Unit #02: Inequalities and Proof

Content Area: **Mathematics**
Course(s): **Algebra II**
Time Period: **September**
Length: **1 week**
Status: **Published**

Unit Overview

This unit includes methods for solving inequalities involving conjunction and disjunctions methods for solving inequalities involving absolute value. Problem solving is included in this unit as it was in Unit 1 to reinforce and strengthen algebraic problem solving and critical thinking skills.

Enduring Understandings

Students will understand that there is more than one way to solve a problem.

Students will understand that regardless of the method used, the answer will always come out the same.

Essential Questions

- How can linear inequalities be used to understand real world data?
- Why is Algebra a universal language?

Standards/Indicators/Student Learning Objectives (SLOs)

Student Learning Objectives:

- SWBAT solve conjunctions and disjunctions.
- SWBAT solve inequalities in one variable.
- SWBAT solve open sentences involving absolute value.
- SWBAT solve word problems by using inequalities in one variable.

MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.4	Model with mathematics.
MA.K-12.6	Attend to precision.
MA.A-CED	Creating Equations
MA.A-CED.A	Create equations that describe numbers or relationships
MA.A-REI	Reasoning with Equations and Inequalities
MA.A-REI.A	Understand solving equations as a process of reasoning and explain the reasoning

MA.A-REI.B	Solve equations and inequalities in one variable
MA.A-REI.D	Represent and solve equations and inequalities graphically

Indicators

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students make sense of quantities and their relationships in problem situations. They bring two complementary abilities to bear on problems involving quantitative relationships: the ability to decontextualize—to abstract a given situation and represent it symbolically and manipulate the representing symbols as if they have a life of their own, without necessarily attending to their referents—and the ability to contextualize, to pause as needed during the manipulation process in order to probe into the referents for the symbols involved. Quantitative reasoning entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them; and knowing and flexibly using different properties of operations and objects.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Mathematically proficient students try to communicate precisely to others. They try to use clear definitions in discussion with others and in their own reasoning. They state the meaning of the symbols they choose, including using the equal sign consistently and appropriately. They are careful about specifying units of measure, and labeling axes to clarify the correspondence with quantities in a problem. They calculate accurately and efficiently, express numerical answers with a degree of precision appropriate for the problem context. In the elementary grades, students give carefully formulated explanations to each other. By the time they reach high school they have learned to examine claims and make explicit use of definitions.

MA.A-CED.A.1	Create equations and inequalities in one variable and use them to solve problems.
MA.A-CED.A.2	Create equations in two or more variables to represent relationships between quantities; graph equations on coordinate axes with labels and scales.
MA.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.
MA.A-REI.A.1	Explain each step in solving a simple equation as following from the equality of numbers asserted at the previous step, starting from the assumption that the original equation has a solution. Construct a viable argument to justify a solution method.
MA.A-REI.B.3	Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters.
MA.A-REI.B.4	Solve quadratic equations in one variable.

Lesson Titles

- Applications of Inequalities
- Solve Absolute Value Equations
- Solve Conjunctions and Disjunctions
- Solve Inequalities

Benchmark Assessment

Skills-based assessment- math practice

Alternate Assessment

Performance tasks

Project-based assignments

Problem-based assignments

Presentations

Career Readiness, Life Literacies & Key Skills

TECH.9.4.2.CI.1	Demonstrate openness to new ideas and perspectives (e.g., 1.1.2.CR1a, 2.1.2.EH.1, 6.1.2.CivicsCM.2).
TECH.9.4.2.CI.2	Demonstrate originality and inventiveness in work (e.g., 1.3A.2CR1a).

TECH.9.4.2.CT.2	Identify possible approaches and resources to execute a plan (e.g., 1.2.2.CR1b, 8.2.2.ED.3).
TECH.9.4.2.DC.1	Explain differences between ownership and sharing of information.
TECH.9.4.2.DC.2	Explain the importance of respecting digital content of others.
TECH.9.4.2.DC.3	Explain how to be safe online and follow safe practices when using the internet (e.g., 8.1.2.NI.3, 8.1.2.NI.4).
TECH.9.4.2.TL.2	Create a document using a word processing application.
TECH.9.4.2.TL.3	Enter information into a spreadsheet and sort the information.

Equity Considerations

Climate Change

Connection to math and STEM processes: Students will be able to build on previously taught science material particularly carbon footprints in regards to the mathematically processes centered around it.

What type of function is best to predict the rate of melting of the polar ice caps?

http://www.climatechangeeducation.org/k-12/math/index.html

SCI.HS-ESS3-1	Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and climate change have influenced human activity. Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.

Asian American/ Pacific Islander Considerations

Students will engage in learning different AAPI mathematicians that have contributed to mathematical processes and developments.

https://www.youtube.com/watch?v=_pUHaSapfuo

https://www.ngpf.org/blog/math/math-monday-celebrating-aapi-mathematicians/

https://ideas.ted.com/8-asian-americans-and-pacific-islanders-whose-innovations-have-changed-your-life-really/

LGBTQ and Disabilities

Students will engage in learning different mathematicians from the LGBTQ community along with those with disabilities that have made significant impacts in math.

STEM

LGBTQ:

Sir Francis Bacon (1561–1626)

Florence NightingaleFrancis Bacon | Philosophy, Scientific Method, & Facts | Britannica(1820-1910)

George Washington Carver (1861-1943)

Sara Josephine Baker (1873-1945)

Alan Turing (1912-1954)

Allan Cox (1926-1987)

Sally Ride (1951-2012)

Ben Barres (1954-2017)

Ruth Gates (1962-2018)

Tim Cook (1960)

Disabilities:

Leonardo da Vinci (1452-1519)- Dyslexia

Isaac Newton (1664-1727)- Epilepsy

Thomas Edison (1847-1931)- Hearing

Charles Darwin (1809-1882)- Stutter, Dyslexia

Alexander Graham Bell (1847-1922)- Deaf

Albert Einstein (1879-1955)- Aspergers

Florence B. Seibert (1897-1991)- Mobility

Stephen Hawking (1942-2019)- ALS

John Forbes Nash (1928-2015)-
Schizophrenia

Temple Grandin (1947)- Autism

Inter-Disciplinary Connections

LA.RST.9-10.2	Determine the central ideas, themes, or conclusions of a text; trace the text's explanation or depiction of a complex process, phenomenon, or concept; provide an accurate summary of the text.
LA.RST.9-10.3	Follow precisely a complex multistep procedure when carrying out experiments, taking measurements, or performing technical tasks, attending to special cases or exceptions defined in the text.
LA.RST.9-10.4	Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.
LA.RI.9-10.8	Describe and evaluate the argument and specific claims in a text, assessing whether the reasoning is valid and the evidence is relevant and sufficient; identify false statements and reasoning.
LA.WHST.9-10.2.A	Introduce a topic and organize ideas, concepts, and information to make important connections and distinctions; include formatting (e.g., headings), graphics (e.g., figures, tables), and multimedia when useful to aiding comprehension.
LA.W.9-10.1.E	Provide a concluding paragraph or section that supports the argument presented.
LA.W.9-10.2.D	Use precise language and domain-specific vocabulary to manage the complexity of the topic.
LA.L.11-12.6	Acquire and use accurately general academic and domain-specific words and phrases, sufficient for reading, writing, speaking, and listening at the college and career readiness level; demonstrate independence in gathering vocabulary knowledge when considering a word or phrase important to comprehension or expression.
12.9.3.ST.2	Use technology to acquire, manipulate, analyze and report data.
12.9.3.ST-ET.5	Apply the knowledge learned in STEM to solve problems.
12.9.3.ST-SM.1	Apply science and mathematics to provide results, answers and algorithms for engineering and technological activities.
12.9.3.ST-SM.2	Apply science and mathematics concepts to the development of plans, processes and projects that address real world problems.
12.9.3.ST-SM.3	Analyze the impact that science and mathematics has on society.

Instructional Strategies, Learning Activities, and Levels of Blooms/DOK

- Bloom's Analysis: Break the concept into parts to understand how each is related to one another
- Bloom's Application: Use knowledge gained in new ways
- Bloom's Comprehension: Make sense of what has been learned
- Bloom's Evaluation: Put new information together in an innovative way

- Bloom's Knowledge: Recall relevant knowledge from prior lessons and long-term memory
- Bloom's Synthesis: Make judgements based on a set of guidelines to create new meaning
- Demonstrate how to graph inequalities on a number line
- Intro lesson on solving absolute value inequalities
- Intro lesson on solving compound inequalities and graphing
- Intro lesson on solving inequalities and graphing on a number line
- Notes will be taken using Smart Notebook
- Review homework
- Review warm up
- Students will present solutions on the board
- Students will work independently on examples
- Students will work on mathxl
- Students will work together on a worksheet
- Tutoring during Delsea One

Modifications

ELL Modifications

- Focus on domain specific vocabulary and keywords
- Offer alternate/or modify assessments
- Offer resources for specific topics in primary language (Youtube web resources)
- Provide formal and informal verbal interaction to provide practice, increase motivation, and self-monitoring
- Tutoring during Delsea One

IEP & 504 Modifications

- Allow student to correct mistakes or answer wrong questions correctly for additional credit if failed the first test (another way to re-teach material)
- Allow student to take notes in class for reinforcement but also provide a copy of completed/correct notes to study from
- Provide students with content vocabulary prior to teaching a lesson that contains that vocabulary (pre-teaching)
- Reduce homework length to just those most important for review
- Tutoring during Delsea One

G & T Modifications

- Ask students' higher level questions that require students to look into causes, experiences, and facts to draw a conclusion or make connections to other areas of learning
- Avoid drill and practice activities.
- Encourage peer leadership or mentoring
- Provide additional rigorous challenge problems for advanced students
- Provide rationale for thinking

At Risk Modifications

- guided notes
- modeling
- retesting
- speaking to students privately when redirecting behaviors
- study guides
- tutoring during Delsea One

Formative Assessment

- Exit Ticket
- Group Work
- Guided Practice
- Individual Practice
- Journal Entry
- Kahoot!
- Observation
- Oral Responses
- Poll class to self-analyze their comfort level of the lesson
- Socrative
- Teacher Observation
- Vocabulary Review

Summative Assessment

- Alternative Assessment
- Marking Period Assessment
- Unit Test on Solving and Graphing Compound & Absolute Value Inequalities

Resources & Materials

- Chromebook
- Graphing Calculator
- Promethean Boarn
- Smart Notebook
- Teacher generated worksheets
- Textbooks: Algebra and Trigonometry Structure and Method Book 2 (McDougal Littell), Algebra II Common Core (Pearson)

Technology

- google classroom
- http://kutasoftware.com/
- http://mathxlforschool.com/home_school.htm
- https://create.kahoot.it
- https://njctl.org/
- https://njctl.org/
- https://socrative.com/
- https://www.desmos.com/
- https://www.resourceaholic.com/
- https://www.youtube.com/watch?v=6N73_lhZG9s&feature=youtu.be
- https://www.youtube.com/watch?v=kLfgjxmtfm8&feature=youtu.be
- https://www.youtube.com/watch?v=MJE4EPbQMD0&feature=youtu.be
- Student 1-1 Device (chromebook)
- TI Graphing Calculator

TECH.8.1.12	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.
TECH.8.1.12.A.CS1	Understand and use technology systems.
TECH.8.1.12.A.CS2	Select and use applications effectively and productively.
TECH.8.1.12.B	Creativity and Innovation: Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
TECH.8.1.12.C.CS4	Contribute to project teams to produce original works or solve problems.
TECH.8.1.12.E.CS1	Plan strategies to guide inquiry.
TECH.8.1.12.E.CS3	Evaluate and select information sources and digital tools based on the appropriateness for specific tasks.