



2016 Mathematics Standards of Learning

Grade 7 Mathematics

Overview of Revisions - 2009 to 2016

Referenced documents available at [VDOE Mathematics 2016](#)





Purpose

- Overview of the 2016 *Mathematics Standards of Learning* and the *Curriculum Framework*
- Highlight information included in the Essential Knowledge and Skills and the Understanding the Standard sections of the *Curriculum Framework*





Agenda

- Implementation Timeline
- Resources Currently Available
 - Crosswalk (Summary of Revisions)
 - Standards and Curriculum Frameworks
- Comparison of 2009 to 2016 Standards
 - Number and Number Sense
 - Computation and Estimation
 - Measurement and Geometry
 - Probability and Statistics
 - Patterns, Functions, and Algebra





Implementation Timeline

2016-2017 School Year – Curriculum Development

VDOE staff provides a summary of the revisions to assist school divisions in incorporating the new standards into local written curricula for inclusion in the taught curricula during the 2017-2018 school year.

2017-2018 School Year – Crossover Year

2009 Mathematics Standards of Learning and 2016 Mathematics Standards of Learning are included in the written and taught curricula. Spring 2018 Standards of Learning assessments measure the 2009 Mathematics Standards of Learning and include field test items measuring the 2016 Mathematics Standards of Learning.

2018-2019 School Year – Full-Implementation Year

Written and taught curricula reflect the 2016 Mathematics Standards of Learning. Standards of Learning assessments measure the 2016 Mathematics Standards of Learning.





2016 SOL Revisions –

- Improve the vertical progression of mathematics content
- Ensure developmental appropriateness of student expectations
- Increase support for teachers in mathematics content (including definitions, explanations, examples, and instructional connections)
- Clarify expectations for teaching and learning
- Improve precision and consistency in mathematical language and format
- Ensure proficiency of elementary students in computational skills





Changes to the Curriculum Framework

- Reduction of columns from 3 to 2
 - Understanding the Standard (US) – information that supports mathematical content knowledge
 - Essential Knowledge and Skills (EKS) – information that provides expectations for student learning
- Indicators of SOL sub-bullet added to each bullet within the Essential Knowledge and Skills
- Objectives measured without a calculator on state assessments are indicated with an asterisk *





- 7.10 The student will.
- determine the slope, m , as rate of change in a proportional relationship between two quantities and write an equation in the form $y = mx$ to represent the relationship;
 - graph a line representing a proportional relationship between two quantities given the slope and an ordered pair, or given the equation in $y = mx$ form where m represents the slope as rate of change.
 - determine the y -intercept, b , in an additive relationship between two quantities and write an equation in the form $y = x + b$ to represent the relationship;
 - graph a line representing an additive relationship between two quantities given the y -intercept and an ordered pair, or given the equation in the form $y = x + b$, where b represents the y -intercept; and
 - make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs.

Understanding the Standard

- When two quantities, x and y , vary in such a way that one of them is a constant multiple of the other, the two quantities are “proportional”. A model for that situation is $y = mx$ where m is the slope or rate of change. Slope may also represent the unit rate of a proportional relationship between two quantities, also referred to as the constant of proportionality or the constant ratio of y to x .
- The slope of a proportional relationship can be determined by finding the unit rate.

Example: The ordered pairs (4, 2) and (6, 3) make up points that could be included on the graph of a proportional relationship. Determine the slope, or rate of change, of a line passing through these points. Write an equation of the line representing this proportional relationship.

x	y
4	2
6	3

The slope, or rate of change, would be $\frac{1}{2}$ or 0.5 since the y -coordinate of each ordered pair would result by multiplying $\frac{1}{2}$ times the x -coordinate. This would also be the unit rate of this proportional relationship. The ratio of y to x is the same for each ordered pair. That is, $\frac{y}{x} = \frac{2}{4} = \frac{3}{6} = \frac{1}{2} = 0.5$

The equation of a line representing this proportional relationship of y to x is $y = \frac{1}{2}x$ or $y = 0.5x$.

- The slope of a line is a rate of change, a ratio describing the vertical change to the horizontal change of the line.

$$\text{slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{\text{vertical change}}{\text{horizontal change}}$$

Essential Knowledge and Skills

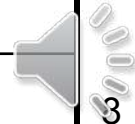
The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to

- Determine the slope, m , as rate of change in a proportional relationship between two quantities given a table of values or a verbal description, including those represented in a practical situation, and write an equation in the form $y = mx$ to represent the relationship. Slope will be limited to positive values (a)
- Graph a line representing a proportional relationship, between two quantities given an ordered pair on the line and the slope, m , as rate of change. Slope will be limited to positive values (b)
- Graph a line representing a proportional relationship between two quantities given the equation of the line in the form $y = mx$, where m represents the slope as rate of change. Slope will be limited to positive values (b)
- Determine the y -intercept, b , in an additive relationship between two quantities given a table of values or a verbal description, including those represented in a practical situation, and write an equation in the form $y = x + b$, $b \neq 0$, to represent the relationship (c)



Overview – Math 7

2009		2016	
Strand	# of Standards	# of Standards	Strand
Number and Number Sense	2	1	Number and Number Sense
Computation and Estimation	2	2	Computation and Estimation
Measurement	2	4	Measurement and Geometry
Geometry	2		
Probability and Statistics	3	2	Probability and Statistics
Patterns, Functions, and Algebra	5	4	Patterns, Functions, and Algebra
Total	16	13	Total

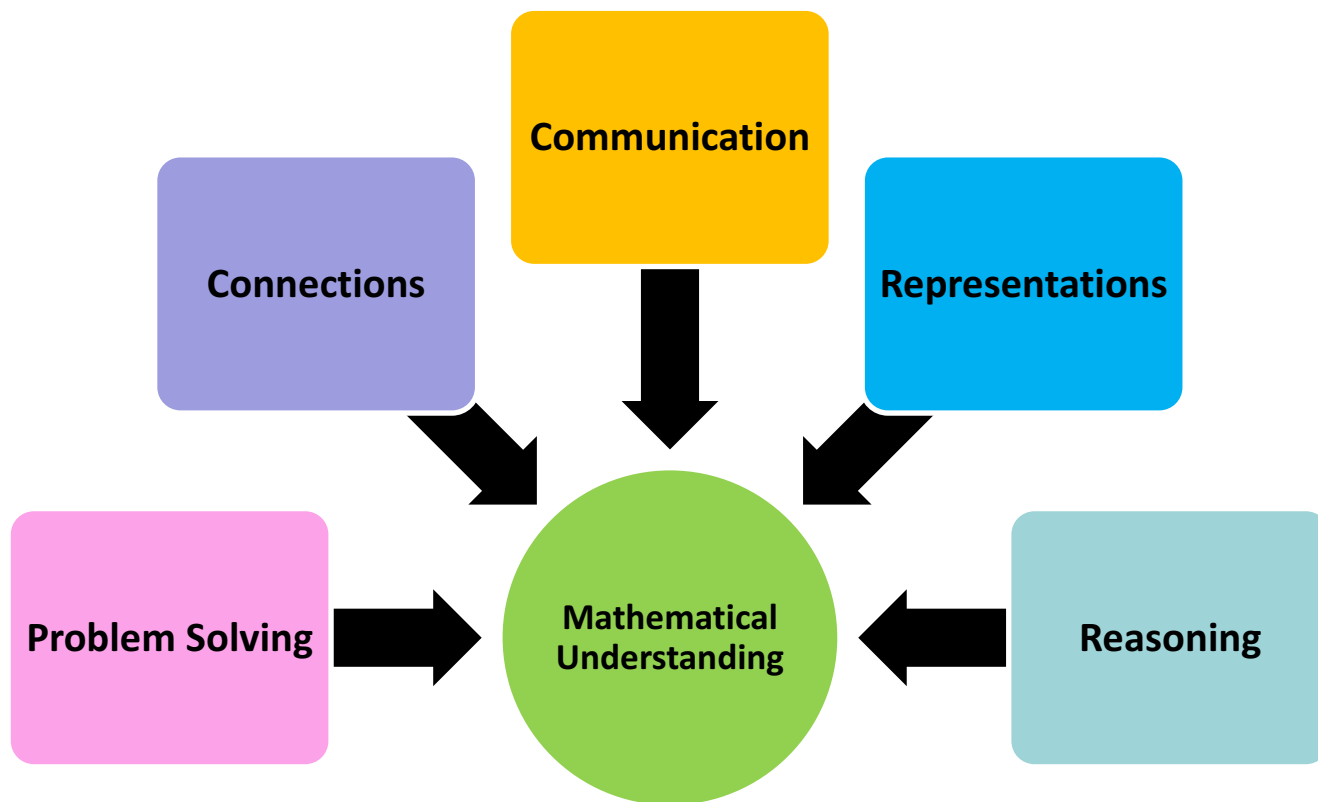




Mathematics Process Goals for Students

“The content of the mathematics standards is intended to support the five process goals for students”

- 2009 and 2016 *Mathematics Standards of Learning*





Standards of Learning Curriculum Frameworks

Introduction includes:

- Mathematical Process Goals for Students
- **Instructional Technology**
- **Computational Fluency**
- **Algebra Readiness**
- **Equity**





Grade 7– Crosswalk (Summary of Revisions): 2016 Mathematics Standards of Learning and Curriculum Framework

Additions (2016 SOL)	Deletions from Grade 7 (2009 SOL)
<ul style="list-style-type: none"> 7.1d EKS – identify the perfect squares from 0 to 400 7.2 – Solve practical problems involving operations with rational numbers 7.5 EKS – Determine unknown side lengths or angle measures, given two similar quadrilaterals or triangles; solve a proportion to find a missing side length of similar quadrilaterals and triangles 7.6b – Determine unknown side lengths or angle measures [EKS bullet moved from 6.13] of quadrilaterals, using properties of quadrilaterals 7.10 – Determine slope as rate of change and write an equations in $y = mx$ form to represent a proportional relationship; graph lines representing proportional relationships; determine the y-intercept and write equations of lines in $y = x + b$ form to represent the relationship; graph lines representing additive relationships; and make connections among representations (verbal descriptions, tables, equations, and graphs) 7.13 – Solve two-step inequalities and practical problems [Moved from 8.15b] 	<ul style="list-style-type: none"> 7.2 – Describe and represent arithmetic and geometric sequences using variable expressions [Included in AFDA.1 EKS and All.5] 7.3 – Model operations with integers [Moved to 6.6a EKS] and perform operations with integers [Moved to 6.6a] 7.5c – Describe how changing one attribute of a rectangular prism affects surface area and volume [Included in 8.6b] 7.6 – Determine whether two figures are similar [Included in G.7] 7.8 – Transform a figure using dilation [Included in 8.7] and rotation [Included in G.3] 7.10 – Determine the probability of compound events using the Fundamental Counting Principle [Moved to 5.15] 7.14a – Solve one-step linear equations in one variable and practical problems [Included in 6.14]
Parameter Changes/Clarifications (2016 SOL)	Moves within Grade 7 (2009 SOL TO 2016 SOL)
<ul style="list-style-type: none"> 7.1b EKS – Compare and order no more than four numbers written in scientific notation; convert between a number written in scientific notation and decimals 7.1c and 7.1c EKS – Compare and order rational numbers (positive/negative) expressed as integers, fractions (proper/improper), mixed numbers, decimals, and percents 7.3 EKS – Create and use a ratio table to determine missing values in a proportional relationship; apply proportional reasoning to convert units of measurement given the conversion factor [Moved from 6.9] 7.7 EKS – Transformations of a right triangle or rectangle can include both translation and then reflection over the x- or y-axis, or reflection over the x- or y-axis and then translation 7.8a – Determine theoretical and experimental probabilities explicitly included in standard 7.9a EKS – Number of data values to construct a histogram is no longer limited 7.9b – Observations/inferences about data represented in a histogram now in stan 7.9c – Compare histograms with the same data represented in other graphs now specified as line plots, circle graphs, and stem-and-leaf plots 7.11 EKS – Represent algebraic expressions using concrete materials and pictorial representations; evaluating expressions – limit exponents to 1, 2, 3, or 4; no braces, but can include brackets and absolute value; square roots limited to perfect squares 7.13 EKS – Solve one-step inequalities using multiplication and division; two-step inequalities using addition, subtraction, multiplication and division 7.11, 7.12, 7.13 EKS and US - apply properties of real numbers and properties of equality/inequality 	<ul style="list-style-type: none"> 7.4 – [Moved to 7.3] 7.5a, b – [Moved to 7.4a, b] 7.6 – [Moved to 7.5] 7.7 – [Moved to 7.6] 7.8 – [Moved to 7.7] 7.9 – [Moved to 7.8] 7.11 – [Moved to 7.9] 7.12 – [Included in 7.10e] 7.13a – Write verbal expressions and sentences as algebraic expressions and equations and vice versa [Included in 7.12 EKS] 7.13b – [Moved to 7.11] 7.14 – [Moved to 7.12] 7.15 – [Moved to 7.13] 7.16 – Properties of real numbers [Incorporated into 7.11, 7.12, and 7.13 EKS and US]

EKS = Essential Knowledge and Skills, referring to the column on the right side of the Curriculum Framework
 US = Understanding the Standard, referring to the column on the left side of the Curriculum Framework





2009 SOL	2016 SOL
Number and Number Sense *On the state assessment, items measuring this objective are assessed without the use of a calculator.	
7.1 The student will <ul style="list-style-type: none"> a) investigate and describe the concept of negative exponents for powers of ten; b) determine scientific notation for numbers greater than zero;* c) compare and order fractions, decimals, percents, and numbers written in scientific notation;* d) determine square roots;* and e) <u>identify</u> and describe absolute value for rational numbers. 	7.1 The student will <ul style="list-style-type: none"> a) investigate and describe the concept of negative exponents for powers of ten; b) compare and order numbers greater than zero written in scientific notation;* c) compare and order rational numbers;* d) determine square roots of perfect squares;* and e) <u>identify</u> and describe absolute value of rational numbers.
7.2 The student will describe and represent with arithmetic and geometric sequences, using variable expressions. <u>Included in AFDA.1 EKS and All.5</u>	
Computation and Estimation *On the state assessment, items measuring this objective are assessed without the use of a calculator.	
	7.2 The student will solve practical problems involving operations with rational numbers.
7.3 The student will <ul style="list-style-type: none"> a) model addition, subtraction, multiplication, and division of integers; and [Moved to 6.6a EKS] b) add, subtract, multiply, and divide integers. <u>[Moved to 6.6a]</u> 	
7.4 The student will solve single-step and multistep practical problems, using proportional reasoning.	7.3 The student will solve single-step and multistep practical problems, using proportional reasoning.
Measurement and Geometry	
7.5 The student will <ul style="list-style-type: none"> a) describe volume and surface area of cylinders; b) solve practical problems involving the volume and surface area of rectangular prisms and cylinders; and c) <u>describe</u> how changing one measured attribute of a rectangular prism affects its volume and surface area. [Included in 8.6b] 	7.4 The student will <ul style="list-style-type: none"> a) describe and determine the volume and surface area of rectangular prisms and cylinders; and b) <u>solve</u> problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.
7.6 The student will determine whether plane figures—quadrilaterals and triangles—are similar. <u>Included in G.7</u> and write proportions to express the relationships between corresponding sides of similar figures.	7.5 The student will solve problems, including practical problems, involving the relationship between corresponding sides and corresponding angles of similar quadrilaterals and triangles.





NUMBER AND NUMBER SENSE



2009 SOL	2016 SOL
<p>7.1 The student will</p> <ul style="list-style-type: none">a) investigate and describe the concept of negative exponents for powers of ten;b) determine scientific notation for numbers greater than zero;*c) compare and order fractions, decimals, percents, and numbers written in scientific notation;*d) determine square roots;* ande) identify and describe absolute value for rational numbers.	<p>7.1 The student will</p> <ul style="list-style-type: none">a) investigate and describe the concept of negative exponents for powers of ten;b) compare and order numbers greater than zero written in scientific notation;*c) compare and order rational numbers;*d) determine square roots of perfect squares;*ande) identify and describe absolute value of rational numbers.

Revisions:

- Compare and order no more than four numbers written in scientific notation; convert between a number written in scientific notation and decimals
- Compare and order rational numbers (positive/negative) expressed as integers, fractions (proper/improper), mixed numbers, decimals, and percents
- Determine the absolute value of a rational number

*On the state assessment, items measuring this objective are assessed without the use of a calculator.



2009 SOL	2016 SOL
7.2 The student will describe and represent arithmetic and geometric sequences, using variable expressions. [Included in AFDA.1 EKS and All.5]	


Revisions:

- Removed from Grade 7 and included in AFDA.1 EKS and All.5



COMPUTATION AND ESTIMATION



2009 SOL	2016 SOL
	7.2 The student will solve practical problems involving operations with rational numbers.

Revisions:

- Solve practical problems involving operations with rational numbers



2009 SOL	2016 SOL
<p>7.3 The student will</p> <p>a) model addition, subtraction, multiplication, and division of integers; and [Moved to 6.6a EKS]</p> <p>b) add, subtract, multiply, and divide integers.* [Moved to 6.6a]</p>	

Revisions:

- Removed from Grade 7 and included in SOL 6.6



2009 SOL	2016 SOL
7.4 The student will solve single-step and multistep practical problems, using proportional reasoning.	7.3 The student will solve single-step and multistep practical problems, using proportional reasoning.

Revisions:

- Create and use a ratio table to determine missing values in a proportional relationship
- Apply proportional reasoning to convert units of measurement given the conversion factor
[Moved from 6.9]



MEASUREMENT AND GEOMETRY



2009 SOL	2016 SOL
<p>7.5 The student will</p> <ul style="list-style-type: none">a) describe volume and surface area of cylinders;b) solve practical problems involving the volume and surface area of rectangular prisms and cylinders; andc) describe how changing one measured attribute of a rectangular prism affects its volume and surface area. [Included in 8.6b]	<p>7.4 The student will</p> <ul style="list-style-type: none">a) describe and determine the volume and surface area of rectangular prisms and cylinders; andb) solve problems, including practical problems, involving the volume and surface area of rectangular prisms and cylinders.

Revisions:

- 7.4a – Determine the volume and surface area of a rectangular prism **[Removed from Grade 6]** and cylinder
- 7.5c – Removed from Grade 7 and included in SOL 8.6



2009 SOL	2016 SOL
<p>7.6 The student will determine whether plane figures—quadrilaterals and triangles—are similar [Included in G.7] and write proportions to express the relationships between corresponding sides of similar figures.</p>	<p>7.5 The student will solve problems, including practical problems, involving the relationship between corresponding sides and corresponding angles of similar quadrilaterals and triangles.</p>

Revisions:

- Determine unknown side lengths or angle measures, given two similar quadrilaterals or triangles
- Solve a proportion to find a missing side length of similar quadrilaterals and triangles



2009 SOL	2016 SOL
<p>7.7 The student will compare and contrast the following quadrilaterals based on properties: parallelogram, rectangle, square, rhombus, and trapezoid.</p>	<p>7.6 The student will</p> <ul style="list-style-type: none">a) compare and contrast quadrilaterals based on their properties; andb) determine unknown side lengths or angle measures of quadrilaterals

Revisions:

- Properties of quadrilaterals were removed from grade 6
- Determine unknown side lengths or angle measures of quadrilaterals, using properties of quadrilaterals



2009 SOL	2016 SOL
7.8 The student, given a polygon in the coordinate plane, will represent transformations (reflections, dilations [Included in 8.7a and G.3] , rotations [Included in G.3] , and translations) by graphing in the coordinate plane.	7.7 The student will apply translations and reflections of right triangles or rectangles in the coordinate plane.

Revisions:

- Removed from Grade 7 - Transform a figure using dilation **[Included in 8.7]** and rotation **[Included in G.3]**
- Transformations of a right triangle or rectangle can include both translation and then reflection over the x- or y-axis, or reflection over the x- or y-axis and then translation



PROBABILITY AND STATISTICS



2009 SOL	2016 SOL
7.9 The student will investigate and describe the difference between the experimental probability and theoretical probability of an event.	7.8 The student will <ol style="list-style-type: none">determine the theoretical and experimental probabilities of an event; andinvestigate and describe the difference between the experimental probability and theoretical probability of an event

Revisions:

- **7.8a -Determine the theoretical and experimental probabilities of an event**



2009 SOL	2016 SOL
7.10 The student will determine the probability of compound events, using the Fundamental (Basic) Counting Principle. [Moved to 5.15]	

Revisions:

- Removed from Grade 7 and included in SOL 5.15



2009 SOL	2016 SOL
<p>7.11 The student, given data for a practical situation, will</p> <ul style="list-style-type: none">a) construct and analyze histograms; andb) compare and contrast histograms with other types of graphs presenting information from the same data set.	<p>7.9 The student, given data in a practical situation, will</p> <ul style="list-style-type: none">a) represent data in a histogram;b) make observations and inferences about data represented in a histogram; andc) compare histograms with the same data represented in stem-and-leaf plots, line plots, and circle graphs.

Revisions:

- Number of data values to construct a histogram is no longer limited
- Observations/inferences about data represented in a histogram now part of the standard itself
- Compare histograms with the same data represented in other graphs now specified as line plots, circle graphs, and stem-and-leaf plots



PATTERNS, FUNCTIONS, AND ALGEBRA



Example (using slope triangles): Cecil walks 2 meters every second. If x represents the number of seconds and y represents the number of meters he walks, this proportional relationship can be represented graphically using slope triangles.

tables, graphs, rules, and words. Included in

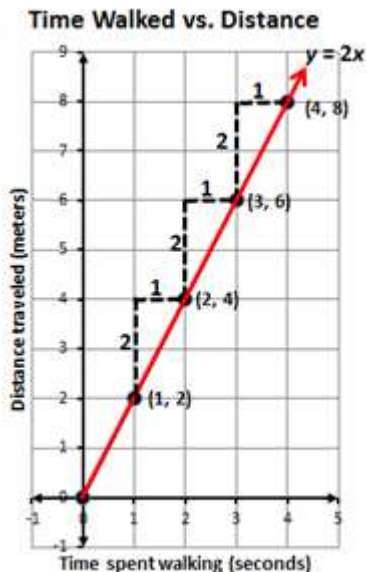
The slope of a proportional

Example: The ordered pair is a point on a proportional relationship. Write an equation of the line passing through the origin and this point.

x	y
4	2
6	3

The slope, or rate of change, of this pair. That is,

The equation of a line representing



by finding the unit rate.

that could be included on the graph of a proportional relationship.

5 since the y -coordinate of each ordered pair is twice the x -coordinate. This would also be the unit rate of y to x is the same for each ordered pair.

relationship of y to x is $y = \frac{1}{2}x$ or $y = 0.5x$.

a rate of change in a proportional relationship between two quantities given an equation in the form $y = mx$.

proportional quantities given a pair, or given the rate of change;

Revisions:

- 7.10a - Determine slope as rate of change and write an equations in $y = mx$ form to represent a proportional relationship
- 7.10b - Graph lines representing proportional relationships given the slope and an ordered pair or the equation $y = mx$
- Examples added in the US



2009 SOL

2016 SOL

Example: Graph the equation $y = x - 1$.

In order to graph the equation, we can create a table of values by substituting arbitrary values for x to determine coordinating values for y :

x	x - 1	y
-1	(-1) - 1	-2
0	(0) - 1	-1
1	(1) - 1	0
2	(2) - 1	1

These values can then be plotted as the points (-1, -2), (0, -1), (1, 0), and (2, 1) on a graph.

c) determine the y-intercept, b , in an additive relationship between two quantities and write the equation in the form $y = mx + b$ to represent the relationship. The y-intercept is the value of b in the equation in the form $y = mx + b$.

e) make connections between and among representations of a proportional or additive relationship between two quantities using verbal descriptions, tables, equations, and graphs.

Revisions:

- 7.10c - Determine the y-intercept and write equations of lines in $y = x + b$ form to represent the relationship
- 7.10d - Graph lines representing additive relationships; y-intercept limited to integers and slope is 1
- 7.10e - Make connections among representations (verbal descriptions, tables, equations, and graphs)





2009 SOL	2016 SOL
<p>7.13 The student will</p> <ul style="list-style-type: none">a) write verbal expressions as algebraic expressions and sentences as equations and vice versa; and [Included in 7.12 EKS]b) evaluate algebraic expressions for given replacement values of the variables.	<p>7.11 The student will evaluate algebraic expressions for given replacement values of the variables.</p>

Revisions:

- Represent algebraic expressions using concrete materials and pictorial representations;
- Evaluating expressions – limit exponents to 1, 2, 3, or 4; no braces, but can include brackets and absolute value; square roots limited to perfect squares



2009 SOL	2016 SOL
<p>7.14 The student will</p> <ul style="list-style-type: none">a) solve one- and two-step linear equations in one variable; andb) solve practical problems requiring the solution of one- and two-step linear equations. <p>[One-step equations included in 6.13]</p>	<p>7.12 The student will solve two-step linear equations in one variable, including practical problems that require the solution of a two-step linear equation in one variable.</p>

Revisions:

- One-step equations are included in 6.13
- Coefficients and numeric terms will be rational
- Apply properties of real numbers and properties of equality
- EKS – Write verbal expressions and sentences as algebraic expressions and equations and vice versa **[Moved from 7.13a]**



2009 SOL	2016 SOL
<p>7.15 The student will</p> <ul style="list-style-type: none">a) solve one-step inequalities in one variable; andb) graph solutions to inequalities on the number line.	<p>7.13 The student will solve one- and two-step linear inequalities in one variable, including practical problems, involving addition, subtraction, multiplication, and division, and graph the solution on a number line.</p>

Revisions:

- Solve two-step inequalities and practical problems **[Moved from 8.15b]**
- Solve one-step and two-step inequalities involving addition, subtraction, multiplication and division including practical problems
- Coefficients and numeric terms will be rational
- EKS – Write verbal expressions and sentences as algebraic expressions and inequalities and vice versa
- EKS – Identify a numerical value that is part of the solution set of a given inequality
- Apply properties of real numbers and properties of equality/inequality



2009 SOL	2016 SOL
<p>7.16 The student will apply the following properties of operations with real numbers:</p> <ul style="list-style-type: none">a) the commutative and associative properties for addition and multiplication;b) the distributive property;c) the additive and multiplicative identity properties;d) the additive and multiplicative inverse properties; ande) the multiplicative property of zero. <p>[Included in EKS and US for 7.11, 7.12, and 7.13]</p>	

Revisions:

- Moved to 7.11, 7.12 and 7.13 Understanding the Standard
- The focus is not to identify a specific property being used, but correctly apply the properties.



Middle School Revisions Leading to Algebra I

	Grade 6	Grade 7	Grade 8
Proportional Relationships; slope; linear functions	Represent proportional relationships; unit rates; ratio tables; determine if a proportional relationship exists; and make connections between and among representations	Slope as rate of change; write an equation in $y = mx$ form to represent a proportional relationship and $y = x + b$ form to represent an additive relationship and graphs their lines; make connections between and among representations	Slope of a line given a graph; slope and y -intercept of a linear function and graph using $y = mx + b$ form; make connections between and among representations
Linear equations in one variable	Solve one-step equations and within practical problems	Solve two-step equations, including practical problems	Solve multi-step equations (includes variables on both sides), including practical problems
Linear Inequalities in one variable	Represent practical situations with inequalities; solve one-step inequalities using addition/subtraction and graph solution on a number line	Solve one- and two-step inequalities (all operations) including practical problems; graph solution on a number line	Solve multistep inequalities with variable on one or both sides of the inequality, including practical problems, and graph solution on a number line



Questions?
Please contact us!

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