeks)

New Jersey Student Learning Standards (NJSLS) Major Focus Standards addressed:

Ratios and Proportional Relationships 7.RP

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

1. Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units. For example, if a person walks $\frac{1}{2}$ mile in each $\frac{1}{4}$ hour, compute the unit rate as the complex fraction mph, equivalently 2 mph.
2. Recognize and represent proportional relationships between quantities.
 - a. Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
 - b. Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
 - c. Represent proportional relationships by equations.
For example, if total cost t is proportional to the number n of items purchased at a constant price p , the relationship between the total cost and the number of items can be expressed as $t = pn$.
 - d. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation, with special attention to the points $(0, 0)$ and $(1, r)$ where r is the unit rate.
3. Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

New Jersey Student Learning Standards (NJSLS) Supporting Standards addressed:

Geometry 7.G

A. Draw, construct, and describe geometrical figures and describe the relationship between them.

- 1: 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.

Standards for Mathematical Practices:

- MP.1 Make sense of problems and persevere in solving them
- MP.2 Reason abstractly and quantitatively
- MP.3 Construct viable arguments and critique the reasoning of others
- MP.4 Model with Mathematics

MP.5 Use appropriate tools strategically
MP.6 Attend to precision
MP.7 Look for and make use of structure
MP.8 Look for and express regularity in repeated reasoning

NJSLS 21st Century Skills Content Standards(s) addressed: 9.1, 9.2, 9.3

NJSLS 21st Century Life and Career Skills & Standards

- **CRP1:** Act as a responsible and contributing citizen and employee.
- **CRP2:** Apply appropriate academic and technical skills.
- **CRP3:** Attend to personal health and financial well-being.
- **CRP4:** Communicate clearly and effectively and with reason.
- **CRP8:** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP11:** Use technology to enhance productivity.

9.1 Personal Financial Literacy

9.1.8.A.1 Explain the meaning and purposes of taxes and tax deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay.

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.A.6 Explain how income affects spending decisions.

9.1.8.A.7 Explain the purpose of the payroll deduction process, taxable income, and employee benefits.

9.1.8.B.1 Distinguish among cash, check, credit card, and debit card.

9.1.8.B.2 Construct a simple personal savings and spending plan based on various sources of income.

9.1.8.B.7 Construct a budget to save for long-term, short-term, and charitable goals.

9.1.8.C.1 Compare and contrast credit cards and debit cards and the advantages and disadvantages of using each.

9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).

NJSLS Technology Content Standard(s) addressed:

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of results

Primary Interdisciplinary Connections:

Infused within the unit are connections to the NJSLS for Mathematics, Language Arts Literacy

W.6.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting

or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Stage 1: Desired Results

Transfer

Students will be able to independently use their learning to:

- Analyze proportional relationships and use them to solve real world and mathematical problems
- Analyze and solve percent problems

Meaning

Understandings:

Students will understand that:

- Ratios and rates describe the relationship between two quantities.
- Equivalent ratios and unit rates are used to solve multi-step problems.
- Unit rates are related to ratios of fractions and use unit rates to solve multi-step problems.
- Quantities are proportional by testing for equivalent ratios.
- The constant of proportionality can be used to write equations that represent proportional relationships.
- Equations can be used to solve problems involving proportional relationships.
- Mathematical modeling can be used to represent a problem situation and to propose a solution.
- They need to test and verify the appropriateness of math models.
- They need to explain why the results from mathematical models may not align exactly to the problem situation.
- Graphs can be used to recognize proportionality.
- The constant of proportionality can be recognized from a graph.
- Graphs of a proportional

Essential Questions:

- How are equivalent ratios and unit rates used to compare ratios and solve problems?
- How can a unit rate be easier to use to solve problems than a ratio of fractions?
- How can quantities in a proportional relationship be described by equivalent ratios?
- How can equations be used to represent proportional relationships and solve problems in the form of $y=kx$, where k is the constant of proportionality?
- How can real-world problem situations be represented with a mathematical model and may not represent a real-world situation exactly?
- Is the graph is a proportional relationship if it is a straight line through the origin?
- How can recognizing proportional quantities help identify what you know about proportional relationships to solve problems?

relationships can be used to interpret a point. • Situations can be represented by proportional relationships. • Representations can be used to find entry points into problems.	
Acquisition	
Students will know..... • how to use ratios and rates to describe the relationship between two quantities. • how to find equivalent ratios and use unit rates to solve multi-step problems. • how to find unit rates with ratios of fractions and use unit rates to solve multi-step problems. • whether quantities are proportional. • how to use the constant of proportionality to write equations that represent proportional relationships. • how to use a graph to recognize proportionality. • how to identify and interpret the proportional relationship from a graph. • whether a situation represents a proportional relationship.	Students will be able to.... • understand and reason about ratios and rates, and make comparisons with unit rates. • apply equivalent ratios and unit rates to solve multi-step problems in real-world situations. • extend their understanding and skills with unit rates and fraction operations as they solve problems involving ratios of fractions. • determine if a relationship is proportional. • use equations to solve problems involving proportional relationships. • explain the characteristics of a graph of proportional relationship. • interpret points on graphs of proportional relationships in the context of real-world situations. • use reasoning skills to determine whether a relationship is proportional.
Stage 2-Assessment Evidence	
<i>Students will show their learning by...</i>	
Performance Tasks/ Alternative Assessments: • Cooperative learning • Daily Do-Nows • Math workshop activities • Extended constructed response questions • Student workbook exercises • Note taking • Performance based tasks	Other Evidence: • Student Surveys • Small Group Discussion • Exit Ticket Formative: • In-Class activities • Do-Now/ Problem of the Day • Informal Observation • Homework

- Project based learning
- Benchmark Assessment

- Quizzes
- Benchmark Assessments

Summative:

- Common Benchmarks
- SGO Assessments
- Projects

Stage 3- Learning Plan

Summary of Key Learning Events and Instruction

Unit Planning for Lesson Plans

- Pre-assess students' prior knowledge in the form of written tests and surveys.
- Introduction of Essential Questions
- Introduction to terminology, concepts taught, and how they will be assessed, and expectations
- Discuss sequences to creating and completing the performance tasks
- Explain daily practice of learning goals and assessment methods.
- Include modifications in the student's daily learning goals to help practice and deepen their knowledge.
- Differentiated Instruction
- Cooperative Learning
- Teacher led "skill" based instruction
- Activities to help students deepen and apply knowledge.
- Survey the students for improvement and understanding of concepts after practice.
- Jigsaw activity
- Review terminology and correct technique.
- Administer Benchmarks
- Discuss any remaining questions or concerns about the performance tasks
- Administer Benchmark

Pre-Assessment Strategies:

Written Tests for Knowledge
 Concept MAPS
 K-W-L- Charts
 Questioning
 Self Evaluations
 Teacher Observation Checklists
 Portfolios

Progress Monitoring Strategies:

Written Tests for Knowledge
 Concept MAPS
 K-W-L- Charts
 Questioning
 Self Evaluations

Teacher Observation Checklists
Portfolios
Surveys
Class Discussion
Answers Obtained

Recommended Accommodations and Modifications

Add Modifications/Accommodations as per Student's IEP/504
Add Tier RTI Tier 1, II, or III modification as per Educational Proficiency Plans (EPPs)
Suggested Tier I Interventions

- One-One Conferencing
- Small Group Instruction- Ability, Interest, Choice
- Use of Graphic Organizers/Guided Notes
- Leveled Reading materials
- [Differentiated Instruction Checklist](#)

ELL:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies/ Peer Tutoring
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues/Models
- Number Chart/Supplemental Aids (Number line, Addition/Multiplication Table)
- Technology Integration
- Work toward longer passages as skills in English increase

Special Education:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available

- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Allow answers to be given orally or dictated
- Follow all IEP modifications/504 plan

Gifted and Talented:

- Opportunities for Critical Thinking
- Problem Solving/Design Challenges
- Technology Integration
- Student Choice Activities
- Student Driven Activities
- Group Projects
- Tiered Activities
- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities

Title 1 (At-Risk Students):

- Follow all EPP modifications, accommodations, and interventions
- Tier 1 classroom modifications and accommodations
- Differentiated Instruction Assignments/ Activities
- Small Group Instruction
- Individualized Instruction
- BSI Teacher: Push-in and pull-out instruction
- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Peer Buddies
- Homework
- Leveled Reading
- Supplemental Assignments
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Tiered Activities
- Manipulatives

- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues/Models
- Number Chart/Supplemental Aids (Number line, Addition/Multiplication Table)
- Technology Integration
- Assistive Technology

Students at Risk of School Failure

- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Communication logs

Specific Resources for Unit

EnVision Math 2.0 7th Grade Edition
 EnVision Math 2.0 Student workbook
 Versatiles 7th Grade Edition
 7th Grade Model Curriculum
 PARCC Evidence Tables
 PARCC Test Design

General Resources for Course

Study Island
 Khan Academy
 BuzzMath

Course Unit 2

Unit Title: The Number System

Date/Duration: 40 days

New Jersey Student Learning Standards (NJSLS) Major Focus Standards addressed:

The Number System 7.NS

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

1. Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line.

a. Describe situations in which opposite quantities combine to make 0. *For example, In the first round of a game, Maria scored 20 points. In the second round of the same game, she lost 20 points. What is her score at the end of the second round?*

b. 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. Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts.

c. Understand subtraction of rational numbers as adding the additive inverse, $p - q = p + (-q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts.

d. Apply properties of operations as strategies to add and subtract rational numbers.

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

a. Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as $(-1)(-1) = 1$ and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts.

b. Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers, then $-(p/q) = (-p)/q = p/(-q)$. 2c. Interpret quotients of rational numbers by describing real world contexts.

c. Apply properties of operations as strategies to multiply and divide rational numbers.

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.

3. Solve real-world and mathematical problems involving the four operations with rational numbers.

New Jersey Student Learning Standards (NJSLS) Supporting Standards addressed:

Standards for Mathematical Practices:

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.3 Construct viable arguments and critique the reasoning of others
MP.4 Model with Mathematics
MP.5 Use appropriate tools strategically
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9.1 Personal Financial Literacy

9.1.8.A.1 Explain the meaning and purposes of taxes and tax deductions and why fees for various benefits (e.g., medical benefits) are taken out of pay.

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.A.6 Explain how income affects spending decisions.

NJSLS Technology Content Standard(s) addressed:

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of results

Primary Interdisciplinary Connections:

Infused within the unit are connections to the NJSLS for Mathematics, Language Arts Literacy

W.6.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Stage 1: Desired Results

Transfer	
<i>Students will be able to independently use their learning to:</i> • Apply and extend previous understandings of operations with rational numbers • Apply and extend previous understandings of operations with integers	
Meaning	
Understandings: Students will understand that: • Integers and their opposites are related. • Rational numbers can be written as decimals. • Adding positive and negative integers can model integer addition in real-life applications. • Subtraction of integers is adding the additive inverse, $p - q = p + (-q)$. • Properties of operations can be used to add and subtract rational numbers. • Properties of operations can be used to multiply positive and negative integers and apply integer multiplication in real-life applications. • Properties of operations can be used to divide positive and negative integers and apply integer division in real-life applications. • Equivalencies exist among integer quotients. • The signs of integers in a multiplication sentence relate to the signs in a related division statement. • Different operations are needed to solve problems involving integers and rational numbers. • Precision is needed when solving problems involving rational numbers.	Essential Questions: • What is the relationship between an integer and its opposite from 0 on a number line and have the sum of 0? • How are rational numbers expressed as fractions and be written as decimal form? • How can knowledge of absolute value aid you in adding and subtracting integers? • How is subtracting a number similar to adding that number's additive inverse? • How is adding and subtracting integers related to adding and subtracting other rational numbers? • How is the sign of a product determined by the signs of the factors in a multiplication expression? • How are the same properties used to multiply integers also apply when multiplying rational numbers? • How can the relationship between multiplication and division be useful when dividing positive and negative integers? • How are dividing rational numbers similar to dividing integers? • How does the sign of the quotient depends on the signs of the dividend and divisor? • How do problems involving rational numbers be solved by making sense of the quantities and their relationships to each other?

Acquisition	
Students will know..... • how integers, their opposites and absolute values are related. • how to identify rational numbers. • how to add positive and negative integers. • how to understand subtraction of integers as adding the inverse, $p-q=p+(-p)$. • how to add and subtract positive and negative rational numbers. • how to multiply positive and negative integers. • how to multiply rational numbers. • how to use the relationship between multiplication and division to divide integers. • how the signs of integers in a multiplication sentence relate to the signs in a related division sentence. • how to decide which operations to use to solve problems with rational numbers.	Students will be able to.... • apply this understanding to models and use these to solve real-world problems. • convert rational numbers expressed as fractions to terminating or repeating decimals. • model integer addition in real-life applications. • use addition and subtraction rules to solve real-world problems. • use number lines to model addition and subtraction as movement or distance between rational numbers. • use models and mathematical properties to develop deep understanding of and fluency with multiplying integers. • apply operations with rational numbers to real world contexts. • relate dividing positive and negative numbers to real-world situations that require mathematical understanding. • extend the rules for dividing integers to divide rational numbers. • relate multiplying rational numbers and dividing integers to division of rational numbers. • apply what they know about the properties of operations to solve problems with rational numbers.
Stage 2-Assessment Evidence	
<i>Students will show their learning by...</i>	
Performance Tasks/ Alternative Assessments: • Cooperative learning • Daily Do-Nows • Math workshop activities • Extended constructed response questions • Student workbook exercises	Other Evidence: • Student Surveys • Small Group Discussion • Exit Ticket Formative: • In-Class activities • Do-Now/ Problem of the Day • Informal Observation

- Note taking
- Performance based tasks
- Project based learning
- Benchmark Assessment

- Homework
- Quizzes
- Benchmark Assessments

Summative:

- Common Benchmarks
- SGO Assessments
- Projects

Stage 3- Learning Plan

Summary of Key Learning Events and Instruction

Unit Planning for Lesson Plans

- Pre-assess students' prior knowledge in the form of written tests and surveys.
- Introduction of Essential Questions
- Introduction to terminology, concepts taught, and how they will be assessed, and expectations
- Discuss sequences to creating and completing the performance tasks
- Explain daily practice of learning goals and assessment methods.
- Include modifications in the student's daily learning goals to help practice and deepen their knowledge.
- Differentiated Instruction
- Cooperative Learning
- Teacher led "skill" based instruction
- Activities to help students deepen and apply knowledge.
- Survey the students for improvement and understanding of concepts after practice.
- Jigsaw activity
- Review terminology and correct technique.
- Administer Benchmarks
- Discuss any remaining questions or concerns about the performance tasks
- Administer Benchmark

Pre-Assessment Strategies:

Written Tests for Knowledge
 Concept MAPS
 K-W-L- Charts
 Questioning
 Self Evaluations
 Teacher Observation Checklists
 Portfolios

Progress Monitoring Strategies:

Written Tests for Knowledge
 Concept MAPS
 K-W-L- Charts
 Questioning

Self Evaluations
Teacher Observation Checklists
Portfolios
Surveys
Class Discussion
Answers Obtained

Recommended Accommodations and Modifications

Add Modifications/Accommodations as per Student's IEP/504
Add Tier RTI Tier 1, II, or III modification as per Educational Proficiency Plans (EPPs)
Suggested Tier I Interventions

- One-One Conferencing
- Small Group Instruction- Ability, Interest, Choice
- Use of Graphic Organizers/Guided Notes
- Leveled Reading materials

[Differentiated Instruction Checklist](#)

ELL:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies/ Peer Tutoring
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues/Models
- Number Chart/Supplemental Aids (Number line, Addition/Multiplication Table)
- Technology Integration
- Work toward longer passages as skills in English increase

Special Education:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice
- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives

- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Allow answers to be given orally or dictated
- Follow all IEP modifications/504 plan

Gifted and Talented:

- Opportunities for Critical Thinking
- Problem Solving/Design Challenges
- Technology Integration
- Student Choice Activities
- Student Driven Activities
- Group Projects
- Tiered Activities
- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities

Title 1 (At-Risk Students):

- Follow all EPP modifications, accommodations, and interventions
- Tier 1 classroom modifications and accommodations
- Differentiated Instruction Assignments/ Activities
- Small Group Instruction
- Individualized Instruction
- BSI Teacher: Push-in and pull-out instruction
- Extended Time
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- Homework
- Leveled Reading
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Students at Risk of School Failure

- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Communication logs

Specific Resources for Unit

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 Versatiles 7th Grade Edition
 7th Grade Model Curriculum
 PARCC Evidence Tables
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General Resources for Course

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 Khan Academy
 BuzzMath

Course Unit 3

Unit Title: Expressions and Equations

Date/Duration: 45 days (9 weeks)

New Jersey Student Learning Standards (NJSLS) Major Focus Standards addressed:

Expressions and Equations 7.EE

A. Use properties of operations to generate equivalent expressions.

1. Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

3. Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies. *For example: If a woman making \$25 an hour gets a 10% raise, she will make an additional $\frac{1}{10}$ of her salary an hour, or \$2.50, for a new salary of \$27.50. If you want to place a towel bar $9\frac{3}{4}$ inches long in the center of a door that is $27\frac{1}{2}$ inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation.*

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities .

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

b. Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where p , q , and r are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem. *For example: As a salesperson, you are paid \$50 per week plus \$3 per sale. This week you want your pay to be at least \$100. Write an inequality for the number of sales you need to make, and describe the solutions.*

New Jersey Student Learning Standards (NJSLS) Supporting Standards addressed:

Expressions and Equations 7.EE

A. Use properties of operations to generate equivalent expressions.

2. Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. *For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”*

Standards for Mathematical Practices:

- MP.1 Make sense of problems and persevere in solving them
- MP.2 Reason abstractly and quantitatively
- MP.3 Construct viable arguments and critique the reasoning of others
- MP.4 Model with Mathematics
- MP.5 Use appropriate tools strategically
- MP.6 Attend to precision
- MP.7 Look for and make use of structure
- MP.8 Look for and express regularity in repeated reasoning

NJSLS 21st Century Skills Content Standards addressed: 9.1, 9.2, 9.3

NJSLS 21st Century Life and Career Skills & Standards

- **CRP1:** Act as a responsible and contributing citizen and employee.
- **CRP2:** Apply appropriate academic and technical skills.
- **CRP3:** Attend to personal health and financial well-being.
- **CRP4:** Communicate clearly and effectively and with reason.
- **CRP8:** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP11:** Use technology to enhance productivity.

9.1 Personal Financial Literacy

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.A.7 Explain the purpose of the payroll deduction process, taxable income, and employee benefits.

9.1.8.B.2 Construct a simple personal savings and spending plan based on various sources of income.

9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).

NJSLS Technology Content Standard(s) addressed:

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of results

Primary Interdisciplinary Connections:

Infused within the unit are connections to the NJSLS for Mathematics, Language Arts Literacy

W.6.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Stage 1: Desired Results

Transfer

Students will be able to independently use their learning to:

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

Meaning

Understandings:

Students will understand that:

- Word problems can be analyzed to write equations.
- That there is a relationship between the terms of an equation and the values they represent.
- Models can be used to represent and solve equations and inequalities.
- Algebraic and arithmetic solutions can be used to represent the same information.
- The distributive property can be used to rewrite and simplify expressions.
- Inequalities can be solved using properties of equality and can be graphed on a number line.
- They can test and verify the appropriateness of their mathematical models.
- They can write and solve a two step inequality to solve a problem.
- There is a relationship between two step inequalities and multi-step inequalities.

Essential Questions:

- How can equations with more than one operation be used to represent a situation?
- How can one and two-step problems be solved using the properties of equality?
- How can the Distributive Property be used to solve equations in the form $p(x + q) = r$?
- How is solving inequalities with addition, subtraction, multiplication and division similar to solving equations?
- Why do we reverse the inequality symbol when multiplying or dividing by a negative value?
- How can real-world situations be represented with a mathematical model?
- How can using properties of inequalities aid in solving multi-step equations and inequalities?

Acquisition

Students will know.....

- how to analyze word problems to write two-step equations
- how to solve a problem using a two-step equation
- how to solve equations using the distributive property
- how to graph the solution of

Students will be able to....

- interpret the quantities of an equation
- compare algebraic and arithmetic solutions
- apply the Distributive Property to simplify expressions
- solve inequalities using the

inequalities on a number line • how to write inequalities and solve them using the properties of inequality • how to solve an inequality by multiplying or dividing by a negative rational number • how to write and solve a two-step inequality • how to solve multi-step inequalities	Addition and Subtraction Properties of Equality • graph the solutions of inequalities on a number line • interpret the solutions of inequalities • explore the relationship between 2-step and multi-step inequalities • apply the Distributive Property to simplify and solve equations
Stage 2-Assessment Evidence	
<i>Students will show their learning by...</i>	
Performance Tasks/ Alternative Assessments: • Cooperative learning • Daily Do-Nows • Math workshop activities • Extended constructed response questions • Student workbook exercises • Note taking • Performance based tasks • Project based learning • Benchmark Assessment	Other Evidence: • Student Surveys • Small Group Discussion • Exit Ticket Formative: • In-Class activities • Do-Now/ Problem of the Day • Informal Observation • Homework • Quizzes • Benchmark Assessments Summative: • Common Benchmarks • SGO Assessments • Projects
Stage 3- Learning Plan	
Summary of Key Learning Events and Instruction	
Unit Planning for Lesson Plans • Pre-assess students' prior knowledge in the form of written tests and surveys. • Introduction of Essential Questions • Introduction to terminology, concepts taught, and how they will be assessed, and expectations • Discuss sequences to creating and completing the performance tasks • Explain daily practice of learning goals and assessment methods. • Include modifications in the student's daily learning goals to help practice and deepen their knowledge. • Differentiated Instruction	

- Cooperative Learning
- Teacher led “skill” based instruction
- Activities to help students deepen and apply knowledge.
- Survey the students for improvement and understanding of concepts after practice.
- Jigsaw activity
- Review terminology and correct technique.
- Administer Benchmarks
- Discuss any remaining questions or concerns about the performance tasks
- Administer Benchmark

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Progress Monitoring Strategies:

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 Answers Obtained

Recommended Accommodations and Modifications

Add Modifications/Accommodations as per Student's IEP/504
 Add Tier RTI Tier 1, II, or III modification as per Educational Proficiency Plans (EPPs)
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ELL:

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- Flexible Grouping
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- Peer Buddies/ Peer Tutoring

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- Gradual Release Model
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- Work toward longer passages as skills in English increase

Special Education:

- Extra help opportunities provided
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Gifted and Talented:

- Opportunities for Critical Thinking
- Problem Solving/Design Challenges
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Title 1 (At-Risk Students):

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 PARCC Evidence Tables
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General Resources for Course

Study Island
Khan Academy
BuzzMath

Course Unit 4

Unit Title: Geometry

Date/Duration: 20 days

New Jersey Student Learning Standards (NJSLS) Major Focus Standards addressed:

Expressions and Equations 7.EE

B. Solve real-life and mathematical problems using numerical and algebraic expressions and equations

4. Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.

a. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach. *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*

b. Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p , q , and r are specific rational numbers. Solve equations of these forms fluently.

Ratios and Proportional Relationships 7.RP.

A. Analyze proportional relationships and use them to solve real-world and mathematical problems.

3. Use proportional relationships to solve multistep ratio and percent problems. *Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error*

New Jersey Student Learning Standards (NJSLS) Supporting Standards addressed:

Geometry 7.G

A. Draw, construct, and describe geometrical figures and describe the relationships between them.

2. Draw (with technology, with ruler and protractor as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle

3. Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids.

B. Solve real-life and mathematical problems involving angle measure, area, surface area, and volume

4. 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.

5. Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

6. 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.

Standards for Mathematical Practices:

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.3 Construct viable arguments and critique the reasoning of others

MP.4 Model with Mathematics

MP.5 Use appropriate tools strategically

MP.6 Attend to precision

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MP.8 Look for and express regularity in repeated reasoning

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- **CRP11:** Use technology to enhance productivity.

9.1 Personal Financial Literacy

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.B.2 Construct a simple personal savings and spending plan based on various sources of income.

9.1.8.B.7 Construct a budget to save for long-term, short-term, and charitable goals.

NJSLS Technology Content Standard(s) addressed:

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability

Primary Interdisciplinary Connections:

Infused within the unit are connections to the NJSLS for Mathematics, Language Arts Literacy

W.6.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting

or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Stage 1: Desired Results

Transfer

Students will be able to independently use their learning to:

- 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

Meaning

Understandings:

Students will understand that:

- Scale drawings are representations of actual lengths and area.
- Quadrilaterals are classified according to their properties.
- Many different triangles can be constructed with various conditions.
- Use angle relationships to calculate the measures of angles.
- There is a relationship between the radius, diameter, and circumference of a circle.
- The relationship between the circumference and the diameter of a circle is a mathematical constant.
- They can use the area of a circle to find the radius or diameter and solve problems using the area.
- Use mathematical modeling to represent a problem situation and propose a solution.
- They can use cross sections of figures to solve problems.
- They can use surface area to find the total of composite figures.
- Volume formulas can be used to find various three dimensional figures.

Essential Questions:

- How can using scale drawings help calculate measurements and reproduce proportional scale drawings?
- How can side lengths and angle measures determine unique quadrilaterals? Triangles?
- How can the measure of angles that are formed by intersecting lines determine different types of angles?
- What is the relationship between the circumference and diameter of a circle?
- How can using the formula for area of a circle be used to solve problems?
- How can real-world problem situations be represented by a mathematical model?
- What 2-D figure is formed by slicing a 3-D figure by a 2-D figure?
- What is the difference and how do we find surface area and volume of 3-D figures using formulas and mathematical processes?

Acquisition

Students will know..... • how to use a scale drawing as a representation of actual lengths and area. • how to draw geometric shapes with given conditions. • to name and classify quadrilaterals according to their properties. • how to sketch and construct triangles with given conditions. • the number of triangles that can be formed given side lengths and angle measures. • how to find the measure of angles using angle relationships. • to recognize the relationship between different angles formed by intersecting lines and rays. • how to calculate the circumference, radius, or diameter of a circle. • to recognize the relationship between the circumference of a circle and pi. • how to calculate the area of a circle and use it to solve problems. • how to describe and sketch the cross sections of 3D figures • to solve problems involving cross sections. • how to find the surface area of 2D and 3D composite shapes. • how to calculate the volume of various 3D figures.	Students will be able to.... • apply ratios and proportional reasoning to solve multi-step problems involving a scale drawing. • apply knowledge of triangles and quadrilaterals to solve real-world problems. • draw triangles and identify if more than one or no triangles can be formed given certain conditions. • apply angle relationships in different real-world scenarios to determine angle measures. • calculate and understand the circumference, diameter, or radius of a circle. • apply the equation for area of a circle to solve for radius, area, or circumference and apply it to real-world problems. • visualize how different cross sections relate to the prism they divide. • extend their knowledge of area of polygons and nets of solids to more complex figures and deconstruct shapes to calculate the area of composite figures. • extend their understanding of volume by solving real-world problems.
Stage 2-Assessment Evidence	
<i>Students will show their learning by...</i>	
Performance Tasks/ Alternative Assessments:	Other Evidence: • Student Surveys

- Cooperative learning
- Daily Do-Nows
- Math workshop activities
- Extended constructed response questions
- Student workbook exercises
- Note taking
- Performance based tasks
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- Benchmark Assessment

- Small Group Discussion
- Exit Ticket

Formative:

- In-Class activities
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Summative:

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Questioning

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Portfolios

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Add Tier RTI Tier 1, II, or III modification as per Educational Proficiency Plans (EPPs)

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- [Differentiated Instruction Checklist](#)

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- Opportunities for Critical Thinking
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- Organize integrated problem-solving simulations
- Propose interest-based extension activities

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- Extended Time
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- Strategic grouping
- Pre-teach concepts
- Small group for assessments
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- Communication logs

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General Resources for Course

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 Khan Academy
 BuzzMath

Course Unit 5

Unit Title: Statistics and Probability

Date/Duration: 30 days (6 weeks)

New Jersey Student Learning Standards (NJSLS) Major Focus Standards addressed:

All standards are either supporting or additional.

New Jersey Student Learning Standards (NJSLS) Supporting Standards addressed:

Statistics and Probability 7.SP.

A. Use random sampling to draw inferences about a population

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.
2. Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions. *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be.*

B. Draw informal comparative inferences about two populations

3. Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability.
For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable.
4. Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations. *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book.*

C. Investigate chance processes and develop, use, and evaluate probability models.

5. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around $\frac{1}{2}$ indicates an event that is neither unlikely nor likely, and a probability near 1 indicates

a likely event.

6. Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability. *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times.*

7. Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy.

a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected.*

b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process. *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*

8. Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

a. Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs.

b. Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event.

c. Design and use a simulation to generate frequencies for compound events. *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

Standards for Mathematical Practices:

MP.1 Make sense of problems and persevere in solving them

MP.2 Reason abstractly and quantitatively

MP.3 Construct viable arguments and critique the reasoning of others

MP.4 Model with Mathematics

MP.5 Use appropriate tools strategically

MP.6 Attend to precision

MP.7 Look for and make use of structure

MP.8 Look for and express regularity in repeated reasoning

NJSLS 21st Century Skills Content Standards(s) addressed: 9.1, 9.2, 9.3

NJSLS 21st Century Life and Career Skills & Standards

- **CRP1:** Act as a responsible and contributing citizen and employee.
- **CRP2:** Apply appropriate academic and technical skills.
- **CRP3:** Attend to personal health and financial well-being.
- **CRP4:** Communicate clearly and effectively and with reason.

- **CRP8:** Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP11:** Use technology to enhance productivity.

9.1 Personal Financial Literacy

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.B.7 Construct a budget to save for long-term, short-term, and charitable goals.

NJSLS Technology Content Standard(s) addressed:

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.1.8.A.2 Create a document (e.g. newsletter, reports, personalized learning plan, business letters or flyers) using one or more digital applications to be critiqued by professionals for usability.

8.1.8.A.3 Use and/or develop a simulation that provides an environment to solve a real-world problem or theory.

8.1.8.A.4 Graph and calculate data within a spreadsheet and present a summary of results.

Primary Interdisciplinary Connections:

Infused within the unit are connections to the NJSLS for Mathematics, Language Arts Literacy

W.6.10. Write routinely over extended time frames (time for research, reflection, metacognition/self correction, and revision) and shorter time frames (a single sitting or a day or two) for a range of discipline-specific tasks, purposes, and audiences.

Stage 1: Desired Results

Transfer

Students will be able to independently use their learning to:

- Investigate chance processes and develop, use, and evaluate probability models
- Use random sampling to draw inferences about a population
- Draw informal comparative inferences about two populations

Meaning

Understandings:

Students will understand that:

- There is a difference between a population and a sample.
- A sample should be representative of a population.
- When conducting experiments it is necessary to generate random

Essential Questions:

- How can representative samples reflect the entire population?
- What is the best way to determine a representative sample?
- How can data from random samples be used to make valid inferences about a population?

samples. • It is necessary to make qualitative and quantitative inferences from a sample data set. • It is necessary to make estimates about a population based on a sample data set and assess whether the inferences are valid. • Box plots are used to compare populations. • Mean, median, mode, range, and mean absolute deviation (MAD) are used to compare populations. • Mathematical modeling is used to represent a problem situation and helps propose a solution. • It is necessary to test and verify the appropriateness of their math models. • Probability is used to describe the likelihood that an event will occur. • Probability is directly related to mathematical fairness. • Theoretical and experimental probability are related and can both be used to predict an outcome. • How to develop a probability model and use it to make an estimate. • The results from a mathematical model may not align exactly to the problem situation. • Tree diagrams, tables, or organized lists can be used to represent the sample space for compound events. • It might be necessary to use different tools to simulate a compound event.	• How can data displays, such as box plots, be used to make informal comparisons? What can the shape of the data tell us? • How can dot plots be used to compare populations? • How can the use of statistical measures, such as mean and MAD, be used to make inferences and predictions about populations? • How can real-world problems be represented with a mathematical model? • How can probability be expressed as the likelihood that an event will occur through ratios? • How does theoretical and experimental probabilities compare and contrast? • How can a probability model be used to evaluate a chance process? • How can using tree diagrams, tables, or an organized list show possible outcomes of an event?
Acquisition	
Students will know..... • the difference between a population and sample. • whether a sample is representative of a population. • how to generate random samples	Students will be able to.... • apply what they know about populations to draw inferences from data and compare the populations. • use random samples to make and

that represent the entire population. • how to make qualitative and quantitative inferences from a sample data set. • how to make estimates about a population based on sample data and assess whether they are valid. • to use box plots to compare and make inferences about populations. • how to use the median and IQR of data sets to informally compare and make inferences about two populations. • to use the mean, median, mode, and mean absolute deviation to compare populations. • how to use probability to describe the likelihood that an event will occur. • to relate probability to mathematical fairness. • theoretical probability and how it can be used. • how to compare theoretical and experimental probability. • how to explain differences between theoretical and experimental probability. • how to develop a probability model and use it to estimate. • how to use a tree diagram, table, or organized list to represent the sample space for a compound event. • how to find compound probability.	compare inferences about populations, and determine if these inferences are valid. • apply their knowledge of data distributions and statistical measures of center, and variability to informally compare and make inferences about two populations. • apply their knowledge of measures of center and variability to compare and make inferences about two populations. • evaluate the likelihood of outcomes in different situations. • calculate the probability that an event will occur. • compare and contrast experimental and theoretical probability. • determine the probability of compound events. • make predictions using experimental probability. • create a probability model from information about a situation or from limited experimental data. • use tree diagrams, tables, and organized lists to represent sample spaces. • apply what they know about sample spaces, outcomes, and probabilities for different probability models.
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Stage 2-Assessment Evidence

Students will show their learning by...

Performance Tasks/ Alternative Assessments:

- Cooperative learning
- Daily Do-Nows

Other Evidence:

- Student Surveys
- Small Group Discussion
- Exit Ticket

- Math workshop activities
- Extended constructed response questions
- Student workbook exercises
- Note taking
- Performance based tasks
- Project based learning
- Benchmark Assessment

Formative:

- In-Class activities
- Do-Now/ Problem of the Day
- Informal Observation
- Homework
- Quizzes
- Benchmark Assessments

Summative:

- Common Benchmarks
- SGO Assessments
- Projects

Stage 3- Learning Plan

Summary of Key Learning Events and Instruction

Unit Planning for Lesson Plans

- Pre-assess students' prior knowledge in the form of written tests and surveys.
- Introduction of Essential Questions
- Introduction to terminology, concepts taught, and how they will be assessed, and expectations
- Discuss sequences to creating and completing the performance tasks
- Explain daily practice of learning goals and assessment methods.
- Include modifications in the student's daily learning goals to help practice and deepen their knowledge.
- Differentiated Instruction
- Cooperative Learning
- Teacher led "skill" based instruction
- Activities to help students deepen and apply knowledge.
- Survey the students for improvement and understanding of concepts after practice.
- Jigsaw activity
- Review terminology and correct technique.
- Administer Benchmarks
- Discuss any remaining questions or concerns about the performance tasks
- Administer Benchmark

Pre-Assessment Strategies:

Written Tests for Knowledge

Concept MAPS

K-W-L- Charts

Questioning

Self Evaluations

Teacher Observation Checklists

Portfolios

Progress Monitoring Strategies:

Written Tests for Knowledge
Concept MAPS
K-W-L- Charts
Questioning
Self Evaluations
Teacher Observation Checklists
Portfolios
Surveys
Class Discussion
Answers Obtained

Recommended Accommodations and Modifications

Add Modifications/Accommodations as per Student's IEP/504
Add Tier RTI Tier 1, II, or III modification as per Educational Proficiency Plans (EPPs)
Suggested Tier I Interventions

- One-One Conferencing
- Small Group Instruction- Ability, Interest, Choice
- Use of Graphic Organizers/Guided Notes
- Leveled Reading materials
- [Differentiated Instruction Checklist](#)

ELL:

- Multi-Sensory Instruction
- Flexible Grouping
- Small Group Instruction
- Peer Buddies/ Peer Tutoring
- Graphic Organizers
- Chunking Information
- Scaffolded Questioning
- Manipulatives
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Gradual Release Model
- Visual Cues/Models
- Number Chart/Supplemental Aids (Number line, Addition/Multiplication Table)
- Technology Integration
- Work toward longer passages as skills in English increase

Special Education:

- Extra help opportunities provided
- Partial credit for late work
- Allow use of a calculator, when appropriate
- Modified length and time frame of assignments
- Alternate assessments with extended time
- Provide guided notes and study guides as needed
- Preferential Seating
- Extra Practice

- Directions repeated, clarified, and reworded
- Breakdown task into manageable units
- Differentiated instruction
- Use of manipulatives
- Math tool paper available
- Cooperative learning groups
- Supplemental books
- Repeat, reword or clarify directions
- Small group instruction as needed
- Instructional technology as needed/required
- Effective teacher questioning; ranging from fact recall to higher order critical thinking questions
- Allow answers to be given orally or dictated
- Follow all IEP modifications/504 plan

Gifted and Talented:

- Opportunities for Critical Thinking
- Problem Solving/Design Challenges
- Technology Integration
- Student Choice Activities
- Student Driven Activities
- Group Projects
- Tiered Activities
- Create an enhanced set of introductory activities (e.g. advance organizers, concept maps, concept puzzles)
- Provide options, alternatives and choices to differentiate and broaden the curriculum
- Organize and offer flexible small group learning activities
- Provide whole group enrichment explorations
- Teach cognitive and methodological skills
- Use center, stations, or contracts
- Organize integrated problem-solving simulations
- Propose interest-based extension activities

Title 1 (At-Risk Students):

- Follow all EPP modifications, accommodations, and interventions
- Tier 1 classroom modifications and accommodations
- Differentiated Instruction Assignments/ Activities
- Small Group Instruction
- Individualized Instruction
- BSI Teacher: Push-in and pull-out instruction
- Extended Time
- Multi-Sensory Instruction
- Flexible Grouping
- Peer Buddies
- Homework
- Leveled Reading
- Supplemental Assignments
- Graphic Organizers
- Chunking Information

- Scaffolded Questioning
- Tiered Activities
- Manipulatives
- Build Background/Vocabulary
- Math Word Wall/Word Bank
- Modified Assignments
- Gradual Release Model
- Preferential Seating
- Brain Breaks
- Visual Cues/Models
- Number Chart/Supplemental Aids (Number line, Addition/Multiplication Table)
- Technology Integration
- Assistive Technology

Students at Risk of School Failure

- Strategic grouping
- Pre-teach concepts
- Small group for assessments
- Check in's during experiments to help refocus
- Communication logs

Specific Resources for Unit

EnVision Math 2.0 7th Grade Edition
 EnVision Math 2.0 Student workbook
 Versatiles 7th Grade Edition
 7th Grade Model Curriculum
 PARCC Evidence Tables
 PARCC Test Design

General Resources for Course

Study Island
 Khan Academy
 BuzzMath