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<tr>
<th>Course Name</th>
<th>Keystone Algebra I - A (1.00)</th>
<th>Grade Level</th>
<th>Grade 9</th>
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</table>
| Instructional Procedures | • Course Manual Contains Details  
• Graphing Calculator Activities  
• Computer Software Simulations/Activities |             |         |

## Unit 1
Expressions, Equations, and Functions

### Module 1
Operations and Linear Equations & Inequalities

<table>
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<tr>
<th>Time Frame</th>
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<tr>
<th>Key Concepts</th>
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<th>PA Common Core Content Standard</th>
<th>Eligible Content</th>
<th>Terminology</th>
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</thead>
</table>
| A1.1.1.3     | How do you evaluate algebraic expressions?                                          | CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems. | A1.1.1.3.1 Simplify/evaluate expressions involving properties/laws of exponents, roots, and/or absolute values to solve problems. Note: Exponents should be integers from -10 to 10. | • variable  
• algebraic expression  
• power  
• base  
• exponent  
• order of operations  
• verbal model  
• rate  
• unit rate |
|              | How do you evaluate algebraic expressions involving exponents?                      | CC.2.2.8.B.1 Apply concepts of radicals and integer exponents to generate equivalent expressions. |                                                                                |                                                                              |
|              | How do you evaluate expressions involving more than one operation?                   |                                                                                   |                                                                                |                                                                              |
|              | How do you translate verbal phrases into expressions?                                |                                                                                   |                                                                                |                                                                              |
| A1.1.2.1     | How do you translate verbal sentences into equations?                                | CC.2.2.7.B.3 Model and solve real world and mathematical problems by using and connecting numerical, algebraic, | A1.1.2.1.1 Write, solve, and/or apply a linear equation (including problem situations). | • equation  
• open sentence  
• solution of an equation |
|              | What is our problem solving plan                                                   |                                                                                   |                                                                                |                                                                              |

Algebra I - A  
Northern York County School District  
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<tr>
<td>How do you use our problem solving plan to solve problems?</td>
<td>CC.2.2.8.B.3 Represent and analyze quantitative relationships between dependent and independent variables.</td>
<td>A1.1.2.1.3 Interpret solutions to problems in the context of the problem situation. <strong>Note:</strong> Linear equations only.</td>
<td></td>
</tr>
<tr>
<td>How do you use estimation to solve problems?</td>
<td>CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays.</td>
<td>A1.1.1.4.1 Use estimation to solve problems.</td>
<td></td>
</tr>
<tr>
<td>How do you determine the precision of a measurement?</td>
<td>CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems</td>
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<tr>
<td>What are significant digits?</td>
<td>CC.2.1.HS.F.5 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</td>
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<td></td>
</tr>
<tr>
<td>How are significant digits used?</td>
<td>CC.2.2.HS.D.7 Create and graph equations or inequalities to describe numbers of relationships.</td>
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</tr>
<tr>
<td></td>
<td>CC.2.2.HS.D.8 Apply inverse operations to solve equations or formulas for a given variable.</td>
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<td></td>
<td>CC.2.2.HS.D.9 Use reasoning to solve equations and justify the solution method.</td>
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</tr>
<tr>
<td></td>
<td>CC.2.2.HS.D.10 Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
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<tr>
<td></td>
<td>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two</td>
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<td></td>
</tr>
<tr>
<td>A1.1.3.1</td>
<td>Write, solve, and/or graph linear inequalities using various methods.</td>
<td>How do you translate verbal sentences into inequalities?</td>
<td>CC.2.2.HS.D.7</td>
</tr>
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</table>
# Unit 1

**Expressions, Equations, and Functions**

## Module 2

**Linear Functions and Data Organizations**

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<th>Time Frame</th>
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<tbody>
<tr>
<td>A1.2.1.2</td>
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</tbody>
</table>
Interpret and/or use linear functions and their equations, graphs, or tables. | How do you represent functions as rules? | CC.2.2.8.B.2 Understand the connections between proportional relationships, lines, and linear equations. | A1.2.1.2.1 | function, independent variable, dependent variable |
|              |                     | CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. | A1.2.1.2.2 | Translate from one representation of a linear function to another (i.e., graph, table, equation). |
|              |                     | CC.2.1.HS.F.3 Apply quantitative reasoning to choose and interpret units and scales in formulas, graphs and data displays. | Vertical Alignment (Introductory Topics) |             |
|              |                     | CC.2.1.HS.F.4 Use units as a way to understand problems and to guide the solution of multi-step problems. | A2.2.1.1.2 | Identify and/or extend a pattern as either an arithmetic or geometric sequence (e.g., given a geometric sequence, find the 20th term). Algebra 1 with understanding of functions. |
|              |                     | CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. |             |             |
|              |                     | CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. |             |             |
| A1.2.1.1  | How do you represent patterns as rules? | CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. | A1.2.1.1.1  | Analyze a set of data for the existence of a pattern and represent the pattern algebraically and/or graphically. |
| A1.2.1.1.1  | How do you represent patterns as graphs? | CC.2.2.HS.C.2 Graph and analyze functions and use their properties to make connections between the different representations. | A1.2.1.1.2  | Determine whether a relation is a function, given a set of points or graph. |
|  | How do you identify the domain of a relation? | CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. | A1.2.1.1.3  | Identify the domain or range of a relation (may be presented as ordered pairs, a graph, or a table). |
|  | How do you identify the range of a relation? | CC.2.2.HS.C.6 Interpret functions in terms of the situation they model. | Vertical Alignment (Introductory Topics) A2.2.1.1.1  | Analyze a set of data for the existence of a pattern and represent the pattern with a rule algebraically and/or graphically. |
|  | How do you determine if a relation is a function? | CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. |  |  |

- domain
- range
- relation
- function
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<tbody>
<tr>
<td>A1.1.1.1</td>
<td>How do you find the square root of a number?</td>
<td>CC.2.1.8.E.1 Distinguish between rational and irrational numbers using their properties.</td>
<td>A1.1.1.1 Compare and/or order any real numbers. Note: Rational and irrational may be mixed.</td>
<td>square root, radicand, perfect square, prime factorization, real numbers, irrational number, rational number</td>
</tr>
<tr>
<td></td>
<td>How do you approximate the square root of a number?</td>
<td>CC.2.1.8.E.4 Estimate irrational numbers by comparing them to rational numbers.</td>
<td>A1.1.1.2 Simplify square roots.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How do you simplify square roots?</td>
<td>CC.2.1.HS.F.1 Apply and extend the properties of exponents to solve problems with rational exponents.</td>
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</tr>
<tr>
<td></td>
<td>How do you determine if a real number is rational or irrational?</td>
<td>CC.2.1.HS.F.2 Apply properties of rational and irrational numbers to solve real world or mathematical problems.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1.1.1.2</td>
<td>How do you find the Greatest Common Factor for sets of monomials?</td>
<td>CC.2.1.6.E.3 Develop and/or apply number theory concepts to find common factors and multiples.</td>
<td>A1.1.1.2.1 Find the Greatest Common Factor (GCF) and/or the Least Common Multiple (LCM) for sets of monomials.</td>
<td>Greatest Common Factor, Least Common Multiple</td>
</tr>
<tr>
<td></td>
<td>How do you find the Least Common Multiple for sets of monomials?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A1.1.2.1</td>
<td>How do you solve one-step equations using algebra?</td>
<td>CC.2.2.8.B.3 Represent and analyze quantitative relationships between dependent and independent variables.</td>
<td>A1.1.2.1.1 Write, solve, and/or apply a linear equation (including problem situations).</td>
<td>equation, inverse operation, equivalent equations</td>
</tr>
<tr>
<td></td>
<td>How do you solve two-step</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| Equations using algebra? | CC.2.1.HS.F.3  
Apply quantitative reasoning to  
choose and interpret units and scales  
in formulas, graphs and data displays. | A1.1.2.1.2  
Use and/or identify an algebraic property to  
justify any step in an equation-solving  
process. Note: Linear equations only. | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
|---|---|---|---|
| How do you solve multi-step equations? | CC.2.1.HS.F.4  
Use units as a way to understand  
problems and to guide the solution of  
multi-step problems | A1.1.2.1.3  
Interpret solutions to problems in the  
context of the problem situation. Note:  
Linear equations only. | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you solve equations with variables on both sides? | CC.2.1.HS.F.5  
Choose a level of accuracy  
appropriate to limitations on  
measurement when reporting  
quantities. | Vertical Alignment (Introductory Topics)  
A2.1.3.2.2  
Use algebraic processes to solve a formula  
for a given variable (e.g., solve \( d = rt \) for \( r \)). | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you determine if an equation has no solution? | CC.2.2.HS.D.7  
Create and graph equations or  
inequalities to describe numbers of  
relationships. | G.2.1.1.2  
Use trigonometric ratios to write and/or  
solve problems involving right triangles. | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you determine if an equation has all real numbers as its solution? | CC.2.2.HS.D.8  
Apply inverse operations to solve  
equations or formulas for a given  
variable. | G.2.2.2.5  
Find the area of a sector of a circle. | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you write a ratio? | CC.2.2.HS.D.9  
Use reasoning to solve equations and  
justify the solution method. | | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you write proportions? | CC.2.2.HS.D.10  
Represent, solve and interpret  
equations/inequalities and systems of  
equations/inequalities algebraically  
and graphically. | | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you solve proportions? | CC.2.2.HS.C.2  
Graph and analyze functions and use  
their properties to make connections  
between the different representations. | | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
| How do you rewrite equations and formulas? | CC.2.2.HS.C.3  
Write functions or sequences that  
model relationships between two  
quantities. | | • reciprocal  
• like terms  
• input  
• output  
• addition property of equality  
• subtraction property of equality  
• multiplication property of equality  
• division property of equality  
• distributive property  
• identity  
• no solution  
• all real numbers  
• ratio  
• proportion  
• cross product  
• scale model  
• literal equation  
• formula |
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<tr>
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<th>Graphing Linear Equations and Functions</th>
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<td>Linear Functions and Data Organizations</td>
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<td><strong>7 Weeks</strong></td>
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<tr>
<td><strong>Key Concepts</strong></td>
<td><strong>Essential Questions</strong></td>
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<tr>
<td>A1.2.1.2</td>
<td>Interpret and/or use linear functions and their equations, graphs, or tables.</td>
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<tr>
<td></td>
<td>How do you plot points in a coordinate plane?</td>
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<td></td>
<td>How do you graph linear equations in a coordinate plane?</td>
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<td>How do you graph linear equations using intercepts?</td>
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<td>How do you graph linear equations using slope-intercept form?</td>
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<td>How do you graph direct variation equations?</td>
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<tr>
<td></td>
<td>How do you graph linear functions?</td>
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<tr>
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<td>What is a parent function?</td>
</tr>
<tr>
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<td>What is a family of functions?</td>
</tr>
<tr>
<td><strong>A1.2.2.1</strong> Describe, compute, and/or use the rate of change (slope) of a line.</td>
<td><strong>CC.2.2.HS.C.4</strong> Interpret the effects transformations have on functions and find the inverses of functions.</td>
</tr>
<tr>
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<tr>
<td>How do you find the slope of a line?</td>
<td>CC.2.2.8.C.1 Define, evaluate, and compare functions.</td>
</tr>
<tr>
<td>How do you interpret slope as a rate of change?</td>
<td>CC.2.2.8.C.2 Use concepts of functions to model relationships between quantities.</td>
</tr>
<tr>
<td>How do you determine if two lines are parallel?</td>
<td>CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context.</td>
</tr>
<tr>
<td>How do you determine the constant of variation?</td>
<td>CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities.</td>
</tr>
<tr>
<td>How do you write direct variation equations?</td>
<td>CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems.</td>
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<tr>
<td>Unit 4</td>
<td>Writing Linear Equations</td>
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<tr>
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<td>Time Frame</td>
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<tr>
<td>A1.2.2.1</td>
<td>Describe, compute, and/or use the rate of change (slope) of a line.</td>
<td>CC.2.2.8.C.1 Define, evaluate, and compare functions. CC.2.2.8.C.2 Use concepts of functions to model relationships between quantities. CC.2.2.HS.C.1 Use the concept and notation of functions to interpret and apply them in terms of their context. CC.2.2.HS.C.3 Write functions or sequences that model relationships between two quantities. CC.2.2.HS.C.5 Construct and compare linear, quadratic and exponential models to solve problems.</td>
<td>A1.2.2.1.3 Write or identify a linear equation when given the graph of the line, two points on the line, or the slope and a point on the line. Note: Linear equations may be in point-slope, standard, and/or slope-intercept form. A1.2.2.1.4 Determine the slope and/or y-intercept represented by a linear equation or graph.</td>
<td>y –intercept • slope • slope-intercept form • point-slope form • standard form • conditional statement • converse • parallel lines • perpendicular lines</td>
</tr>
<tr>
<td>A1.2.2.2</td>
<td>Analyze and/or interpret data on a scatter plot.</td>
<td>CC.2.4.HS.B.2 Summarize, represent, and interpret data on two categorical and quantitative variables. CC.2.4.HS.B.3 Analyze linear models to make interpretations based on the data.</td>
<td>A1.2.2.2.1 Draw, identify, find, and/or write an equation for a line of best fit for a scatter plot.</td>
<td>scatter plot • correlation • positive correlation • negative correlation • relatively no correlation • line of fit</td>
</tr>
</tbody>
</table>
| **A1.2.3.2** | How do you find the equation of best-fitting lines?  
How do you find the zero of a function?  
How do you make predictions using best-fitting lines? | **CC.2.4.HS.B.1** | Summarize, represent, and interpret data on a single count or measurement variable.  
CC.2.4.HS.B.3 | Analyze linear models to make interpretations based on the data.  
CC.2.4.HS.B.5 | Make inferences and justify conclusions based on sample surveys, experiments, and observational studies. | **A1.2.3.2.2** | Analyze data, make predictions, and/or answer questions based on displayed data (box-and-whisker plots, stem-and-leaf plots, scatter plots, measures of central tendency, or other representations).  
A1.2.3.2.3 | Make predictions using the equations or graphs of best-fit lines of scatter plots. | **•** best-fitting line  
• linear regression  
• interpolation  
• extrapolation  
• zero of a function |
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<th>Solving and Graphing Linear Inequalities</th>
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<td>7 Weeks</td>
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<tr>
<td>Key Concepts</td>
<td>Essential Questions</td>
</tr>
<tr>
<td>A1.1.3.1 Write, solve, and/or graph linear inequalities using various methods.</td>
<td>How do you graph an inequality?</td>
</tr>
<tr>
<td></td>
<td>How do you write a verbal sentence as an inequality?</td>
</tr>
<tr>
<td></td>
<td>How do you write inequalities given a graph?</td>
</tr>
<tr>
<td></td>
<td>How do you solve inequalities using addition and subtraction?</td>
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<tr>
<td></td>
<td>How do you solve inequalities using multiplication and division?</td>
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<tr>
<td></td>
<td>How do you solve multi-step inequalities?</td>
</tr>
<tr>
<td></td>
<td>How do you solve compound inequalities?</td>
</tr>
<tr>
<td></td>
<td>How do you solve absolute value inequalities?</td>
</tr>
<tr>
<td>A1.1.2.1 Write, solve, and/or graph linear equations using various methods.</td>
<td>How do you solve absolute value equations?</td>
</tr>
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<td></td>
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</tr>
<tr>
<td>A1.1.3.2</td>
<td>How do you graph linear inequalities in two variables?</td>
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</tr>
<tr>
<td>Write, solve, and/or graph systems of linear inequalities using various methods.</td>
<td><strong>CC.2.2.HS.D.10</strong> Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
</tr>
<tr>
<td><strong>CC.2.2.HS.D.7</strong> Create and graph equations or inequalities to describe numbers of relationships.</td>
<td><strong>CC.2.1.HS.F.5</strong> Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.</td>
</tr>
<tr>
<td><strong>CC.2.2.HS.D.8</strong> Apply inverse operations to solve equations or formulas for a given variable.</td>
<td><strong>CC.2.2.HS.D.9</strong> Use reasoning to solve equations and justify the solution method.</td>
</tr>
<tr>
<td><strong>CC.2.2.HS.D.10</strong> Represent, solve and interpret equations/inequalities and systems of equations/inequalities algebraically and graphically.</td>
<td><strong>How do you graph linear inequalities in two variables?</strong></td>
</tr>
<tr>
<td>A1.1.3.2.1</td>
<td>How do you graph linear inequalities in two variables?</td>
</tr>
<tr>
<td>A1.1.3.2.1</td>
<td>How do you graph linear inequalities in two variables?</td>
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