**Wayne, New Jersey**

**Middle School Mathematics Department**
**Seventh Grade Unified Mathematics I (1A) Curriculum Guide**
**July 2022**
**Revised**

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**Mrs. Donna Reichman, Assistant Superintendent**
**Mrs. Nicole Rodriguez, Floating Assistant Principal - Mathematics & Science**
**Mr. David Kardos, Middle School Mathematics Teacher**

This curriculum may be modified through varying techniques, strategies, and materials
as per an individual student's Individualized Educational Plan (IEP)

Approved by the Wayne Township Board of Education at the regular meeting held on
September 8, 2022

**Wayne Township Public Schools - Mathematics - Grade 7 - 1A/Unified Mathematics I - Pacing Guide**

| Month | Sept | | | | Oct | | | | Nov | | | | Dec | | | | Jan | | | | Feb/March | | | | March/April | | | | April/May | | | | June | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Weeks** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| **Unit 1: Expressions and Equations** | Launch | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| **Unit 2: Geometry** | | | | | | | X | X | X | X | X | | | | | | | | | | | | | | | | | | | | | | | | |
| **Unit 3: Statistics and Probability** | | | | | | | | | | | | X | X | X | X | X | | | | | | | | | | | | | | | | | | | |
| **Unit 4: The Number System** | | | | | | | | | | | | | | | | | X | X | X | X | | | | | | | | | | | | | | | |
| **Unit 5: Linear Relationships/Functions** | | | | | | | | | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | | | | | |
| **Unit 6: Geometry Continued** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X | X | | |
| **Unit 7: Statistics and Probability Continued** | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | X | X |
| **Weeks** | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 |
| **Month** | Sept | | | | Oct | | | | Nov | | | | Dec | | | | Jan | | | | Feb/March | | | | March/April | | | | April/May | | | | June | | |

## *Wayne Township Public Schools*
## Unified Mathematics I Curriculum

| Content Area/ Grade Level/ Course: | **Mathematics** **Grade 7** **Unified I (1A)** |
|---|---|
| **Unit Plan Title:** | **Unit 1-Expressions and Equations** |
| **Time Frame** | **4 weeks (see pacing guide)** |

### Anchor Standards/Domain

**Anchor Standards for Mathematics**
- 7.EE.A Use properties of operations to generate equivalent expressions.
- 7.EE.B Solve real-life and mathematical problems using numerical and algebraic expressions and equations.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

### Unit Summary

Students use arithmetic of rational numbers as they develop expressions and equations using variables. They represent real-world situations using equations and inequalities. They use these equations and inequalities to solve problems by reasoning about the quantities.

### Standard Number(s)

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

**7.EE.A.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."*

**7.EE.B.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 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 3/4 inches long in the center of a door that is 27 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.*

**7.EE.B.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.*

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

**Technology Standards:**
- 9.4.8.TL.2   Gather data and digitally represent information to communicate a real-world problem.

## Essential Question(s)

- How can algebraic expressions and equations be used to model, analyze, and solve mathematical situations?
- Why would one need to find equivalent forms of an expression?
- What real world problems could be represented by equations?
- What real world problems could be represented by inequalities?

## Enduring Understandings

- Students will understand that rewriting an expression in different forms in a problem context can clarify the problem.
- Students will understand that rewriting an expression can clarify how the quantities in the problem are related.
- Students will understand algebraic expressions and equations are used to model real-life problems.
- Students will understand algebraic expressions and equations are used to represent quantitative relationships, so that the numbers and symbols can be mindfully manipulated to reach a solution or make sense of the quantitative relationships.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"
- Being able to 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 will allow students to be successful in the following science standards:
  - MS-ESS1-2. Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.
  - MS-ESS1-4.Construct a scientific explanation based on evidence from rock strata for how the geologic time scale is used to organize Earth's 4.6-billion-year-old history.

- o MS-ESS2-2. Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.
  - o MS-ESS2-3. Analyze and interpret data on the distribution of fossils and rocks, continental shapes, and seafloor structures to provide evidence of the past plate motions.
  - o MS-ESS3-1. Construct a scientific explanation based on evidence for how the uneven distribution of Earth's mineral, energy, and groundwater resources are the rest of past and current geoscience processes.
  - o MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.
  - o MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.
  - o MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.
  - o MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.
  - o MS-PS2-1. Apply Newton's Third Law to design a solution to a problem involving the motion of two colliding objects.
  - o MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.
- ● Being able to solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), being able to use tools strategically, being able to apply properties of operations to calculate with numbers, being able to convert between forms as appropriate, and being able to assess the reasonableness of answers using mental computation and estimation strategies will allow students to be successful in the following science standards:
  - o MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.
  - o MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.
  - o MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

| In this unit plan, the following 21st Century themes and skills are addressed. | | | |
|---|---|---|---|
| *Check all that apply.* **21st Century Themes** | | *Check all that apply.* **21st Century Skills** | |
| | Global Awareness | x | Creativity and Innovation |
| | Environmental Literacy | x | Critical Thinking and Problem Solving |
| | Health Literacy | x | Communication |
| | Civic Literacy | x | Collaboration |
| x | Financial, Economic, Business, and Entrepreneurial Literacy | | |

## Student Learning Targets/Objectives  (Students will know/Students will understand)

- The use of the commutative and associative properties to add linear expressions with rational coefficients.
- The use of the distributive property to add and/or subtract linear expressions with rational coefficients.
- The use of the distributive property to factor a linear expression with rational coefficients.
- The use of the distributive property to expand a linear expression with rational coefficients.
- The use of equivalent expressions to understand the relationships between quantities.
- How to solve real-world problems using rational numbers in any form, including those problems involving multiple steps.
- How to apply the properties of operations to fluently compute with rational numbers in any form.
- The use of mental math and estimation strategies to determine if a solution is reasonable.
- The use of a variable to represent an unknown quantity and write a simple algebraic equation to represent a real world problem.
- How to solve a simple algebraic equation by using the properties of equality or mathematical reasoning, and show or explain my steps.
- How to compare an arithmetic solution to an algebraic solution.
- How to write and solve a simple algebraic inequality and graph the solution on a number line to represent a real-world problem and describe the solution to an inequality in relation to the problem.

## Assessments (Pre, Formative, Summative, Other)      *Denote required common assessments with an *

Assessments (some can be in more than one category):
- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topic 4 and 5 Assessments
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

## Teaching and Learning Activities

| Activities | |
|---|---|
| | ● Lessons 4-2, 4-3, 4-4, 4-5, 4-6, 4-7, Topic 4 Review |
| | ● Lessons 5-1, 5-2, 5-3, 5-4, 5-5, 5-6, 5-7, Topic 5 Review |
| | ● Lessons 1-10, 4-1, 6-2, 7-1, 7-4, 8-5, 8-6, 8-8, 8-9 |
| | ● "3-Act Math" activities |
| | ● STEM projects |
| | ● "Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to: |
| |    o Work productively in teams |
| |    o Communicate clearly and effectively and with reason |
| |    o Demonstrate creativity and innovation |
| |    o Utilize critical thinking to make sense of problems and persevere in solving them |
| |    o Use digital tools to enhance their group response |
| |    o Utilize digital tools to present their work to the class, where appropriate |

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|---|---|
| | - Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity<br>- www.illustrativemathematics.org:  Writing Expressions, Miles to kilometers, Guess My Number, Discounted Books, Fishing Adventure 2,  Sports Equipment Set<br>- https://illuminations.nctm.org/Default.aspx: Pan Balance- Numbers, Pan Balance- Expressions, Algebra Tiles |
| *Differentiation Strategies* | - enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games<br>- Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)<br>- Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games<br>- Math Diagnosis and Intervention System<br>- English Language Learners Toolkit<br>- Differentiation Strategies for Special Education Students<br>- Differentiation Strategies for Gifted and Talented Students<br>- Differentiation Strategies for ELL Students<br>- Differentiation Strategies for At Risk Students<br>- Differentiation Strategies for Students with a 504 |

## Resources

- enVision 2.0 Math Topics 4 and 5
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Websites
  - http://nlvm.usu.edu/en/nav/vlibrary.html
  - http://illuminations.nctm.org
  - http://map.mathshell.org/materials/index.php
  - www.IXL.com
  - http://insidemathematics.org
  - http://mathsnacks.com
  - www.openmiddle.com
  - https://nysed-prod.engageny.org/

| Content Area/ Grade Level/ Course: | Mathematics Grade 7 Unified I (1A) |
|---|---|
| Unit Plan Title: | Unit 2-Geometry |
| Time Frame | 5 weeks (see pacing guide) |

## Anchor Standards/Domain

**Anchor Standards for Mathematics**
- 7.G.A Draw, construct, and describe geometrical figures and describe the relationships between them.
- 7.G.B Solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**

**9.4 Life Literacies, and Key Skills**

*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

## Unit Summary

Students reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions. They gain familiarity with the relationship between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross-sections. They solve problems involving area and circumference of a circle. They also solve real-world problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

## Standard Number(s)

**7.G.A.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.

**7.G.A.2** Draw (freehand, with ruler and protractor, and with technology) 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.

**7.G.A.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.

**7.G.B.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.

**7.G.B.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.

**7.G.B.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.

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

**Technology Standards:**
- 9.4.8.TL.2  Gather data and digitally represent information to communicate a real-world problem.

## Essential Question(s)

- How can one use a scale drawing and scale to compute lengths and areas?
- How can one draw three-dimensional figures?
- What happens to a solid when a plane intersects it?
- How would changing the radius or diameter of a circle affect its circumference and area?
- What is the difference between complementary and supplementary angles?
- What is the relationship between angles formed by intersecting lines?
- When would one want to find area of a figure?
- When would one want to find surface area of a figure?
- When would one want to find volume of a figure?

## Enduring Understandings

- Students will be able to solve problems about scale drawings by relating corresponding lengths within objects or by using the fact that relationships of lengths within an object are preserved in similar objects.
- Students will understand the relationship between angles formed by lines.
- Students will be able to write a simple equation to find an unknown angle.
- Students will be able to solve real-world and mathematical problems involving two-and-three dimensional figures.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"

**In this unit plan, the following 21st Century themes and skills are addressed.**

| Check all that apply.<br>**21st Century Themes** | | Check all that apply.<br>**21st Century Skills** | |
|---|---|---|---|
| | **Global Awareness** | x | **Creativity and Innovation** |

| | | | | |
|---|---|---|---|---|
| | Environmental Literacy | | x | Critical Thinking and Problem Solving |
| | Health Literacy | | x | Communication |
| | Civic Literacy | | x | Collaboration |
| x | Financial, Economic, Business, and Entrepreneurial Literacy | | | |

## Student Learning Targets/Objectives  (Students will know/Students will understand)

- How to use a scale drawing to determine the actual dimensions and area of a geometric figure.
- How to use a different scale to reproduce a similar scale drawing.
- How to draw a geometric shape with specific conditions.
- How to construct a triangle when given three measurements:  3 side lengths, 3 angle measurements, or a combination of side and angle measurements.
- How to determine when three specific measurements will result in one unique triangle, more than one possible triangle, or no possible triangles.
- How to name the two-dimensional figure that represents a particular slice of a three-dimensional figure
- How to state the formula for finding the area of a circle.
- How to state the formula for finding the circumference of a circle.
- How to use formulas to compute the area and circumference of a circle.
- How to determine the diameter or radius of a circle when the circumference is given.
- How to use a ratio and algebraic reasoning to compare the area and circumference of a circle.
- How to state the relationship between supplementary, complementary, and vertical angles.
- How to use angle relationships to write algebraic equations for unknown angles.
- How to use algebraic reasoning and angle relationships to solve multi-step problems.
- How to determine the area of two-dimensional figures.
- How to determine the surface area and volume of three-dimensional figures.
- How to solve real-world problems involving area, surface area, and volume.

## Assessments (Pre, Formative, Summative, Other)                *Denote required common assessments with an ***

Assessments (some can be in more than one category):
- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topic 8 Assessment
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

### *Teaching and Learning Activities*

| | |
|---|---|
| *Activities* | - Lessons 8-1, 8-2, 8-3, 8-4, 8-5, 8-6, 8-7, 8-8, 8-9, Topic 8 Review<br>- "3-Act Math" activities<br>- STEM projects<br>- "Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to: |

| | |
|---|---|
| | <ul><li>○ Work productively in teams</li><li>○ Communicate clearly and effectively and with reason</li><li>○ Demonstrate creativity and innovation</li><li>○ Utilize critical thinking to make sense of problems and persevere in solving them</li><li>○ Use digital tools to enhance their group response</li><li>○ Utilize digital tools to present their work to the class, where appropriate</li></ul><ul><li>Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity</li><li>"Most Square?" activity</li><li>https://illuminations.nctm.org/Default.aspx: Cube Nets, Scale Factor</li><li>www.illustrativemathematics.org : Floor Plan</li></ul> |
| *Differentiation Strategies* | <ul><li>enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games</li><li>Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)</li><li>Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games</li><li>Math Diagnosis and Intervention System</li><li>English Language Learners Toolkit</li><li>Differentiation Strategies for Special Education Students</li><li>Differentiation Strategies for Gifted and Talented Students</li><li>Differentiation Strategies for ELL Students</li><li>Differentiation Strategies for At Risk Students</li><li>Differentiation Strategies for Students with a 504</li></ul> |

## Resources

- enVision 2.0 Math Topic 8
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Websites
    - ○ http://nlvm.usu.edu/en/nav/vlibrary.html
    - ○ http://illuminations.nctm.org
    - ○ http://map.mathshell.org/materials/index.php
    - ○ www.IXL.com
    - ○ http://insidemathematics.org
    - ○ http://mathsnacks.com
    - ○ www.openmiddle.com
    - ○ https://nysed-prod.engageny.org/

| Content Area/ Grade Level/ Course: | Mathematics<br>Grade 7<br>Unified I (1A) |
|---|---|
| Unit Plan Title: | Unit 3 - Statistics and Probability |
| Time Frame | 5 weeks (see pacing guide) |

## Anchor Standards/Domain

**Anchor Standards for Mathematics**
- 7.SP.A Use random sampling to draw inferences about a population.
- 7.SP.B Draw informal comparative inferences about two populations.
- 7.SP.C Investigate the chance process and develop, use, and evaluate probability models.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**
### 9.1 Personal Financial Literacy
*Planning and Budgeting*
- There are strategies to decrease and manage expenses.

### 9.4 Life Literacies, and Key Skills
*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

### WIDA Standards
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

## Unit Summary

Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences using measures of center and variability. They approximate probabilities by making predictions based on long-run relative frequencies. Students also find probabilities and identify sample spaces through models, organized lists, tables, tree diagrams, and simulations.

## Standard Number(s)

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

**7.SP.A.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.*

**7.SP.B.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.*

**7.SP.B.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.*

**7.SP.C.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 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event.

**7.SP.C.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.SP.C.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?*

**7.SP.C.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?*


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

**21st Century Learning Standards: Life and Careers**

- 9.1.8.PB.7  Brainstorm techniques that will help decrease expenses including comparison shopping, negotiating, and day-to-day expense management.
- 9.1.8.E.5 Analyze interest rates and fees associated with financial services, credit cards, debit cards, and gift cards.

**Technology Standards:**
- 9.4.8.TL.2  Gather data and digitally represent information to communicate a real-world problem

## Essential Question(s)

- What is the relationship between a sample and a population?
- How can one use a random sample to make conclusions about the general population?
- What does the shape of data in a display tell one about the data?
- How can one use the mean or median and range to help understand and describe a data distribution?
- How can one determine and understand the meaning of the likelihood of an event?
- Why would one need to use a probability model?
- How can one use a simulation to predict the number of times an event will occur?
- What is the difference between dependent and independent events?

## Enduring Understandings

- Students will understand that statistics can be used to gain information about a population by examining a sample of the populations.
- Students will be able to draw informal comparative inferences about two populations.
- Students will be able to use the rules of probability to make valid and reliable predictions about the likelihood of an event occurring.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"
- MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.
  Being able to develop a probability model and use it to find probabilities of events and being able to compare probabilities from a model to observed frequencies will allow students to be successful in the following science standards.

**In this unit plan, the following 21st Century themes and skills are addressed.**

| | Check all that apply. 21st Century Themes | | Check all that apply. 21st Century Skills |
|---|---|---|---|
| x | Global Awareness | x | Creativity and Innovation |
| | Environmental Literacy | x | Critical Thinking and Problem Solving |
| | Health Literacy | x | Communication |
| | Civic Literacy | x | Collaboration |

| | Financial, Economic, Business, and Entrepreneurial Literacy | |
|---|---|---|

## Student Learning Targets/Objectives (Students will know/Students will understand)

- That inferences about a population can be made by examining a sample.
- Why the validity of a sample depends on whether the sample is representative of the population.
- That random sampling tends to produce representative samples.
- How to find the difference in the mean or median of two different data sets.
- How to draw inferences about the data sets by making a comparison of these differences relative to the mean absolute deviation or interquartile range of either set of data.
- How to demonstrate how two data sets that are very different can have similar variabilities.
- How to define probability as a ratio that compares favorable outcomes to all possible outcomes.
- How to recognize and explain that probabilities are expressed as a number between 0 to 1.
- How to interpret a probability near 0 as unlikely to occur and a probability near 1 as likely to occur.
- How to interpret a probability near ½, as being as equally to occur as to not occur.
- How to develop a simulation to model a situation in which all events are equally likely to occur.
- How to utilize a simulation to determine the probability of specific events.
- How to determine the probability of events that may not be equally likely to occur, by utilizing a simulation model.
- How to create a sample space of all possible outcomes for a compound event using an organized list, a table, or a tree diagram.
- How to use the sample space to compare the number of favorable outcomes to the total number of outcomes and determine the probability of the compound event.
- How to design and utilize a simulation to predict the probability of a compound event.

## Assessments (Pre, Formative, Summative, Other)          *Denote required common assessments with an ***

Assessments (some can be in more than one category):
- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topics 6 and 7 Assessments
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

## *Teaching and Learning Activities*

| | |
|---|---|
| *Activities* | <ul><li>Lessons 6-1, 6-2, 6-3, 6-4, Topic 6 Review</li><li>Lessons 7-1, 7-2, 7-3, 7-4, 7-5, 7-6, 7-7, Topic 7 Review</li><li>"3-Act Math" activities</li><li>STEM projects</li><li>"Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to:<ul><li>Work productively in teams</li><li>Communicate clearly and effectively and with reason</li><li>Demonstrate creativity and innovation</li></ul></li></ul> |

| | |
|---|---|
| | o Utilize critical thinking to make sense of problems and persevere in solving them<br>o Use digital tools to enhance their group response<br>o Utilize digital tools to present their work to the class, where appropriate<br>● Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity<br>● Grade 7 Project - Better Money Habits<br>    o Students will investigate the advantages and disadvantages of credit vs debit cards.<br>    o Students will learn about the following economic/personal concepts: fraud protection, credit score, interest, and late fees.<br>● Estimating: Counting Trees:<br>http://map.mathshell.org/materials/lessons.php?taskid=422&subpage=problem<br>● Evaluating Statements About Probability<br>http://map.mathshell.org/materials/lessons.php?taskid=225&subpage=concept |
| *Differentiation Strategies* | ● enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games<br>● Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)<br>● Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games<br>● Math Diagnosis and Intervention System<br>● English Language Learners Toolkit<br>● Differentiation Strategies for Special Education Students<br>● Differentiation Strategies for Gifted and Talented Students<br>● Differentiation Strategies for ELL Students<br>● Differentiation Strategies for At Risk Students<br>● Differentiation Strategies for Students with a 504 |

**Resources**

- enVision 2.0 Math Topics 6 and 7
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Websites
    - http://nlvm.usu.edu/en/nav/vlibrary.html
    - http://illuminations.nctm.org
    - http://map.mathshell.org/materials/index.php
    - www.IXL.com
    - http://insidemathematics.org
    - http://mathsnacks.com
    - www.openmiddle.com
    - https://nysed-prod.engageny.org/

## *Wayne Township Public Schools*
## Unified Mathematics I Curriculum

| Content Area/ Grade Level/ Course: | Mathematics Grade 7 Unified I (1A) |
|---|---|
| Unit Plan Title: | Unit 4 – The Number System |
| Time Frame | 4 Weeks (see pacing guide) |

### Anchor Standards/Domain*

**Anchor Standards for Mathematics**
- 8.NS.A Know that there are numbers that are not rational, and approximate them by rational numbers.
- 8.EE.A Work with radicals and integer exponents.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**

**9.4 Life Literacies, and Key Skills**

*Critical Thinking and Problem-Solving*
- Multiple solutions often exist to solve a problem.
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.

*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

### Unit Summary

In previous grades, students described lengths using only whole numbers and fractions.  In this Unit, students explore lengths that cannot be described using whole numbers or fractions.  They discover irrational numbers and approximate their magnitudes using rational numbers.  They discover properties of exponents that will allow them to transform expressions.  These properties also help students to express very large and very small quantities using powers.  Students work with square and cube root symbols to prepare for working with rational exponents in high school.

### Standard Numbers

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

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

8.EE.A.1 - Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example, $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.*

8.EE.A.2 – Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational.

8.EE.A.3 – Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities, and to express how many times as much one is than the other. *For example, estimate the population of the United States as $3 \times 10^8$ and the population of the world as $7 \times 10^9$, and determine that the world population is more than 20 times larger.*

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

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

**New Jersey Student Learning Standards for Career Readiness, Life Literacy, and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
● 9.4.8.CT.2 Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.
● 9.4.8.CT.3 Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

*Technology Literacy*
● 9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.

**Essential Questions**
● In what ways can rational numbers be useful?
● How does one locate irrational numbers on a number line?
● How does one determine whether a number is rational or irrational?
● How can one estimate the decimal value of an irrational number?
● Why does one need to write numbers in scientific notation?
● What is the advantage of performing operations on numbers expressed in scientific notation rather than numbers in standard form?

**Enduring Understandings**
● All numbers, rational and irrational, have a location on a number line.
● Every number has a decimal expansion.

- Every rational number has a decimal expansion that terminates or eventually repeats.
- A number in the form a/b means a is divided by b.
- Every irrational square root can be estimated by its location between two rational square roots.
- Numbers can be written in many equivalent forms.
- Perfect cube numbers are whole numbers each raised to the third power.
- Very large or very small quantities can be estimated using numbers expressed in scientific notation.
- Compare magnitudes of numbers when expressed in scientific notation.
- Operations can be performed with numbers expressed in scientific notation.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"
- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. Understanding of very small and very large quantities and ability to express how many times as much one is than the other will allow students to be successful in this science standard.
- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
  Understanding of properties of integer exponents and square roots and cube roots will allow students to be successful in this science standard.

## In this unit plan, the following 21st Century themes and skills are addressed.

| | *Check all that apply.* **21st Century Themes** | | *Check all that apply* **21st Century Skills** |
|---|---|---|---|
| x | **Global Awareness** | x | **Creativity and Innovation** |
| | **Environmental Literacy** | x | **Critical Thinking and Problem Solving** |
| x | **Health Literacy** | x | **Communication** |
| | **Civic Literacy** | x | **Collaboration** |
| x | **Financial, Economic, Business, and Entrepreneurial Literacy** | | |

## Student Learning Targets/Objectives  (Students will know/Students will understand)

- How to write rational numbers as quotients of integers.
- How to distinguish between rational and irrational numbers.
- Perfect square numbers.  If not memorized, students should know how to find the perfect square numbers by multiplying each whole number by itself.
- That the decimal expansion of a rational number terminates or repeats.
- How to convert a decimal expansion which repeats eventually into a rational number.
- How to find rational approximations of irrational numbers.
- How to compare the size of approximations of irrational numbers.
- How to locate approximations of irrational numbers on a number line.
- How to estimate the value of expressions of irrational numbers.  *E.g.,* $\pi^2$
- How to apply properties of integer exponents to generate equivalent numerical expressions.
- How to evaluate square roots of small perfect squares and cube roots of small perfect cubes.
- Conversion of numbers between standard form and scientific notation.
- How to express how many times as much one number in scientific notation is than another.
- How to interpret scientific notation that has been generated by technology.

| Assessments (Pre, Formative, Summative, Other) | *Denote required common assessments with an \** |
|---|---|

Assessments (some can be in more than one category):
- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topic 1 Assessment
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

| *Teaching and Learning Activities* | |
|---|---|
| *Activities* | <ul><li>Lessons 1-1, 1-2, 1-3, 1-4, 1-5, 1-6, 1-7, 1-8, 1-9, 1-10, Topic 1 Review</li><li>"3-Act Math" activities</li><li>STEM projects</li><li>"Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to:<ul><li>Work productively in teams</li><li>Communicate clearly and effectively and with reason</li><li>Demonstrate creativity and innovation</li><li>Utilize critical thinking to make sense of problems and persevere in solving them</li><li>Use digital tools to enhance their group response</li><li>Utilize digital tools to present their work to the class, where appropriate</li></ul></li><li>Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity</li></ul> |

| | |
|---|---|
| | - Classifying Rational and Irrational Numbers Lesson from the Mathematics Assessment Project: https://www.map.mathshell.org/download.php?fileid=1710 & Mathshell slides classifying rational and irrational numbers<br>- Desmos: Circles (Whole Number Exponents) |
| *Differentiation Strategies* | - Expand work with integer exponents to include variable bases<br>- Estimate roots to different place values based on ability<br>- Use of extra skill practice/calculators<br>- enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games<br>- Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)<br>- Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games<br>- Math Diagnosis and Intervention System<br>- English Language Learners Toolkit<br>- Differentiation Strategies for Special Education Students<br>- Differentiation Strategies for Gifted and Talented Students<br>- Differentiation Strategies for ELL Students<br>- Differentiation Strategies for At Risk Students<br>- Differentiation Strategies for Students with a 504 |

## Resources

- enVision 2.0 Math Topic 1
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Reference Sheets:
    - Rational vs. Irrational Numbers
    - How to Approximate Irrational Numbers Template
    - Scientific Notation Reference Sheet
- Websites:
    - http://nlvm.usu.edu/en/nav/vlibrary.html
    - http://illuminations.nctm.org/
    - http://map.mathshell.org/materials/index.php
    - http://www.ixl.com
    - http://insidemathematics.org
    - http://mathsnacks.com
    - http://www.openmiddle.com
    - http://https://nysed-prod.engageny.org/
    - https://www.desmos.com/
- Videos:
    - Properties of Rational and Irrational Numbers Explained!
    - Approximating Square Roots on a Number Line
    - BrainPOP Rational and Irrational Numbers

- o [Math Antics Exponents & Square Roots](#)
- o [Math Antics Intro to Exponents](#)
- o [Math Antics Laws of Exponents](#)
- o [Simplify the Middle: Powers of 10](#)
- o [Math Antics Scientific Notation](#)
- o [Scientific Notation and Their Operations](#)

| Content Area/<br>Grade Level/<br>Course: | **Mathematics<br>Grade 7<br>Unified I (1A)** |
|---|---|
| **Unit Plan Title:** | **Unit 5 – Linear Relationships/Functions** |
| **Time Frame** | **10 Weeks (see pacing guide)** |

## Anchor Standards/Domain*

**Anchor Standards for Mathematics**
- 8.EE.B. Understand the connections between proportional relationships, lines, and linear equations.
- 8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.
- 8.F.A Define, evaluate, and compare functions.
- 8.F.B Use functions to model relationships between quantities.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.

*Information and Media Literacy*
- Digital tools make it possible to analyze and interpret data, including text, images, and sound. These tools allow for broad concepts and data to be more effectively communicated.

*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

## Unit Summary

In Grade 7, students learned to solve equations. In this unit, they begin to understand the connection between proportional relationships, lines, and linear equations. They build on this knowledge to solve and analyze multi-step linear equations and pairs of simultaneous linear equations.
In this unit, students grasp the concept of a function and use functions to describe quantitative relationships. They describe how aspects of functions are reflected in different representations. Students also determine which functions are linear. Students use linear equations to represent, analyze, and solve a variety of problems. Students investigate non-linear functions through the use of tables, graphs, and equations.

## Standard Numbers

8.EE.C.7. Solve linear equations in one variable.

a. Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where $a$ and $b$ are different numbers).
b. Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

8.F.A. Define, evaluate, and compare functions.
1. Understand that a function is a rule that assigns to each input exactly one output. The graph of a function is the set of ordered pairs consisting of an input and the corresponding output. (Function notation is not required in Grade 8.)
2. Compare properties (e.g. rate of change, intercepts, domain and range) of two functions each represented in a different way (algebraically, graphically, numerically in tables, or by verbal descriptions). *For example, given a linear function represented by a table of values and a linear function represented by an algebraic expression, determine which function has the greater rate of change.*

8.EE.B.5. Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways. *For example, compare a distance-time graph to a distance-time equation to determine which of two moving objects has greater speed.*

8.F.A.3. Interpret the equation $y = mx + b$ as defining a linear function, whose graph is a straight line; give examples of functions that are not linear.  *For example, the function $A = s^2$ giving the area of a square as a function of its side length is not linear because its graph contains the points (1,1),(2,4) and (3,9), which are not on a straight line.*

8.F.B.4. Construct a function to model a linear relationship between two quantities. Determine the rate of change and initial value of the function from a description of a relationship or from two $(x, y)$ values, including reading these from a table or from a graph. Interpret the rate of change and initial value of a linear function in terms of the situation it models, and in terms of its graph or a table of values.

8.EE.B.6. Use similar triangles to explain why the slope $m$ is the same between any two distinct points on a non-vertical line in the coordinate plane; derive the equation $y = mx$ for a line through the origin and the equation $y = mx + b$ for a line intercepting the vertical axis at $b$.

8.F.B.5. Describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear). Sketch a graph that exhibits the qualitative features of a function that has been described verbally.

8.EE.C.8. Analyze and solve pairs of simultaneous linear equations.
a. Understand that solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs, because points of intersection satisfy both equations simultaneously.
b. Solve systems of two linear equations in two variables algebraically, and estimate solutions by graphing the equations. Solve simple cases by inspection. *For example, 3x + 2y = 5 and 3x +2y = 6 have no solution because 3x + 2y cannot simultaneously be 5 and 6.*
c. Solve real-world and mathematical problems leading to two linear equations in two variables. *For example, given coordinates for two pairs of points, determine whether the line through the first pair of points intersects the line through the second pair.*

**Mathematical Practices 1-8:**
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.

7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

**New Jersey Student Learning Standards for Career Readiness, Life Literacy, and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
- 9.4.8.CT.3 Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

*Information and Media Literacy*
- 9.4.8.IML.5 Analyze and interpret local or public data sets to summarize and effectively communicate the data.

*Technology Literacy*
- 9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.

## Essential Questions
- How does one interpret the number of solutions to linear equations in one variable?
- How can algebraic expressions and equations be used to model, analyze, and solve mathematical situations?
- When is a relationship between two variables proportional?
- How does thinking of a unit rate as the slope of a line help to solve problems?
- How are functions useful?
- When should functions be evaluated and compared?
- What applications could be represented by variables that are not related by a linear function?
- What are the distinguishing characteristics of a graph of a function?
- What applications require solving simultaneous linear equations?

## Enduring Understandings
- The solution to a linear equation is a point or set of points which will make the equation true.
- Algebraic expressions and equations are used to model real-life problems and represent quantitative relationships.
- A unit rate is a ratio between two measurements in which the denominator is one.
- The relationship between variables can be represented using word descriptions, tables, graphs, and equations.
- Proportional relationships can be represented by lines and linear equations.
- The slope $m$ is the same between any two distinct points on a line.
- When the ratio of rise to run is the same between two right triangles, their corresponding sides must be proportional.
- Graphing linear equations will enable one to estimate solutions.
- A function is a rule that assigns each input exactly one output.
- Functions can be represented in four different ways: graphically, algebraically, numerically in tables, and verbal descriptions.
- Rate of change and initial values of linear functions can be determined in terms of the situations it models, its graph, or a table of values.
- There are many different functional relationships that are not linear.
- Solutions to a system of two linear equations are points that will make both equations true.
- Solutions to a system of two linear equations in two variables correspond to points of intersection of their graphs.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"
- MS-PS1-1. Develop models to describe the atomic composition of simple molecules and extended structures. Understanding of very small and very large quantities and ability to express how many times as much one is than the other will allow students to be successful in this science standard.
- MS-PS3-1. Construct and interpret graphical displays of data to describe the relationships of kinetic energy to the mass of an object and to the speed of an object.
  Being able to interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line, and give examples of functions that are not linear will allow students to be successful in this science standard.
- MS-PS3-5. Construct, use, and present arguments to support the claim that when the kinetic energy of an object changes, energy is transferred to or from the object.
  Being able to interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line, and give examples of functions that are not linear will allow students to be successful in this science standard.
- MS-PS4-1. Use mathematical representations to describe a simple model for waves that includes how the amplitude of a wave is related to the energy in a wave.
  Being able to interpret the equation $y=mx+b$ as defining a linear function, whose graph is a straight line, and give examples of functions that are not linear will allow students to be successful in this science standard.

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**In this unit plan, the following 21st Century themes and skills are addressed.**

| *Check all that apply.* **21st Century Themes** | | *Check all that apply* **21st Century Skills** | |
|---|---|---|---|
| | Global Awareness | x | Creativity and Innovation |
| x | Environmental Literacy | x | Critical Thinking and Problem Solving |
| | Health Literacy | x | Communication |
| | Civic Literacy | x | Collaboration |
| x | Financial, Economic, Business, and Entrepreneurial Literacy | | |

### Student Learning Targets/Objectives  (Students will know/Students will understand)

- How to solve equations with rational number coefficients.
- How to solve and give examples of linear equations with one solution, infinitely many solutions, and no solution.
- How to expand expressions using the distributive property.
- How to compare representations of proportional relationships, *e.g. graph, table, and equation.*
- How to interpret the unit rate as the slope of the graph.
- How to derive the equation (for proportional relationships) $y=mx$ for the line that goes through the origin.
- How to derive the equation (for linear relationships) $y=mx+b$ for the line intercepting the *y*-axis at *b*.
- How to determine if a relationship between values is a function.

- How to compare properties of two functions each represented in a different way: graphically, algebraically, numerically, or by verbal description.
- How to interpret the equation $y = mx + b$ as defining a linear function whose graph is a straight line.
- How to give examples of functions that are not linear.
- How to determine the rate of change and initial value of linear functions given a graph, table, or verbal description.
- How to describe qualitatively the functional relationship between two quantities by analyzing a graph (e.g., where the function is increasing or decreasing, linear or nonlinear).
- How to analyze and algebraically solve pairs of simultaneous linear equations.
- How to estimate the solution to a system of linear equations by graphing the equations.
- How to solve real-world and mathematical problems leading to two linear equations in two variables.

## Assessments (Pre, Formative, Summative, Other)          *Denote required common assessments with an ***

Assessments (some can be in more than one category):
- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topics 2, 3, and 5 Assessments
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

### Teaching and Learning Activities

| *Activities* | <ul><li>Lessons 2-1, 2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 2-8, 2-9, Topic 2 Review</li><li>Lessons 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, Topic 3 Review</li><li>Lessons 5-1, 5-2, 5-3, 5-4, Topic 5 Review</li><li>"3-Act Math" activities</li><li>STEM projects</li><li>"Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to:<ul><li>Work productively in teams</li><li>Communicate clearly and effectively and with reason</li><li>Demonstrate creativity and innovation</li><li>Utilize critical thinking to make sense of problems and persevere in solving them</li><li>Use digital tools to enhance their group response</li><li>Utilize digital tools to present their work to the class, where appropriate</li></ul></li><li>Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity</li><li>Desmos: Which is Steepest?</li><li>Desmos: Coin Capture: Lines</li><li>Functions Google Slides Activity</li><li>Qualitative Graph Google Slides Intro</li><li>Qualitative Graphs & Stories Activity</li></ul> |
| --- | --- |

| | |
|---|---|
| | ● [Systems of Equations Scavenger Hunt](#) |
| *Differentiation Strategies* | ● Use of extra skill practice/calculators<br>● Choice of process on assessments of solving linear systems<br>● Transparencies for line of best fit<br>● enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games<br>● Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)<br>● Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games<br>● Math Diagnosis and Intervention System<br>● English Language Learners Toolkit<br>● [Differentiation Strategies for Special Education Students](#)<br>● [Differentiation Strategies for Gifted and Talented Students](#)<br>● [Differentiation Strategies for ELL Students](#)<br>● [Differentiation Strategies for At Risk Students](#)<br>● [Differentiation Strategies for Students with a 504](#) |

## Resources

- enVision 2.0 Grade 8 Topics 2, 3, and 5
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Websites:
  - http://nlvm.usu.edu/en/nav/vlibrary.html
  - http://illuminations.nctm.org/
  - http://map.mathshell.org/materials/index.php
  - http://www.ixl.com
  - http://insidemathematics.org
  - http://mathsnacks.com
  - http://www.openmiddle.com
  - http://https://nysed-prod.engageny.org/
  - https://www.desmos.com/
- Reference Sheets
  - [Solving Multi-Step Equations Reference Sheet](#)
  - [Functions Anchor Chart](#)
  - [Linear vs. Nonlinear Functions Reference Sheet](#)
  - [One Solution, No Solution, Infinitely Many Solutions Visual](#)
  - [How Many Solutions in a System of Equations Chart](#)
  - [Inspection Method for Systems of Equations Reference Sheet](#)
  - [Elimination Method for Systems of Equations Reference Sheet](#)
  - [Substitution Method Example](#)
- Videos:
  - [BrainPOP: Two-Step Equations](#)
  - [Khan Academy: Intro to Solving Equations with Variables on Both SIdes](#)

- EdPuzzle: Solve Multistep Equations with the DIstributive Property
- Math Antics Basic Linear Functions
- EdPuzzle: Slope-Intercept Form
- Math Antics Slope and Distance
- Math Antics Graphing on the Coordinate Plane
- EdPuzzle: Is it a Function?
- Khan Academy: Recognizing Linear Functions
- Math Antics What are Functions?
- EdPuzzle: Qualitative Graphs
- EdPuzzle: Systems of Equations
- MyWhyU: Solving Systems of Equations by Substitution
- Khan Academy: Systems of Equation with Elimination

| Content Area/ Grade Level/ Course: | Mathematics Grade 7 Unified I (1A) |
|---|---|
| Unit Plan Title: | Unit 6 – Geometry Continued |
| Time Frame | 3 Weeks (see pacing guide) |

## Anchor Standards/Domain*

**Anchor Standards for Mathematics**
- 8.G.A Understand congruence and similarity using physical models, transparencies, or geometry software.
- 8.G.B Understand and apply the Pythagorean Theorem.
- 8.G.C Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres.

**New Jersey Student Learning Standards for Career Readiness, Life Literacies, and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
- Multiple solutions often exist to solve a problem.
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.

*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

## Unit Summary

In this unit, students describe, analyze, and solve problems about two-dimensional figures using ideas about distance and angles under transformations.  Transformations also allow students to explore congruence and similarity.  Students investigate angle relationships through working with triangles and intersecting lines.  Specifically, right triangles help students discover the Pythagorean Theorem and its converse.  Using the Pythagorean Theorem, students find distances between points, find lengths, and analyze polygons.  This unit also allows students to revisit their work with volume by solving problems involving cones, spheres, and cylinders.

## Standard Numbers

8.G.A.1. Verify experimentally the properties of rotations, reflections, and translations.
a. Lines are transformed to lines, and line segments to line segments of the same length.
b. Angles are transformed to angles of the same measure.
c. Parallel lines are transformed to parallel lines.

8.G.A.2. Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.

8.G.A.3. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.

8.G.A.4. Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.

8.G.A.5. Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*

8.G.B.6. Explain a proof of the Pythagorean Theorem and its converse.

8.G.B.7. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.

8.G.B.8. Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.

8.G.C.9. Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.

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

**New Jersey Student Learning Standards for Career Readiness, Life Literacy, and Key Skills**
**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
● 9.4.8.CT.2 Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.
● 9.4.8.CT.3 Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

*Technology Literacy*
● 9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.

## Essential Questions
● Why does one need to perform transformations on figures?
● How does knowing two figures are congruent or similar help one to solve problems?
● How can one use the Pythagorean Theorem to solve real world and mathematical problems?
● How can one use finding volume to solve real world and mathematical problems?
● What is the relationship between volumes of cones, spheres, and cylinders?

## Enduring Understandings

- Geometric attributes provide descriptive information about an object's properties and position in space.
- Reflections, translations, and rotations are transformations that create congruent figures in alternate positions.
- Dilations are transformations that create similar figures if the scale factor is applied uniformly.
- There are relationships among the angles formed when parallel lines are cut by a transversal.
- Congruence of corresponding angles determines similarity only for triangles.
- Application of the Pythagorean Theorem.
- Application of the converse of the Pythagorean Theorem.
- Why the Pythagorean Theorem can be used to find the distance between two points.
- Volume is a unit of measurement that indicates the amount of cubic units a 3 dimensional shape takes up.

## Interdisciplinary Connections

- Topic "STEM Project"
- Topic "3 ACT Math"

In this unit plan, the following 21st Century themes and skills are addressed.

| Check all that apply.<br>21st Century Themes | | Check all that apply<br>21st Century Skills | |
|---|---|---|---|
| x | Global Awareness | x | Creativity and Innovation |
| | Environmental Literacy | x | Critical Thinking and Problem Solving |
| | Health Literacy | x | Communication |
| | Civic Literacy | x | Collaboration |
| | Financial, Economic, Business, and Entrepreneurial Literacy | | |

**Student Learning Targets/Objectives  (Students will know/Students will understand)**

- How to reflect, translate, rotate, and dilate 2 dimensional figures.
- The effects of a transformation on a 2 dimensional figure using coordinates.
- How to describe a sequence of transformations that exhibits the congruence between two figures.
- How to describe a sequence of transformations that exhibits the similarity between two figures.
- How to identify angle relationships when two parallel lines are cut by a transversal.
- Application of the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two- and three-dimensions.
- Application of the Pythagorean Theorem to find the distance between two points in a coordinate plane.
- How to use the converse of the Pythagorean Theorem to determine if a triangle is right.
- The formulas for Volume of cones, cylinders, and spheres.
- How to use the volume formulas of cones, cylinders, and spheres to solve real-world and mathematical problems.

**Assessments (Pre, Formative, Summative, Other)**          *Denote required common assessments with an ***

Assessments (some can be in more than one category):

- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topics 6, 7, and 8 Assessments
- *Benchmark*: *District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

| | *Teaching and Learning Activities* |
|---|---|
| *Activities* | <ul><li>Lessons 6-1, 6-2, 6-3, 6-4, 6-5, 6-6, 6-7, Topic 6 Review</li><li>Lessons 7-1, 7-2, 7-3, 7-4, Topic 7 Review</li><li>Lessons 8-1, 8-2, 8-3, 8-4, Topic 8 Review</li><li>"3-Act Math" activities</li><li>STEM projects</li><li>"Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to:<ul><li>Work productively in teams</li><li>Communicate clearly and effectively and with reason</li><li>Demonstrate creativity and innovation</li><li>Utilize critical thinking to make sense of problems and persevere in solving them</li><li>Use digital tools to enhance their group response</li><li>Utilize digital tools to present their work to the class, where appropriate</li></ul></li><li>Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity</li><li>Desmos: Transformers</li><li>Desmos: Transformations with Coordinates</li><li>Desmos: Polygraph Transformations Partner Activity</li><li>Math Playground: Reflection Painter Game</li><li>Transformations Cut & Paste Activity</li><li>Desmos: Sketchy Dilations</li><li>Desmos: Dilations Mini Golf</li><li>Pythagorean Theorem Jeopardy</li><li>Pythagorean Explorer</li><li>Converse of the Pythagorean Theorem Maze</li></ul> |
| *Differentiation Strategies* | <ul><li>Allow students to use transparencies to help with drawing transformations</li><li>Use hands-on manipulatives (geometric solids and sand/rice) to show volume relationships</li><li>Color-coding for angle relationships</li><li>Use of extra skill practice/calculators</li></ul> |

- enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games
- Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities)
- Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games
- Math Diagnosis and Intervention System
- English Language Learners Toolkit
- [Differentiation Strategies for Special Education Students](#)
- [Differentiation Strategies for Gifted and Talented Students](#)
- [Differentiation Strategies for ELL Students](#)
- [Differentiation Strategies for At Risk Students](#)
- [Differentiation Strategies for Students with a 504](#)

## Resources

- enVision 2.0 Grade 8 Topics 6,7, and 8
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Websites:
    - http://nlvm.usu.edu/en/nav/vlibrary.html
    - http://illuminations.nctm.org/
    - http://map.mathshell.org/materials/index.php
    - http://www.ixl.com
    - http://insidemathematics.org
    - http://mathsnacks.com
    - http://www.openmiddle.com
    - http://https://nysed-prod.engageny.org/
    - https://www.desmos.com/
    - MathIsFun.com: How to Find if Triangles are Similar
- Reference Sheets:
    - Motion Rules Reference Sheet
    - Angles Cheat Sheet
    - Find the Missing Hypotenuse Example
    - Find the Missing Leg Example
    - Volume of Cones, Spheres, & Cylinders Help Sheet
- Videos:
    - BrainPOP: Transformations
    - Math Mashup: Geometry Transformations
    - Geometry Rotations Explained (90, 180, 270, 360)
    - Math Mashup: The Difference Between Similar & Congruent Figures
    - Math Antics Angle Basics
    - Math Antics Angles & Degrees
    - Math Antics Triangles
    - Shmoop: Pythagorean Theorem
    - Math Antics The Pythagorean Theorem

- Converse of the Pythagorean Theorem
- Math Antics Volume
- Math Mashup: Finding the Volume of a Cone Explained

| Content Area/ Grade Level/ Course: | Mathematics Grade 7 Unified I (1A) |
|---|---|
| **Unit Plan Title:** | **Unit 7 – Statistics and Probability Continued** |
| **Time Frame** | **2 Weeks  (see pacing guide)** |

## Anchor Standards/Domain*

**Anchor Standards for Mathematics**
- 8.SP.A Investigate patterns of association in bivariate data.

**New Jersey Student Learning Standards for Career Readiness, Life Literacy, and Key Skills**

**9.1 Personal Financial Literacy**
*Credit Profile*
- There are strategies to build and maintain good credit history.

*Planning and Budgeting*
- A budget aligned with an individual's financial goal can help prepare for life events.
- Goals (e.g., higher education, autos, and homes, retirement), affect your finances.

**9.2. Career Awareness, Exploration, Preparation, and Training**
*Career Awareness and Planning*
- An individual's strengths, lifestyle goals, choices, and interests affect employment and income.
- Early planning can provide more options to pay for postsecondary training and employment.

**9.4 Life Literacies, and Key Skills**
*Critical Thinking and Problem-Solving*
- Multiple solutions often exist to solve a problem.
- An essential aspect of problem solving is being able to self-reflect on why possible solutions for solving problems were or were not successful.

*Technology Literacy*
- Some digital tools are appropriate for gathering, organizing, analyzing, and presenting information, while other types of digital tools are appropriate for creating text, visualizations, models, and communicating with others.

**WIDA Standards**
- ELD Standard 1: Social and Instructional Language
- ELD Standard 3: The Language of Mathematics

**Technology Standards**
- 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 to create and communicate knowledge.
- 8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming: 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.

## Unit Summary

In this unit, students apply their experience with the coordinate plane and linear functions to study possible associations between two variables. Students analyze bivariate data by describing clustering, outliers, and correlations. They summarize data in two-way tables to look for patterns of association. This allows students to determine linear models for their data.

## Standard Numbers

8.SP.A.1. Construct and interpret scatter plots for bivariate measurement data to investigate patterns of association between two quantities. Describe patterns such as clustering, outliers, positive or negative association, linear association, and nonlinear association.

8.SP.A.2. Know that straight lines are widely used to model relationships between two quantitative variables. For scatter plots that suggest a linear association, informally fit a straight line, and informally assess the model fit (e.g. line of best fit) by judging the closeness of the data points to the line.

8.SP.A.3. Use the equation of a linear model to solve problems in the context of bivariate measurement data, interpreting the slope and intercept. *For example, in a linear model for a biology experiment, interpret a slope of 1.5 cm/hr as meaning that an additional hour of sunlight each day is associated with an additional 1.5 cm in mature plant height.*

8.SP.A.4. Understand that patterns of association can also be seen in bivariate categorical data by displaying frequencies and relative frequencies in a two-way table. Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects. Use relative frequencies calculated for rows or columns to describe possible association between the two variables. *For example, collect data from students in your class on whether or not they have a curfew on school nights and whether or not they have assigned chores at home. Is there evidence that those who have a curfew also tend to have chores?*

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

**New Jersey Student Learning Standards for Career Readiness, Life Literacy, and Key Skills**
**9.1 Personal Financial Literacy**
*Credit Profile*
● 9.1.8.CP.2 Analyze how spending habits affect one's ability to save.
*Planning and Budgeting*
● 9.1.8.PB.4 Construct a simple personal savings and spending plan based on various sources of income and different stages of life (e.g. teenager, young adult, family).
● 9.1.8.PB.6 Construct a budget to save for short-term, long-term, and charitable goals.

**9.2. Career Awareness, Exploration, Preparation, and Training**
*Career Awareness and Planning*
● 9.2.8.CAP.1 Identify offerings such as high school and county career and technical school courses, apprenticeships, military programs, and dual enrollment courses that support career or occupational areas of interest.
● 9.2.8.CAP.2 Develop a plan that includes information about career areas of interest.

- 9.2.8.CAP.3 Explain how career choices, educational choices, skills, economic conditions, and personal behavior affect income.
- 9.2.8.CAP.6 Compare the costs of postsecondary education with the potential increase in income from a career of choice.

## 9.4 Life Literacies, and Key Skills
*Critical Thinking and Problem-Solving*
- 9.4.8.CT.2 Develop multiple solutions to a problem and evaluate short- and long-term effects to determine the most plausible option.
- 9.4.8.CT.3 Compare past problem-solving solutions to local, national, or global issues and analyze the factors that led to a positive or negative outcome.

*Technology Literacy*
- 9.4.8.TL.2 Gather data and digitally represent information to communicate a real-world problem.

## Essential Questions
- Why is it important to describe patterns of the relationship between two quantities?
- How is a scatterplot used to determine if there is a relationship between two quantities?
- How is a two-way table used to determine if there is a relationship between two variables?

## Enduring Understandings
- Lines used to model the association between two quantities will provide more information than just the data points themselves.
- Once the equation of a linear model is found, it can be used to solve problems in the context of bivariate measurement data.
- The slope and y-intercept of the linear model can be interpreted in the context of the problem.
- Scatterplots show whether or not there is an association between two quantities.
- Patterns of association can also be seen in bivariate data by displaying frequencies and relate frequencies in a two-way table.

## Interdisciplinary Connections
- Topic "STEM Project"
- Topic "3 ACT Math"

## In this unit plan, the following 21st Century themes and skills are addressed.

| *Check all that apply.*<br>**21st Century Themes** | | *Check all that apply*<br>**21st Century Skills** | |
|---|---|---|---|
| x | **Global Awareness** | x | **Creativity and Innovation** |
|  | **Environmental Literacy** | x | **Critical Thinking and Problem Solving** |
|  | **Health Literacy** | x | **Communication** |
| x | **Civic Literacy** | x | **Collaboration** |

| | | |
|---|---|---|
| **x** | **Financial, Economic, Business, and Entrepreneurial Literacy** | |

## Student Learning Targets/Objectives  (Students will know/Students will understand)

- How to construct and interpret scatterplots of bivariate data to investigate patterns of association between two quantities.
- How to describe patterns: clustering, outliers, positive and negative correlation, linear and non-linear correlation.
- How to informally fit a straight line for scatterplots that suggest a linear correlation.
- The use of the equation of a linear model to solve problems in the context of bivariate measurement data.
- How to construct and interpret a two-way table summarizing data in two variables collected from the same subjects.
- The use of relative frequencies calculated for rows or columns to describe possible association between two variables.

## Assessments (Pre, Formative, Summative, Other)          *Denote required common assessments with an \**

Assessments (some can be in more than one category):

- *Pre-Assessment:* Beginning-of-the-Year Assessment, Topic Readiness Assessments, "Review What You Know" activities at the beginning of a new topic, classroom warm-up activities
- *Formative*: "Try It!," "Convince Me!," "Do You Understand?," and "Do You Know How?" activities throughout a topic, lesson quizzes, Mid-Topic Checkpoints, informal student questioning, communicator activities, homework, class participation, exit cards/tickets, use of digital assessment tools through, Chromebooks, smart phones, or other devices, Edulastic
- *Summative*: Topic 4 Assessment
- *Benchmark*: \*District mid-year benchmark assessment
- *Alternative* (available for individual students as needed): Topic Performance Tasks, Student Self-Assessment Tool (Teacher's Resource Masters, Volume 2), evaluate student work using the Cognitive Rigor Matrix for Mathematics (Assessment Book), portfolio assessment of student work

### *Teaching and Learning Activities*

| *Activities* | <ul><li>Lessons 4-1, 4-2, 4-3, 4-4, 4-5, Topic 4 Review</li><li>"3-Act Math" activities</li><li>STEM projects</li><li>"Solve & Discuss It"/""Explore It!"/"Explain It!" activities at the beginning of each lesson - students should be encouraged to:<ul><li>Work productively in teams</li><li>Communicate clearly and effectively and with reason</li><li>Demonstrate creativity and innovation</li><li>Utilize critical thinking to make sense of problems and persevere in solving them</li><li>Use digital tools to enhance their group response</li><li>Utilize digital tools to present their work to the class, where appropriate</li></ul></li><li>Ongoing use of NJSLA online tools, NJSLA online calculator, and reference sheet to gain comfort and familiarity</li><li>Desmos: Scatter Plot Capture</li><li>Grade 8 Project - Math Related Careers<ul><li>Students will research Math/STEM related careers and choose one.</li></ul></li></ul> |
|---|---|

| | |
|---|---|
| | o   Students will research the average salary of that job, create a budget based on that salary (food, utilities, mortgage, car), then reflect on cost of living and importance of a budget and responsible spending. <br> ● [Desmos: Scatter Plot Capture](#) <br> ● [Scatter Plot Google Slides Activity](#) <br> ● [Scatter Plot Google Form Practice](#) |
| *Differentiation Strategies* | ● Graphing technology <br> ● Different sized graph paper <br> ● Use of extra skill practice/calculators <br> ● Transparencies for line of best fit <br> ● enVision Differentiated Intervention: Reteach to Build Understanding, Additional Vocabulary Support, Build Mathematical Literacy, Enrichment, Math Tools and Games <br> ● Online enVision resources: (Today's Challenge, accessible student edition of text, Another Look activities and videos, reteaching activities) <br> ● Online enVision resources for student assistance/differentiation: digital tools, extra practice, interactive eText, glossary, games <br> ● Math Diagnosis and Intervention System <br> ● English Language Learners Toolkit <br> ● [Differentiation Strategies for Special Education Students](#) <br> ● [Differentiation Strategies for Gifted and Talented Students](#) <br> ● [Differentiation Strategies for ELL Students](#) <br> ● [Differentiation Strategies for At Risk Students](#) <br> ● [Differentiation Strategies for Students with a 504](#) |

## Resources

- enVision 2.0 Topic 4
- Communicators, graph boards, calculators
- Graph paper, colored pencils, rulers, 3-D manipulatives
- Projection System, Document Camera, Chromebooks, other student devices
- Videos:
    - o [Two-Way Relative Frequency Tables](#)
    - o [Khan Academy: Interpreting Scatter Plots](#)
- Websites:
    - o [http://nlvm.usu.edu/en/nav/vlibrary.html](http://nlvm.usu.edu/en/nav/vlibrary.html)
    - o [http://illuminations.nctm.org/](http://illuminations.nctm.org/)
    - o [http://map.mathshell.org/materials/index.php](http://map.mathshell.org/materials/index.php)
    - o [http://www.ixl.com](http://www.ixl.com)
    - o [http://insidemathematics.org](http://insidemathematics.org)
    - o [http://mathsnacks.com](http://mathsnacks.com)
    - o [http://www.openmiddle.com](http://www.openmiddle.com)
    - o [http://https://nysed-prod.engageny.org/](http://https://nysed-prod.engageny.org/)
    - o [https://www.desmos.com/](https://www.desmos.com/)