



Harnessing Apps to Promote Mathematical Reasoning

Resources



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High Impact Indicators - Algebraic Reasoning

Algebraic Reasoning		
Assessment Target	Indicators	What to look for in student work: The student can
A.3 Write, manipulate, solve, and graph linear inequalities	<p>A.3.a Solve linear inequalities in one variable with rational number coefficients.</p> <p>A.3.b Identify or graph the solution to a one variable linear inequality on a number line.</p> <p>A.3.c Solve real-world problems involving inequalities.</p> <p>A.3.d Write linear inequalities in one variable to represent context.</p>	<ul style="list-style-type: none"> • Solve inequalities in one variable, using the standard algorithms. • Solve a one-variable inequality and identified or created a graph on the number line of the solution. • Analyze the relationship between quantities in a real-world problem, and then create an inequality to model the problem situation. • Analyze the relationship between quantities in a real-world problem, and then solve the problem through algebraic reasoning.

Symbols and Vocabulary for Inequalities

Notation or Vocabulary	Definition
$a > b$	a is more than b
$a \geq b$	a is at least b
$a < b$	a is less than b
$a \leq b$	a is at most b or a is no more than b
$a \neq b$	a is not equal to b
∞	Symbol for positive infinity - an abstract concept describing something without any bound or larger than any number.
Boundary point	A solution that makes the inequality true
Coefficient	$4a > b$ - the number associated with the variable
Inclusive	$a \leq 6$ - includes the number and is indicated on the number line with a closed circle 
Exclusive	$A < 6$ - excludes the number and is indicated on the number line with an open circle 
Solution Set	The range of values that make the inequality true

Inequality Key Words and Symbols

Symbol Æ	Meaning	Associated Words
\geq	Greater than or equal to	<ul style="list-style-type: none">• No less than• At least• Minimum
\leq	Less than or equal to	<ul style="list-style-type: none">• No more than• At most• Maximum
$>$	Greater than	<ul style="list-style-type: none">• More than• Greater than
$<$	Less than	<ul style="list-style-type: none">• Less than• Fewer than
$=$	Equal to/Equals	<ul style="list-style-type: none">• The same as• Is equal to• equals

Vocabulary

Inequality	A mathematical statement formed by placing an inequality symbol between two expressions.
Less Than	Smaller in size, quantity, or amount; the symbol $<$ stands for is less than.
Greater Than	More than in size, quantity, or amount; the symbol $>$ stands for is greater than. $>$
Less Than or Equal To	When the inequality is same or smaller.
Greater Than or Equal To	When the inequality is same or bigger.
Solution of an inequality	The set of all numbers that produce true statements when substituted for the variable in the inequality.
Verbal Sentence	A Verbal Sentence is a sentence containing clues about an equation/inequality within the problem. Or the equation/inequality in sentence.

Steps to Graphing Inequalities

Step 1 To plot an inequality, such as $x > 3$, on a number line, first draw a circle over the number (e.g., 3).



Step 2 Then if the sign includes equal to (\geq or \leq), fill in the circle. If the sign does not include equal to ($>$ or $<$), leave the circle unfilled in.



Step 3 Finally, draw a line going from the circle in the direction of the numbers that make the inequality true.



Properties of Inequalities

Addition and Subtraction

If $a > b$, then $a + c > b + c$

If $a > b$, then $a - c > b - c$

Multiplication and Division

If $a > b$, then $ac > bc$, if $c > 0$

If $a < b$, then $ac < bc$, if $c < 0$

Steps to Solving Inequalities

Step 1 Eliminate fractions by multiplying all terms by the least common denominator of all fractions. Remember, when multiplying both sides by the same negative number, reverse the inequality symbol.

Step 2 Add or subtract quantities to obtain the unknown on one side and the numbers on the other.

Step 3 Simplify by combining like terms on each side of the inequality.

Step 4 Eliminate any remaining coefficient of the variable by dividing both sides of the equation by the same coefficient. Remember, when dividing both sides by the same negative number, reverse the inequality symbol.

Remember, to solve an inequality, you can:

- Add the same quantity to both sides.
- Subtract the same quantity from both sides.
- Multiply both sides by the same positive number.
- Divide both sides by the same positive number.
- Multiply both sides by the same negative number and reverse the sign.
- Divide both sides by the same negative number and reverse the sign.

What is Nearpod?

Nearpod helps educators make any lesson interactive whether in the classroom or virtual. The concept is simple. A teacher can create interactive presentations that can contain Quiz's, Polls, Videos, Collaborate Boards, and more.

With Nearpod, students do not need accounts to access! When you start a lesson, you'll launch a five-letter code. Share this code with students, or share the lesson through your LMS (like Canvas or Schoology), Google Classroom, or Microsoft Teams



How do I Start Using Nearpod?

Learn these three things and begin teaching with Nearpod:

1. There are TWO ways to launch a lesson & both give you student feedback!
 - Live Lesson Option: Teachers share a live session, students enter a code, and the lesson is synced to all devices. This is perfect for running a lesson with a video conferencing solution.
 - Student Paced Option: Share a lesson code for student's to complete at their own time and pace, in order to create a more flexible and equitable remote teaching experience.
2. You can use our editable ready-to-run lessons! Choose from 8,000+ ready-to-run editable lessons and customize any of these lessons to fit your students' needs!
3. Digitize your paper-based lessons! Save prep time by importing existing lessons (pdfs, jpegs, ppts) and adding Virtual Field Trips, Collaborate boards, Quizzes, Polls, Matching Pairs activities + more. Or, start in Nearpod OR Google Slides add your favorite Nearpod activities. It's that easy.

Other Noteworthy Apps



Photomath

Photomath allows you to snap a picture of the math problem and get its step-by-step solution! From basic arithmetic to fractions to trigonometry to linear and quadratic equations, it can help you with a lot of Math problems quite easily.

App Store

<https://apps.apple.com/us/app/photomath/id919087726>

Chrome Web Store

<https://chrome.google.com/webstore/detail/photomath-for-computerand/pfhjeibbbclgcdlejloildabdhifhodc?hl=en-US>

PC Emulator

<https://sites.google.com/view/photomath-app-for-windows-pc/home>



Geogebra

Create constructions with points, lines, circles, polygons, and angles, explore interactive geometry by dragging points, measure lengths and areas, transform shapes, investigate construction steps to get deeper understanding, save and share your results with others.

PC

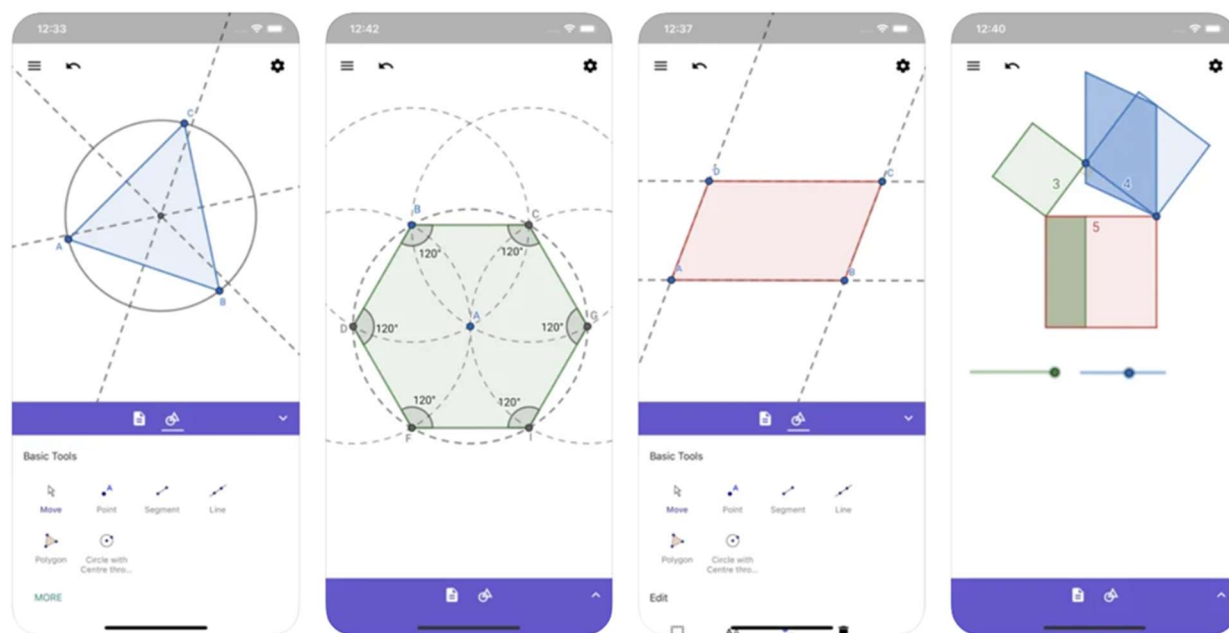
<https://www.geogebra.org/download?lang=en>

Google Play Store

https://play.google.com/store/apps/details?id=org.geogebra.android&hl=en_US&gl=US

App Store

<https://apps.apple.com/us/app/geogebra-graphing-calculator/id1146717204>



The Math Learning Center

Create constructions with points, lines, circles, polygons, and angles, explore interactive geometry by dragging points, measure lengths and areas, transform shapes, investigate construction steps to get deeper understanding, save and share your results with others.

PC

<https://www.mathlearningcenter.org/apps>

Chrome Web Store

<https://chrome.google.com/webstore/detail/geoboard-by-the-math-lear/gaakmmdiopnmcenkojohldanladpajak?hl=en-US>

App Store

<https://apps.apple.com/us/developer/the-math-learning-center/id1542700905>



The MATH LEARNING CENTER



[Open Web App](#)
[Apple App Store](#)
[Chrome Store](#)

SUPPORTS SHARING!

Geoboard

The Geoboard app is a tool for exploring a variety of mathematical topics introduced in the elementary and middle grades. Learners stretch bands around the pegs to form line segments and polygons and make discoveries about perimeter, area, angles, congruence, fractions, and more.



[Open Web App](#)
[Apple App Store](#)
[Chrome Store](#)

SUPPORTS SHARING!

Math Clock

Math Clock helps students become fluent working with time. Learners use analog clocks with geared or free-moving hands to learn how to tell time, explore jumps with count by numbers, and visualize story problems involving intervals of time.



[Open Web App](#)
[Apple App Store](#)
[Chrome Store](#)

SUPPORTS SHARING!

Number Frames

Number Frames help students structure numbers to 5, 10, 20, and 100. Students use the frames to count, represent, compare, and compute with numbers in a particular range.



[Open Web App](#)
[Apple App Store](#)
[Chrome Store](#)

SUPPORTS SHARING!

Number Line

Number Line helps students visualize number sequences and illustrate strategies for counting, comparing, adding, subtracting, multiplying, and dividing. Choose number lines labelled with whole numbers, fractions, decimals.

Brainly

Brainly is a crowdsourced Q&A site for students to give and receive homework help, kind of like Yahoo Answers for education. Students post their questions within a subject or grade level, and other students answer them.

PC

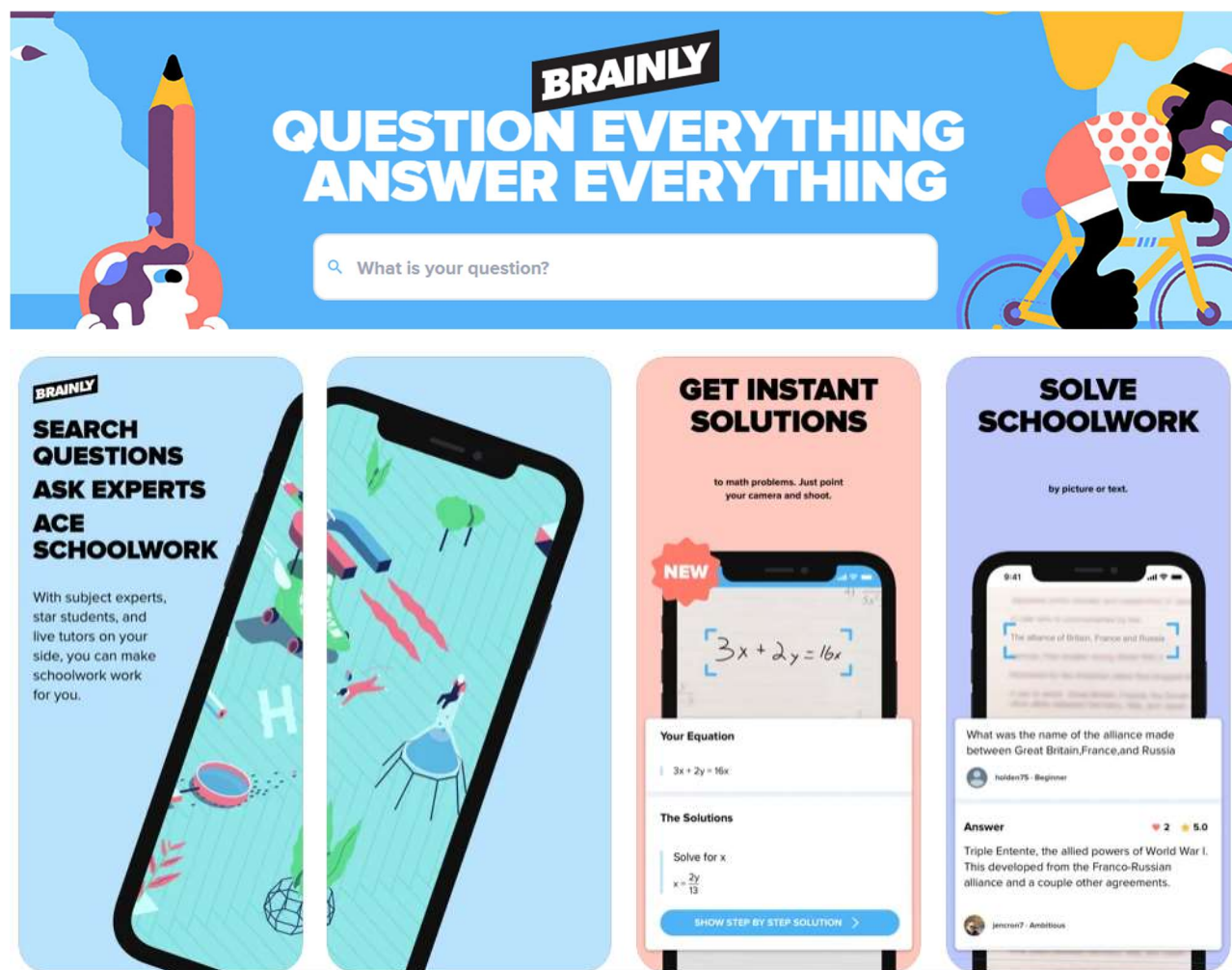
<https://brainly.com/>

Google Play Store

https://play.google.com/store/apps/details?id=co.brainly&hl=en_US&gl=US

App Store

<https://apps.apple.com/us/app/brainly-homework-help-app/id745089947>



Final Tips for Virtual Instruction

1. Pick your app and stick with it.
2. Communicate clearly.
3. Archive your resources for future use.
4. Apply research-based instructional strategies.
5. No IP Address left behind! Accountability matters.
6. Simplify.
7. Give sufficient brain breaks.
8. Make it fun!
9. Allow for accessibility.
10. Promote collaboration and digital citizenship.

Resources from the World Wide Web

The following are resources referenced in the workshop, as well as additional sites that expand the information.

How to Graph Inequalities for Middle School: Fractions & Other Math Tips

<https://www.youtube.com/watch?v=PTDN-ApjzsM>

How to Solve Inequalities

<https://www.youtube.com/watch?v=DrZJKdXIZ3I>

One-Variable Inequalities - Khan Academy

<https://www.khanacademy.org/math/algebra/one-variable-linear-inequalities>

Virtual Nerds: What is an Inequality?

<https://www.youtube.com/watch?v=wcBwdz-ZBaM>

Math is Fun - Solving Inequalities

<https://www.mathsisfun.com/algebra/inequality-solving.html>

Very Basics of Graphing Inequalities (on a number line)

<https://www.youtube.com/watch?v=nif2PKA9bXA>

Solving and Graphing Inequalities (Excellent!)

<https://www.youtube.com/watch?v=EE2qW1yJKDO>

Math Dude Unit 1-4 -Solving Inequalities

<https://www.youtube.com/watch?v=9fbRKV34nt0>

Solving Linear Inequalities - Event Planning

www.floridaipdae.org/index.cfm?fuseaction=resources.GEDAHS&cagiid=35103C4421814CCDCF2B F60B532270EE0718F330D6DCACE4E33EFA989573B6E6

Florida IPDAE - GED and AHS Lessons Beginning Algebra - Lessons 14-15

<http://www.floridaipdae.org/index.cfm?fuseaction=resources.GEDAHS&cagiid=DA077C783C76A85D93EE670F44851D4C70E44B31245B6D1B60A314A7FABD6FAE>

Inequalities in the Real-World

<https://betterlesson.com/lesson/592219/inequalities-in-the-real-world>

Inequalities - Solving and Graphing

<https://teacher.desmos.com/activitybuilder/custom/57d9fdc6ebf48f73093807b2>

Stay in Touch

GED Testing Service® - <https://ged.com/>

Twitter at @GEDTesting® - <https://twitter.com/gedtesting>

GED® Facebook - <https://www.facebook.com/GEDTesting/>

YouTube channel - <https://www.youtube.com/user/GEDTestingService>