Unit 1: Equations and Inequalities (5 Weeks)

Content Area: **Template**
Course(s):
Time Period: **Full Year**
Length: **4 Weeks**
Status: **Published**

Unit Rationale

A unit on equations and inequalities in Algebra 1 is vital for developing students' ability to solve problems, reason mathematically, and understand relationships between quantities. This unit serves as a critical foundation for more advanced mathematical concepts and is applicable in various real-world contexts. Here's a rationale for including a unit on equations and inequalities in Algebra 1:

1. Foundation of Algebraic Reasoning

- **Core Algebraic Skills:** Equations and inequalities are at the heart of algebra. Mastering these topics helps students develop the essential skills needed to manipulate and solve algebraic expressions, which is fundamental for all subsequent mathematics learning.
- **Understanding Relationships:** Equations represent equality, and inequalities represent comparisons between quantities. Understanding these relationships is crucial for grasping how different quantities interact and depend on each other in mathematical models.

2. Critical Problem-Solving Skills

- **Solving and Graphing:** Learning to solve equations and inequalities requires students to use logical reasoning and systematic approaches, enhancing their overall problem-solving skills. Graphing inequalities also introduces students to the concept of solution sets and regions, which is important for visualizing mathematical relationships.
- **Applying Operations:** Students refine their algebraic skills by performing operations such as addition, subtraction, multiplication, and division on equations and inequalities. This reinforces their ability to manipulate expressions and solve for unknowns.

3. Real-World Applications

- **Modeling and Decision Making:** Equations and inequalities are widely used to model real-world situations, such as budgeting, optimizing resources, and comparing outcomes. Understanding these concepts allows students to create models that can inform decisions in everyday life and various professions.
- **Interpreting Constraints:** Inequalities often represent constraints in real-world problems (e.g., limitations on resources or time). Learning to work with inequalities helps students understand how to operate within constraints, a critical skill in fields such as economics, engineering, and management.

4. Preparation for Higher-Level Math

- **Foundation for Advanced Topics:** Equations and inequalities provide the groundwork for more advanced topics in mathematics, including systems of equations, quadratic equations, and linear programming. Success in these areas relies on a solid understanding of how to manipulate and solve basic equations and inequalities.
- **Introduction to Function Concepts:** Solving equations is directly related to finding the values that make a function equal to a specific output. This introduces students to the idea of inverse operations

and the role of equations in defining functions, which is crucial for higher-level math.

5. Developing Mathematical Reasoning

- **Logical and Critical Thinking:** Solving equations and inequalities requires logical reasoning and the ability to follow a sequence of steps to arrive at a solution. This process strengthens students' critical thinking skills, which are valuable across all areas of study.
- **Connecting Algebra and Geometry:** The study of inequalities, particularly when graphing, connects algebraic concepts with geometric representations. This dual approach helps students develop a deeper understanding of both algebraic and geometric reasoning.

6. Enhancing Mathematical Literacy

- **Understanding Symbols and Notation:** Working with equations and inequalities enhances students' familiarity with mathematical symbols and notation, such as the equality sign, inequality symbols, and variable representations. This literacy is essential for reading and understanding mathematical texts and problems.
- **Building Confidence:** As students learn to solve equations and inequalities, they build confidence in their ability to tackle complex problems. This confidence carries over into other areas of mathematics and academic pursuits.

7. Real-Life Problem Solving

- **Budgeting and Finance:** Equations and inequalities are often used in personal finance, such as calculating budgets, loan payments, and investment returns. Understanding these concepts empowers students to make informed financial decisions in their lives.
- **Science and Engineering:** Equations and inequalities are foundational in the sciences and engineering, where they are used to describe relationships between physical quantities, such as speed, distance, and time. Mastery of these topics prepares students for success in STEM fields.

8. Preparation for Standardized Testing

- **Commonly Tested Concepts:** Equations and inequalities are frequently tested on standardized exams like the SAT, ACT, and state assessments. Proficiency in these areas is crucial for students to perform well, as these topics form the basis for many algebraic problems on these tests.

By including a unit on equations and inequalities in Algebra 1, educators provide students with the tools they need to understand and solve a wide range of mathematical problems. This unit is essential for building a strong foundation in algebra, preparing students for more advanced mathematics, and equipping them with practical skills that they can apply in real-life situations.

Essential Questions

1. Understanding Equations

- What does it mean to solve an equation?
- How can we determine if a solution to an equation is valid?

- How can different types of equations (e.g., linear, quadratic) be solved, and what strategies can we use?
- How do the properties of equality help us solve equations?

2. Understanding Inequalities

- What is the difference between an equation and an inequality?
- How do inequalities represent real-world situations and constraints?
- How does the direction of an inequality sign affect the solution?
- How do we solve and graph inequalities, and what does the solution set represent?

3. Graphical Representation

- How can we represent the solutions to equations and inequalities on a number line or coordinate plane?
- What does the graph of an equation or inequality tell us about its solutions?
- How can we use graphs to solve systems of equations and inequalities?

4. Application and Problem Solving

- How can equations and inequalities be used to model and solve real-world problems?
- How do we choose the most appropriate method to solve a particular equation or inequality?
- How do constraints and conditions in a problem lead to the formulation of inequalities?

5. Reasoning and Proof

- How can we prove that a solution to an equation or inequality is correct?
- How can we create and justify a strategy for solving an equation or inequality?
- How does solving equations and inequalities help us understand and explain patterns and relationships?

6. Connecting Concepts

- How are equations and inequalities connected to other areas of mathematics, such as functions and geometry?
- In what ways do equations and inequalities help us understand the relationships between variables?
- How do solving equations and inequalities prepare us for more complex mathematical concepts?

Modifications and/or Accommodations

Suggested Modifications (ELL, Sp. Ed, Gifted, At-risk of Failure)

English Language Learners

*SCIOP/WIDA levels will allow the teacher to determine what supports are appropriate. Reach out to the MLL teacher for suggestions.

Native language support: The teacher provides auditory or written content to students in their native language. Sentence Stems

Adjusted Speech: The teacher changes speech patterns to increase student comprehension. This could include facing the students, paraphrasing, clearly indicating the most important ideas, and speaking more slowly.

Visuals: The teacher uses graphics, pictures, visuals, and manipulatives. This helps ELL students better understand and comprehend the subjects at hand.

Front-Loading Vocabulary: The teacher front-loads vocabulary. This means providing students with a list of important vocabulary words they will need to know for a book, lesson, etc. prior to the lesson being taught. Including pictures to go with the vocabulary words is also very beneficial for the students.

Special Education Students

*Always reference the students IEP for specific accommodations or modification per student need.

Chunking: The teacher presents information in a way that makes it easy for students to understand and remember. Chunking is based on the presumption that our working memory is easily overloaded by excessive detail. The best way to deliver information is to organize it into meaningful units. Because students with special needs get overloaded easily, chunking is an effective strategy to use with them.

Checking for Understanding: It is important to constantly check for understanding, especially for students who have accommodations. Teachers want to make sure students understand the concepts being covered in a way that makes sense to them.

Extra time: The teacher provides students with special needs extra time to complete work or answer questions. It is important to give students enough time to process their thoughts.

Oral Reading: The teacher will read work orally to students. Class work such as tests and literature circles may need to be read aloud to the student.

Timers: The teacher will use timers as an instructional tool. The use of timers is beneficial for students who have trouble completing tasks. Timers can be helpful so the student is aware of how much time they have to complete an assignment.

Students with 504 Plans

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Gifted & Talented Strategies

Extensions/Enrichments: Teachers will provide gifted and talented students with extension/enrichment projects. Students will be challenged to further their understanding, to apply acquired knowledge, and/or to produce something in reference to acquired knowledge.

Modify/Change Activities: Teachers will monitor and modify activities to accommodate those students who need to be challenged further. Additional reading, problem-solving, writing, or project work is necessary for those students who are ready to move on at a rate more accelerated than their peers. In this way, G & T students are provided the same opportunity for support as special needs students.

Students at Risk of School Failure

*Reach out to the Student Support team for assistance.

Directions or Instructions: Make sure directions and/or instructions are given in limited numbers. Give directions/instructions verbally and in simple written format. Ask students to repeat the instructions or directions to ensure understanding occurs. Check back with the student to ensure he/she hasn't forgotten.

Peer Support: Peers can help build confidence in other students by assisting in peer learning. Many teachers use the 'ask 3 before me' approach. This is fine, however, a student at risk may have to have a specific student or two to ask. Set this up for the student so he/she knows who to ask for clarification before going to you.

Alternate or Modified Assignments: Always ask yourself, "How can I modify this assignment to ensure the students at risk are able to complete it?" Sometimes you'll simplify the task, reduce the length of the assignment or allow for a different mode of delivery. For instance, many students may hand something in, the at-risk student may jot notes and give you the information verbally. Or, it just may be that you will need to assign an alternate assignment.

Increase One to One Time: When other students are working, always touch base with your students at risk and find out if they're on track or needing some additional support. A few minutes here and there will go a long way to intervene as the need presents itself.

Contracts: It helps to have a working contract between you and your students at risk. This helps prioritize the tasks that need to be done and ensure completion happens. Each day write down what needs to be completed, as the tasks are done, provide a checkmark or happy face. The goal of using contracts is to eventually have the student come to you for completion sign-offs.

Hands On: As much as possible, think in concrete terms and provide hands-on tasks. This means a child doing math may require a calculator or counters. The child may need to tape record

comprehension activities instead of writing them. A child may have to listen to a story being read instead of reading it him/herself.

Tests/Assessments: Tests can be done orally if need be. Break tests down in smaller increments by having a portion of the test in the morning, another portion after lunch and the final part the next day.

Seating: Seat students near a helping peer or with quick access to the teacher. Those with hearing or sight issues need to be close to the instruction which often means near the front.

Pre-Assessments

- HMH- Math Language Routines Library
- "Are you ready"- at the beginning of all modules.
- Before you begin- interactive lessons

Module 1: Real Numbers and Real-World Quantities

Instructional Plan

Lesson 1: Real Numbers

Lesson 2: Radicals and Rational Exponents

Lesson 3: Precision and Accuracy in Calculations

*All resources are listed in HMH.

https://www.hmhco.com/ui/#/discover/IM_NL20_A1

Module 2: Inequalities

Instructional Plan

Lesson 1: Write, Interpret, and Simplify Expressions

Lesson 2: Write and Solve Equations

Lesson 3: Rewrite Formulas and Solve Literal Equations

Lesson 4: Write and Solve Inequalities

Lesson 5: Write and Solve Compound Inequalities

*All resources are listed in HMH.

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Module 3: Linear Equations in Two Variables

Standards Addressed

New Jersey Student Learning Standards: Content Area

MATH.9-12.A.CED.A	Create equations that describe numbers or relationships
MATH.9-12.A.CED.A.3	Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context.
MATH.9-12.A.CED.A.4	Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations.
MATH.9-12.A.REI	Reasoning with Equations and Inequalities

Integration of Diversity, Equity and Inclusion; Climate Change; Informational and Media Literacy

Diversity, Equity, and Inclusion

NCTM: Access and Equity in Mathematics Education

A Pathway to Equitable Math Instruction

Provide students with opportunities to give feedback to teachers about the classroom and instruction.

• Verbal Example: Fist to five, How well do you understand what we talked about today? Fist to five, How

well did I teach this today?

• Classroom Activity: Exit tickets or surveys that ask students to identify how well teachers taught, what helped them learn, what got in the way of their learning, etc.

Treat mathematics as a language that everyone is learning while authentically centering students home languages.

• Classroom Strategies: Color-coding ideas, learning vocabulary in student languages, visual and kinesthetic learning, representations of learning without words.

• Classroom Activity: Multilingual Frayer Models for
definitions or concepts

Incorporate true culturally relevant pedagogy, practice, and curriculum.

• Verbal Example: What are some of your family traditions that you are proud of? Would you be okay if we brought some of those into the classroom?

• Classroom Activity: Use Ankara fabric to teach mathematical concepts such as tessellations, fractions, area, percentages, etc.

Incorporate the history of mathematics into lessons.
• Verbal Example: Why do you think we call it Pythagorean's theorem, when it was used before he was even born? What should we call it instead?
• Classroom Activity: Learn about different bases and numerical ideas: Base 2, binary and connections to computer programming, how the Yoruba of Nigeria used base 20, and how the Mayans conceptualized the number 0 before the first recording of it

Solicit student ways of thinking and processing.
• Verbal Example: How might you all go about this? What do you notice?
• Classroom Activity: Incorporate explorations, where students interact with mathematics in a way that allows them to "discover" or experience mathematics.

Reorganize your classroom teaching around concepts, and teach them more like a web rather than discrete sets of knowledge.
• Verbal Example: How does this connect to what you've learned in the past? How can you use that knowledge today?
• Classroom Activity: Learning webs that connect content

Start with more complex math problems and scaffold as necessary.
• Verbal Example: If we wanted to build a rocket, what are all the things we might need to know before we get

started? Along the way, we decided that we want the rocket to reach the moon. What do we need to consider now?
• Classroom Activity: When solving equations, start with the most complex problem, generate ideas for how to solve it, and use the simpler equations as examples to support those ideas.

Offer a variety of ways to demonstrate thinking and knowledge.
• Verbal Example: Show your thinking with words, pictures, symbols.

Ask other questions that will demonstrate learning when it is not clear to you how students know the answer.
• Verbal Example: If you were working with a fellow mathematician who was absent this day, what might you tell them to help them learn it?

Learn about, engage with, and incorporate ethnomathematics.
• Verbal Example: Reflect on your day so far. What math have you already used today?
• Classroom Activity: Community walks to engage with slope.

Co-construct knowledge in the classroom.
• Verbal Example: Let's get into partners and do a think pair-share. We will incorporate everyone's ideas and try to synthesize them.
• Classroom Activity: Have students create mathematical definitions in their own words in groups, and bring the groups together to co-construct mathematical definitions as a class

Choose problems that have complex, competing, or multiple answers.
• Verbal Example: Come up with at least two answers that might solve this problem.
• Classroom Activity: Challenge standardized test questions by getting the "right" answer, but justify other answers by unpacking the assumptions that are made in the problem.
• Classroom Activity: Deconstructed Multiple Choice
- given a set of multiple choice answers, students discuss why these answers may have been included (can also be used to highlight common mistakes).

Identify what is right about the thinking, and highlight the mistake in what is factually or procedurally accepted.
• Verbal Example: You recognized that you had to combine the constants 27 and 9, could you explain your thinking?
• Classroom Activity: Error Analysis worksheets that highlight what is the right idea behind the mistake.

Using thoughtful questioning to solicit mathematical thoughts rather than telling.

• Verbal Example: What would a mathematician who is confused ask about this question?

• Classroom Activity: After students demonstrate knowledge of a topic, have them play a game where they have to explain their topic to a fellow mathematician and a skeptic. Develop their own reflective questioning/explaining in all three roles.

Create multiple ways of participating that honor myriad ways of thinking and being.
• Verbal Example: For this section, feel free to work alone, in pairs, trios, or quads (let them choose).
• Classroom Activity: Community circles or storytelling circles, incorporating dance, music, song, call and response, and other cultural ways of communicating.

Climate Change

Math Climate Change Companion Guide

• S.ID.B.6a Fit a function to the data (including with the use of technology); use functions fitted to data to solve problems in the context of the data. Use given functions or choose a function suggested by the context. Emphasize linear and exponential models.
Climate Change Example: Students may use linear or exponential functions fitted to geoscience data to solve problems and analyze the results from global climate models to make an evidence-based forecast of the current rate of global climate change.

• F.IF.A.2 Use function notation, evaluate functions for inputs in their domains, and interpret statements that use function notation in terms of a context.
Climate Change Example: Students may use function notation to determine the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline), m, where c(m) is the number of molecules of carbon dioxide.
• F.IF.B.5 Relate the domain of a function to its graph and, where applicable, to the quantitative relationship it describes. For example, if the function gives the number of person-hours it takes to assemble n engines in a factory, then the positive integers would be an appropriate domain for the function.
Climate Change Example: Students may relate the domain of a function c(m) representing the amount of carbon dioxide produced by burning m molecules of ethane (gasoline), to its graph in order to determine the appropriate domain for c(m).
• F.IF.B.6 Calculate and interpret the average rate of change of a function (presented symbolically or as a table) over a specified interval. Estimate the rate of change from a graph.
Climate Change Example: Students may calculate the average rate of change of a function c(m) presented symbolically or as a table, where c(m) represents the amount of carbon dioxide produced by burning a given number of molecules of ethane (gasoline).

• A.CED.A.1 Create equations and inequalities in one variable and use them to solve problems. Include equations arising from linear and quadratic functions, and simple rational and exponential functions.
Climate Change Example: Students may create equations and/or inequalities to represent the economic impact of climate change.
• A.CED.A.3 Represent constraints by equations or inequalities, and by systems of equations and/or inequalities, and interpret solutions as viable or nonviable options in a modeling context. For example, represent inequalities describing nutritional and cost constraints on combinations of different foods.
Climate Change Example: Students may represent constraints describing the economic impact of climate change by equations, inequalities, and/or by systems of inequalities, and interpret solutions as viable or nonviable options.

• A.CED.A.4 Rearrange formulas to highlight a quantity of interest, using the same reasoning as in solving equations. For example, rearrange Ohm's law to highlight resistance R.
Climate Change Example: Students may rearrange formulas related to the economic impact of climate change to highlight a quantity of interest, using the same reasoning as in solving equations.

• N.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.
Climate Change Example: Students may use units to guide the solution of multi-step problems about how variations in the flow of energy into and out of the Earth's systems result in climate change. Note: Changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.
• N.Q.A.2 Define appropriate quantities for the purpose of descriptive modeling.
Climate Change Example: Students may define appropriate quantities for a descriptive model of how variations in the flow of energy into and out of Earth's systems result in climate change. Note: changes in climate are limited to changes in surface temperatures, precipitation patterns, glacial ice volumes, sea levels, and biosphere distribution.

21st Century Life and Career

CRP.K-12.CRP1	Act as a responsible and contributing citizen and employee.
CRP.K-12.CRP2	Apply appropriate academic and technical skills.
CRP.K-12.CRP4	Communicate clearly and effectively and with reason.
CRP.K-12.CRP6	Demonstrate creativity and innovation.
CRP.K-12.CRP7	Employ valid and reliable research strategies.
CRP.K-12.CRP8	Utilize critical thinking to make sense of problems and persevere in solving them.

Integration of Computer Science and Design Thinking

CS.9-10.3A-AP-14	Use lists to simplify solutions, generalizing computational problems instead of repeatedly using simple variables.
CS.9-10.3A-AP-17	Decompose problems into smaller components through systematic analysis, using constructs such as procedures, modules, and/or objects.

Interdisciplinary Connections: NJSLS for ELA, Social Studies, Science and/or Math

ELA.K-12.L.KL	Knowledge of Language: By the end of grade 12, apply knowledge of language and command of vocabulary to understand how language functions in different contexts, to make effective choices for meaning or style, and to comprehend more fully when reading or listening.
ELA.K-12.SL.UM	Use Media: By the end of grade 12, make strategic use of digital media and visual displays of data to express information and enhance understanding of presentations.
ELA.SL.PE.9–10.1	Initiate and participate effectively in a range of collaborative discussions (one-on-one, in

groups, and teacher-led) with peers on grades 9–10 topics, texts, and issues, building on others' ideas and expressing their own clearly and persuasively.

Integration of Career Readiness. Life Literacies and Key Skills

TECH.9.4.2.CI	Creativity and Innovation
TECH.9.4.2.CT	Critical Thinking and Problem-solving
TECH.9.4.2.GCA	Global and Cultural Awareness
TECH.9.4.2.IML	Information and Media Literacy