Richmond Public Schools
Department of Curriculum and Instruction
Curriculum Pacing and Resource Guide

Course Title/ Course #: 06 Honors Mathematics

Start day: 1

Meetings: 180 days

Course Description

The sixth-grade standards are a transition from the emphasis placed on whole number arithmetic in the elementary grades to foundations of algebra. The standards emphasize rational numbers. Students will use ratios to compare data sets; recognize decimals, fractions, and percents as ratios; solve single-step and multistep problems, using rational numbers; and gain a foundation in the understanding of integers. Students will solve linear equations and use algebraic terminology. Students will solve problems involving area, perimeter, and surface area, work with π (pi), and focus on the relationships among the properties of quadrilaterals. In addition, students will focus on applications of probability and statistics.

While learning mathematics, students will be actively engaged, using concrete materials and appropriate technology such as calculators, computers, and spreadsheets.

Pacing Resources Assessments MP1

Time Frame (days)	Standards of Learning	Units/ Topics/ Concepts	Resources	Assessments
4	Assessments/ Review	**Pre-Test**	**NWEA-MAP**	
4	6.19 a-c	Properties	**Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 289 - 293 Extra Practice page –EP 13 Lesson 5-2 Coach book, 6th Grade Virginia Gold Edition	RPS Common Powerschool Assessment Formative Assessment

			page(s) 244 – 248 **Technology** Gizmo – Chocomatic - interactive instructional resource http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&ResourceID=1014 Smart Exchange - interactive skill practice Properties of Numbers [SMART Notebook lesson] **Virginia Department of Education** SOL 6.19, 7.16c,d,e – lesson plan page 14 Pick and Choose – lesson plan	Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
9	6.18 *6.13 2016*	One-step Linear Equations	6.18 The student will solve one-step linear equations in one variable involving whole number coefficients and positive rational solutions. *(2016-6.13) The student will solve one-step linear equations in one variable, including practical problems that require the solution of a one-step linear equation in one variable.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 314 – 317 (addition and subtraction), 322 – 326 (models), 335 – 338 (multiplication), 339 -343(division) Extra Practice page –EP 14 - 16 Lessons 6-1 and 6-2 Coach book, 6th Grade Virginia Gold Edition page(s) – 238 – 243 Mulligan Math in Minutes 6.18 **Technology** Brain Pop – Equations with Variables - interactive skill practice https://www.brainpop.com/math/algebra/ Gizmo – Modeling One-step Equations - interactive instructional resource http://www.explorelearning.com/index.cfm?method=cResource.dspDetail&resourceid=109 Smart Exchange - interactive skill practice Solving One-Step Equations [SMART Notebook lesson]	RPS Common Powerschool Assessment Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill Page(s) 356 – 357 Formative Assessment Flash Answers Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Equations [SMART Notebook lesson] **Virginia Department of Education** Balanced – lesson plan Equation Vocabulary - lesson plan SOL 6.18, 7.14- lesson plan page 65 **Other Sites** Study Jams –Add and Subtract Study Jams – Multiply and Divide	
11	6.3 a-c & *6.6ab* *(2016)*	Integers and Absolute Value	6.3 The student will a) identify and represent integers; b) order and compare integers; and c) identify and describe absolute value of integers. *(2016-6.6ab) The student will* *a) add, subtract, multiply, and divide integers* *b) solve practical problems involving operations with integers;* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 408 – 412 and pages 765 – 768 (additional lessons if needed) Extra Practice page –EP19 Lesson 7-3 part a & b Coach book, 6th Grade Virginia Gold Edition 6.3a - page(s) 33 – 39 6.3b – page(s) 40 – 44 6.3c – page(s) 45 – 50 *Virginia Math Connects, Course 2, ©2012, Price, et al, McGraw-Hill School Education Group 1* *Integer Operations: page(s) 86 – 113;* *Virginia SOL Coach, New Gold Edition, Mathematics, Grade 7* *Add and Subtract Integers, page(s) 54 – 59* *Multiply and Divide Integers, page(s) 60 – 65* *Order of Operations, page(s) 66 – 70*	RPS Common Powerschool Assessment Formative Assessment Whip Around Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Mulligan Math in Minutes 6.3 *Mulligan Math in Minutes 7.3* **Interactive Reading and Note taking SOL 6.3** ***Interactive Reading and Note taking SOL 7.3*** **Technology** Gizmo – Integers, Opposites, and Absolute Value – interactive instructional resource *Gizmo Lessons* *7.3a -Adding and Subtracting Integers* *7.3a - Adding and Subtracting Integers with Chips* *7.3b – Order of Operations* Brain Pop – Absolute Value - - interactive skill practice *BrainPop* *Adding and Subtracting Integers* *Order of Operations* Smart Exchange - interactive skill practice Introducing Integers [SMART Notebook lesson] Introduction to Integers [SMART Notebook lesson] Understanding Integers [SMART Notebook lesson] **Virginia Department of Education** Working With Integers Ground Zero *Adding and Subtracting Integers* *Multiplying and Dividing Integers* **Other Sites** Interactive sites weebly – Number lines ***Lesson Plans and Activities:*** ● *Integer Operations* ● *Integer Operations*	

			• *Integer Football* • *Order of Operations* • *Integer Operations* ***Teacher Led Instructional Videos:*** • *Subtracting Integers using Counters* ***Khan Academy Videos:*** • *Subtracting Negative Numbers* • *Order of Operation* • *Multiplying and Dividing Integers* ***Interactive Skills Practice and Interactive Instructional Resource:*** • *Adding Integers on a Number Line* • *Adding and Subtracting Integers on a number line* • *Integer* • *Order of Operation* • *Integers Mixed Operation* • *Order of Operations with Integers* • *Order of Operations*	
5	6.20 *6.14 (2016)*	Graphing Inequalities	6.20 The student will graph inequalities on a number line. *(2016- 6.14) The student will* *a. represent a practical situation with a linear inequality in one variable; and* *b. solve one-step linear inequalities in one variable, involving addition or subtraction, and graph the solution on a number line.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) – 387 – *395, 396-401 (Solving one-step inequalities)* Extra Practice page –EP18 Lesson 7-2	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Coach book, 6th Grade Virginia Gold Edition page(s) 249 – 255 **Technology** Smart Exchange (use slides 1-8) - interactive skill practice Graphing Inequalities [SMART Notebook Math Tools lesson] Brain Pop – Inequalities – interactive skill practice **Virginia Department of Education** Give or Take a Few – lesson plan	
7 6.8 *Items measuring these SOL will be completed without the use of a calculator.	6.5 / 6.8* *6.6c (2016)*	Positive Exponents, Perfect Squares, and Order of Operations	6.5 The student will investigate and describe concepts of positive exponents and perfect squares. 6.8 The student will evaluate whole number numerical expressions, using the order of operations.* [Combined with 6.6] *(2016-6.6c) simplify numerical expressions involving integer.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 62 – 65 (exponents and perfect squares) page(s) 270 – 273 (Order of Operations) Extra Practice page –EP3 Lesson 1-3 / EP12 Lesson 5-1 Coach book, 6th Grade Virginia Gold Edition 6.5 – page(s) 51 – 56 6.8 – page(s) 104 – 109 Mulligan Math in Minutes 6.5 and 6.8 **Technology** Gizmo – Square Roots - interactive instructional resource Flocabulary – Order of Operations Brain Pop – Order of Operations - interactive skill practice Smart Exchange - interactive skill practice Squares and Square Roots [SMART Notebook lesson] Equations: Which Order? (Question set) [SMART Response question set] Math Exponents [SMART Notebook lesson] **Virginia Department of Education**	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Build a Square – lesson plan Order of Operation - lesson plan Math Strategies – Instructional video SOL 6.5 – lesson plan SOL 6.8 – lesson plan **Other Sites** http://www.crctlessons.com/Perfect-Squares/perfect-squares-game.html http://studyjams.scholastic.com/studyjams/jams/math/algebra/aorder-of-operations.htm http://studyjams.scholastic.com/studyjams/jams/math/problem-solving/psorder-of-operations.htm http://www.quia.com/rr/116044.html	
4	Review 6.19, 6.18/*6.13*, 6.3a-c & *6.6ab*, 6.20/*6.14ab*, 6.5, 6.8/*6.6c*		**End of Nine Weeks Review**	VDOE - Performance Analysis RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Kahoot.it

Pacing Resources Assessments MP2				
Time Frame (days)	**Standards of Learning**	**Units/ Topics/ Concepts**	**Resources**	**Assessments**
8	6.1	Ratios	6.1 The student will describe and compare data, using ratios, and will use appropriate notations, such as a/b , a to b, and a:b. **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 150 – 155 and 173 - 177 Extra Practice page –EP 7 – 8 Lessons 3-1 and 3-3 Coach book, 6th Grade Virginia Gold Edition page(s) – 20 - 25 Mulligan Math in Minutes 6.1 **Technology** Brain Pop – Ratios - interactive skill practice Gizmo – Part to Part and Part to Whole Ratios - interactive instructional resource Smart Exchange - interactive skill practice Ratio [SMART Notebook lesson] **Virginia Department of Education** SOL 6.1 – Lesson Plan, page 2 Teaching Ratios – Instructional video Field Goals, Balls, and Nets - Lesson plan **Other Sites** Study Jams – Ratio – Instructional review	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
6	6.2 a-d	Fractions, Decimals, and Percents	6.2 The student will a) investigate and describe fractions, decimals, and percents as ratios; [Moved to 6.2 EKS]	RPS Common Powerschool Assessment

6.2c,d* *Items measuring these SOL will be completed without the use of a calculator.	&		b) identify a given fraction, decimal, or percent from a representation; [Included in 6.2a] c) demonstrate equivalent relationships among fractions, decimals, and percents;* and [Included in 6.2a] d) compare and order fractions, decimals, and percents.* [Included in 6.2b] **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 210 -213 (Percents as Fractions) 214 – 217 (Fractions as Percents) 218 – 221 (Percents and Decimals) 227 – 241 (Compare and Order Fractions, Decimals, and Percents) Extra Practice page –EP 9 – 11 Lessons 4-1, 4-2, and 4-3 Coach book, 6th Grade Virginia Gold Edition 6.2a – page(s) 20 – 25 (also includes ratios) 6.2b and 6.2c 12 - 19 6.2d - page(s) 26 – 32 **Technology** Smart Exchange - interactive skill practice Fractions, Decimals, and Percents [SMART Notebook lesson] Percent Jeopardy Game [SMART Notebook lesson] Gizmo – Part, Part, Whole - interactive instructional resource Gizmo – Fraction, Decimal, Percent - interactive instructional resource Brain Pop – Converting fractions and decimals - interactive skill practice **Virginia Department of Education** Rational Speed Matching – lesson plan SOL 6.2 a –c – lesson plan SOL 6.2a, 7.4 - lesson plan SOL 5.2b, 6.2d, 7.1c, 8.1b - lesson plan **Other Sites** http://studyjams.scholastic.com/studyjams/jams/math/decimals-	Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it6.6 a-b

			percents/decimal-fraction-percent-equivs.htm Interactivesites weebly - Fractions	
10 6.6a *Items measuring these SOL will be completed without the use of a calculator.	6.4 / 6.6 6.5 (2016)	Models for Multiplication and Division of Fractions Computation of Fractions	**6.4 The student will demonstrate multiple representations of multiplication and division of fractions. [Moved to 6.5 EKS]** **6.6 The student will** **a) multiply and divide fractions and mixed numbers;* and** **b) estimate solutions and then solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions.** *(2016-6.5) The student will* *a) multiply and divide fractions and mixed numbers;** *b) solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions and mixed numbers; and* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 96 -101 and 104 - 115 -Multiplication page(s) 117 – 133– Division Extra Practice page –EP5 - 7 Lessons 2-1, 2-2, and 2-3 Coach book, 6th Grade Virginia Gold Edition 6.4 and 6.6a – page(s) 69 – 75 (multiplication) 76 – 82 (division) 6.6b – page(s) 62 – 68 and 83 – 89 **Technology** Smart Exchange - interactive skill practice Introduction to Multiplying Mixed Numbers [SMART Notebook lesson] Multiplication of Fractions [SMART Notebook lesson] Dividing fractions [SMART Notebook lesson] Compass- Dividing Fractions and Mixed Numbers - interactive skill practice Gizmos – Dividing Fractions - interactive instructional resource Gizmos –Multiplying Fractions - interactive instructional resource	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Gizmos – Dividing Mixed Numbers - interactive instructional resource Gizmos – Multiplying Mixed Numbers - interactive instructional resource Brain Pop – Multiplying and Dividing Fractions - interactive skill practice **Virginia Department of Education** Modeling Multiplication of Fractions - lesson plan Modeling Division of Fractions – lesson plan **Other Sites** Interactivesites weebly - Fractions	
7	6.16 a-b	Probability	**Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) – 702 -712 Extra Practice page –EP 33-34 Lessons 12-1 and 12-2 Coach book, 6th Grade Virginia Gold Edition page(s) 217 – 223 **Technology** Smart Exchange - interactive skill practice Probability [SMART Notebook lesson] Possible Outcomes [SMART Notebook lesson] Gizmos – Spin the Big Wheel - interactive instructional resource Brain Pop – Independent and Dependent - interactive skill practice **Virginia Department of Education** It Could Happen – lesson plan SOL 5.14, 6.16a,b – lesson plan **Other Sites** Interactivesites weebly - Probability	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
6	6.7 6.5c (2016)	Computation of Decimals	6.7 The student will solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of decimals. [Moved to 6.5c] *(2016-6.5) The student will* *c) solve multistep practical problems involving addition, subtraction, multiplication, and division of decimals. [Moved from 6.7]* **Text**	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL

			Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill Multiplication - page(s) 32 – 41 Division- page(s) 47 – 60 Addition and Subtraction page(s) 7 -9 and 562 Extra Practice page –EP2-3 Lessons 1-1 and 1-2 Coach book, 6th Grade Virginia Gold Edition page(s) 90 – 95 (addition and subtraction) page(s) 96 – 103 (multiplication and division) **Technology** Gizmos – Sums and Differences with Decimals - interactive instructional resource Brain Pop – Multiplying Decimals – interactive skills practice **Virginia Department of Education** Practical Problems Involving Decimals – lesson plan SOL 5.5b, 6.7, 8.3a - lesson plan **Other Sites** Interactivesites weebly - Decimals	Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
4	Review		**End of Nine Weeks Review**	VDOE - Performance Analysis RPS Common Powerschool Assessment Allen Teachers

Course Title/ Course #: Grade 6 Mathematics

Pacing Resources Assessments MP3

Time Frame	Standards of Learning	Units/ Topics/ Concepts	Resources	Assessments
10	6.10 a-d & *6.7 (2016)*	Circumference, Area, Perimeter, Volume, and Surface Area	6.10 The student will a) define π (pi) as the ratio of the circumference of a circle to its diameter; b) solve practical problems involving circumference and area of a circle, given the diameter or radius; c) solve practical problems involving area and perimeter; and d) describe and determine the volume and surface area of a rectangular prism. [Included in 7.4a] *(2016-6.7) The student will* *a) derive π (pi);* *b) solve problems, including practical problems, involving circumference and area of a circle; and* *c) solve problems, including practical problems, involving area and perimeter of triangles and rectangles.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill Circumference – page(s) 507 - 512 Area - page(s) 495 – 500 (triangles) 513 – 518 (circles) Perimeter – page(s) 520 – 524 Volume – page(s) 534 – 540 Surface Area – page(s) 541 – 547 Extra Practice page –EP 24 -27 Lessons 9-1, 9-2, 9-3, and 9-4 Coach book, 6th Grade Virginia Gold Edition 6.10a - page(s) 121 – 126 6.10b - page(s) 127 – 131 6.10c – page(s) 132 – 138 6.10d – page(s) 139 - 150	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			Technology Smart Exchange - interactive skill practice Circumference [SMART Notebook lesson] The Area of Circles [SMART Notebook lesson] Volume of Rectangular Prisms [SMART Notebook lesson] Gizmos – Circumference and Area of Circles - interactive instructional resource Gizmos – Balancing Blocks - interactive instructional resource Gizmos – Finding Fido's Flower Bed - interactive instructional resource Brain Pop – Pi – interactive skills practice **Virginia Department of Education** Going the Distance – lesson plan SOL 6.10 a,b – lesson plan page 10-21 Out of the Box – lesson plan SOL 6.10d, 7.5a – lesson plan page 13 -52 **Other Sites** Interactivesites weebly - Circles Interactivesites weebly – Area and Perimeter	
6	6.14 a-c & 6.10 a-c (2016)	Circle Graphs	6.14 The student, given a problem situation, will a) construct circle graphs; b) draw conclusions and make predictions, using circle graphs; and c) compare and contrast graphs that present information from the same data set. *(2016-6.10) The student, given a practical situation, will* *a) represent data in a circle graph;* *b) make observations and inferences about data represented in a circle graph; and* *c) compare circle graphs with the same data represented in bar graphs, pictographs, and line plots.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) – 644 -650 and 651 – 655 Extra Practice page –EP31-32 Lessons 11-3 and 11-4 Coach book, 6th Grade Virginia Gold Edition	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

			6.14a and 6.14b - page(s) 182 - 188 6.14c – page(s) 202 – 208 **Technology** Smart Exchange - interactive skill practice Graphs, Charts, and Analysis of Data Part 1 [SMART Notebook lesson] Brain Pop – Circles - interactive skill practice **Virginia Department of Education** May I Have Fries with That? – lesson plan SOL 6.14a – lesson plan page 49 -59 **Other Sites** Interactivesites weebly – Graphing	
5	6.17	Geometric and Arithmetic Sequences	6.17 The student will identify and extend geometric and arithmetic sequences. **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) – 378 – 383 Extra Practice page –EP 16-17 Lesson 7-1 Coach book, 6th Grade Virginia Gold Edition page(s) 230 – 237 **Virginia Department of Education** Growing Patterns and Sequences – lesson plan SOL 6.17 - lesson plan page 32 -37 **Other Sites** Interactivesites weebly - Patterns	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
5	6.15 a-b & 6.11 (2011)	Balance Point and Measure of Center	6.15 The student will a) describe mean as balance point; and b) decide which measure of center is appropriate for a given purpose. *(2016-6.11) The student will* *a) represent the mean of a data set graphically as the balance point; and* *b) determine the effect on measures of center when a single value of a data set is added, removed, or changed. [Moved from 5.16 EKS]*	RPS Common Powerschool Assessment Mulligan Check Point Comprehension

			Text Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 613 – 618 (mean) page(s) 620 – 624 (median, mode, and range) page(s) 627 – 630 (appropriate measures) Extra Practice page –EP30 Lesson 11-1 Coach book, 6th Grade Virginia Gold Edition page(s) 209 – 216 **Technology** Smart Exchange - interactive skill practice Measures of Central Tendency [SMART Notebook lesson] Graphs, Charts, and Analysis of Data Part 2 [SMART Notebook lesson] Discovering the Mean [SMART Notebook lesson] Gizmo – Mean, Median, Mode - interactive instructional resource Gizmo – Reaction Time - interactive instructional resource Brain Pop – Mean, Median, Mode – interactive skill practice **Virginia Department of Education** Balancing Act – lesson plan **Other Sites** Interactivesites weebly – Mean, Median, and Mode	questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
6	6.11 a-b 6.8 (2016)	Coordinate Plane and Ordered Pairs	**6.11 The student will** **a) identify the coordinates of a point in a coordinate plane; and [Included in 6.8b]** **b) graph ordered pairs in a coordinate plane.** *(2016-6.8) The student will* *a) identify the components of the coordinate plane; and [Moved from 6.11 EKS bullet]* *b) identify the coordinates of a point and graph ordered pairs in a coordinate plane.* **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill	RPS Common Powerschool Assessment Mulligan Check Point Formative Assessment Response Cards Comprehension questions SOL

			page(s) 413 – 417 and pages 750 and 769-770 (additional lessons if needed) Extra Practice page –EP19 Lesson 7-3 part c Coach book, 6th Grade Virginia Gold Edition 6.11a-b – page(s) 156 – 161 Mulligan Math in Minutes 6.11 **Technology** Gizmo – Coordinates - interactive instructional resource Flocabulary – The Coordinate Plane - instructional video Compass – Finding Points on a Coordinate Plane - interactive skill practice Smart Exchange - interactive skill practice Coordinate Plane [SMART Notebook lesson] Brain Pop – Coordinate Plane – interactive skill practice **Virginia Department of Education** What's the Point? 6.11 Coordinate Plane – pages 49-53 **Other Sites** http://www.mathplayground.com/locate_aliens.html http://www.math-play.com/Coordinate-Plane-Jeopardy/Coordinate-Plane-Jeopardy.html http://studyjams.scholastic.com/studyjams/jams/math/algebra/ordered-pairs.htm http://www.math-play.com/Algebra-Math-Games.html http://hotmath.com/hotmath_help/games/ctf/ctf_hotmath.swf Interactivesites weebly – Coordinates	Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
4	6.13	Quadrilaterals	6.13 The student will describe and identify properties of quadrilaterals. [Included in 7.6] **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 456 – 461 Extra Practice page –EP22 Lesson 8-3 Coach book, 6th Grade Virginia Gold Edition page(s) 169 – 175	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL

			Technology Smart Exchange - interactive skill practice Polygons and Pattern Blocks [SMART Notebook lesson] Quadrilaterals [SMART Notebook lesson] Gizmos – Classifying Quadrilaterals - interactive instructional resource **Virginia Department of Education** Exploring Quadrilaterals – lesson plan SOL 6.13, 7.7 – lesson plan page 74 -91	Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
3	6.12	Congruence of Segments, Angles, and Polygons	6.12 The student will determine congruence of segments, angles, and polygons. (2016-6.9) The student will determine congruence of segments, angles, and polygons. **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 429 – 433 and 462 -473 Extra Practice page –EP20 -23 Lessons 8-1, 8-2, and 8-3 Coach book, 6th Grade Virginia Gold Edition page(s) 162 – 168 **Technology** http://www.harcourtschool.com/activity/similar_congruent/ Smart Exchange - interactive skill practice Similarity and Congruence [SMART Notebook lesson] - - interactive skill practice Congruent and Symmetric Polygons [SMART Notebook lesson] - interactive skill practice Polygons [SMART Notebook lesson] - - interactive skill practice Brain Pop – Polygons – interactive skill practice **Virginia Department of Education** SOL 6.12, 7.6 – lesson plan pages 33- 73 Side to Side – lesson plan **Other Sites** Student Jams – Congruent Figures Interactivesites weebly - Angles Interactivesites weebly – Classify and Sort	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it

3	Review	6.10/6.7, 6.14a-c/6.10a-c, 6.17, 6.15ab/6.11ab, 6.11ab/6.8ab, 6.13, 6.12/6.9	**Nine Weeks Review**	VDOE – Released Test VDOE - Performance Analysis RPS Common Powerschool Assessment

Pacing Resources Assessments MP4				
Time Frame	**Standards of Learning**	**Units/ Topics/ Concepts**	**Resources**	**Assessments**
4	6.9	Ballpark Comparisons between U.S. Customary and Metric Measurement	6.9 The student will make ballpark comparisons between measurements in the U.S. Customary System of measurement and measurements in the metric system. [Included in 7.3 EKS] **Text** Virginia Math Connects, Course 1, ©2012, Glencoe/McGraw-Hill page(s) 594 -599 Coach book, 6th Grade Virginia Gold Edition page(s) 116 – 120 **Technology** Brain Pop – Metric vs. Customary – interactive skill practice **Virginia Department of Education** Measuring Mania - lesson plan SOL 5.8d, 6.9 – lesson plan **Other Sites** Interactivesites weebly – Measurement (Review of basic measurements within the same system)	RPS Common Powerschool Assessment Mulligan Check Point Comprehension questions SOL Released Items Exit Tickets Venn Diagrams Graphic Organizers Plickers Kahoot.it
	Review all Objectives	SOL Preparation	**Text** Coach book, 6th Grade Virginia Gold Edition 6.1, 6.2, 6.3, and 6.5 – page(s) 57 – 60 6.4, 6.6, 6.7, and 6.8 – page(s) 110 – 113 6.9 and 6.10 - page(s) 151 – 154 6.11, 6.12, and 6.13 – page(s) 177 – 179 6.14, 6.15, and 6.16 – page(s) 224 – 228 6.17, 6.18, 6.19, and 6.20 – page(s) 256 - 259 **Technology** **http://www.doe.virginia.gov/testing/sol/released_tests/index.shtml**	VDOE – Released Test VDOE - Performance Analysis Interactive Achievement Post Assessments - ARDT Post Test,

			http://education.jlab.org/solquiz/ **Virginia Department of Education** **http://www.doe.virginia.gov/testing/sol/released_tests/index.shtml** http://doe.virginia.gov/testing/sol/practice_items/ http://doe.virginia.gov/testing/test_administration/cat/index.shtml (CAT Training Test) **Other Sites** http://va.testnav.com/va (ARDT)	NWEA (MAPS) (if required)

Virginia Department of Education
P.O. Box 2120
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http://www.doe.virginia.gov

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NOTICE
The Virginia Department of Education does not unlawfully discriminate on the basis of race, color, sex, national origin, age, or disability in employment or in its educational programs or services.

The 2009 *Mathematics Curriculum Framework* can be found in PDF and Microsoft Word file formats on the Virginia Department of Education's Web site at http://www.doe.virginia.gov.

Virginia *Mathematics Standards of Learning* Curriculum Framework 2009
Introduction

The 2009 *Mathematics Standards of Learning* Curriculum Framework is a companion document to the 2009 *Mathematics Standards of Learning* and amplifies the *Mathematics Standards of Learning* by defining the content knowledge, skills, and understandings that are measured by the Standards of Learning assessments. The Curriculum Framework provides additional guidance to school divisions and their teachers as they develop an instructional program appropriate for their students. It assists teachers in their lesson planning by identifying essential understandings, defining essential content knowledge, and describing the intellectual skills students need to use. This supplemental framework delineates in greater specificity the content that all teachers should teach and all students should learn.

Each topic in the *Mathematics Standards of Learning* Curriculum Framework is developed around the Standards of Learning. The format of the Curriculum Framework facilitates teacher planning by identifying the key concepts, knowledge and skills that should be the focus of instruction for each standard. The Curriculum Framework is divided into three columns: Understanding the Standard; Essential Understandings; and Essential Knowledge and Skills. The purpose of each column is explained below.

Understanding the Standard
This section includes background information for the teacher (K-8). It contains content that may extend the teachers' knowledge of the standard beyond the current grade level. This section may also contain suggestions and resources that will help teachers plan lessons focusing on the standard.

Essential Understandings
This section delineates the key concepts, ideas and mathematical relationships that all students should grasp to demonstrate an understanding of the Standards of Learning. In Grades 6-8, these essential understandings are presented as questions to facilitate teacher planning.

Essential Knowledge and Skills
Each standard is expanded in the Essential Knowledge and Skills column. What each student should know and be able to do in each standard is outlined. This is not meant to be an exhaustive list nor a list that limits what is taught in the classroom. It is meant to be the key knowledge and skills that define the standard.

The Curriculum Framework serves as a guide for Standards of Learning assessment development. Assessment items may not and should not be a verbatim reflection of the information presented in the Curriculum Framework. Students are expected to continue to apply knowledge and skills from Standards of Learning presented in previous grades as they build mathematical expertise.

In the middle grades, the focus of mathematics learning is to

- build on students' concrete reasoning experiences developed in the elementary grades;
- construct a more advanced understanding of mathematics through active learning experiences;
- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students in the middle grades focus on mastering rational numbers. Rational numbers play a critical role in the development of proportional reasoning and advanced mathematical thinking. The study of rational numbers builds on the understanding of whole numbers, fractions, and decimals developed by students in the elementary grades. Proportional reasoning is the key to making connections to most middle school mathematics topics.

Students develop an understanding of integers and rational numbers by using concrete, pictorial, and abstract representations. They learn how to use equivalent representations of fractions, decimals, and percents and recognize the advantages and disadvantages of each type of representation. Flexible thinking about rational number representations is encouraged when students solve problems.

Students develop an understanding of the properties of operations on real numbers through experiences with rational numbers and by applying the order of operations.

Students use a variety of concrete, pictorial, and abstract representations to develop proportional reasoning skills. Ratios and proportions are a major focus of mathematics learning in the middle grades.

6.1 The student will describe and compare data, using ratios, and will use appropriate notations, such as , *a* to *b*, and *a*:*b*.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
A ratio is a comparison of any two quantities. A ratio is used to represent relationships within and between sets. A ratio can compare part of a set to the entire set (part-whole comparison). A ratio can compare part of a set to another part of the same set (part-part comparison). A ratio can compare part of a set to a corresponding part of another set (part-part comparison). A ratio can compare all of a set to all of another set (whole-whole comparison). The order of the quantities in a ratio is directly related to the order of the quantities expressed in the relationship. For example, if asked for the ratio of the number of cats to dogs in a park, the ratio must be expressed as the number of cats to the number of dogs, in that order. A ratio is a multiplicative comparison of two numbers, measures, or quantities. All fractions are ratios and vice versa. Ratios may or may not be written in simplest form. Ratios can compare two parts of a whole. Rates can be expressed as ratios.	• What is a ratio? A ratio is a comparison of any two quantities. A ratio is used to represent relationships within a set and between two sets. A ratio can be written using fraction form ( ), a colon (2:3), or the word *to* (2 to 3).	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Describe a relationship within a set by comparing part of the set to the entire set. Describe a relationship between two sets by comparing part of one set to a corresponding part of the other set. Describe a relationship between two sets by comparing all of one set to all of the other set. Describe a relationship within a set by comparing one part of the set to another part of the same set. Represent a relationship in words that makes a comparison by using the notations $\frac{a}{b}$, *a*:*b*, and *a to b.* Create a relationship in words for a given ratio expressed symbolically.

6.2 **The student will**

a) investigate and describe fractions, decimals and percents as ratios;
b) identify a given fraction, decimal or percent from a representation;
c) demonstrate equivalent relationships among fractions, decimals, and percents; and
d) compare and order fractions, decimals, and percents.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Percent means "per 100" or how many "out of 100"; *percent* is another name for *hundredths*. A number followed by a percent symbol (%) is equivalent to that number with a denominator of 100 (e.g., 30% = = = 0.3). Percents can be expressed as fractions with a denominator of 100 (e.g., 75% = =). Percents can be expressed as decimal (e.g., 38% = = 0.38). Some fractions can be rewritten as equivalent fractions with denominators of powers of 10, and can be represented as decimals or percents (e.g., = $\frac{6}{10}$ = = 0.60 = 60%). Decimals, fractions, and percents can be represented using concrete materials (e.g., Base-10 blocks, number lines, decimal squares, or grid paper). Percents can be represented by drawing shaded regions on grids or by finding a location on number lines. Percents are used in real life for taxes, sales, data description, and data comparison. Fractions, decimals and percents are equivalent forms representing a given number. The decimal point is a symbol that separates the whole number part from the fractional part of a number.	What is the relationship among fractions, decimals and percents? Fractions, decimals, and percents are three different ways to express the same number. A ratio can be written using fraction form ( ), a colon (2:3), or the word *to* (2 to 3). Any number that can be written as a fraction can be expressed as a terminating or repeating decimal or a percent.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Identify the decimal and percent equivalents for numbers written in fraction form including repeating decimals. Represent fractions, decimals, and percents on a number line. Describe orally and in writing the equivalent relationships among decimals, percents, and fractions that have denominators that are factors of 100. Represent, by shading a grid, a fraction, decimal, and percent. Represent in fraction, decimal, and percent form a given shaded region of a grid. Compare two decimals through thousandths using manipulatives, pictorial representations, number lines, and symbols (<, $\leq, \geq$, >, =). Compare two fractions with denominators of 12 or less using manipulatives, pictorial representations, number lines, and symbols (<, $\leq, \geq$, >, =). Compare two percents using pictorial representations and symbols (<, $\leq, \geq$, >, =).

The decimal point separates the whole number amount from the part of a number that is less than one. The symbol • can be used in Grade 6 in place of "x" to indicate multiplication. Strategies using 0, $\frac{1}{2}$ and 1 as benchmarks can be used to compare fractions. When comparing two fractions, use $\frac{1}{2}$ as a benchmark. Example: Which is greater, $\frac{4}{7}$ or $\frac{3}{9}$? $\frac{4}{7}$ is greater than $\frac{1}{2}$ because 4, the numerator, represents more than half of 7, the denominator. The denominator tells the number of parts that make the whole. $\frac{3}{9}$ is less than $\frac{1}{2}$ because 3, the numerator, is less than half of 9, the denominator, which tells the number of parts that make the whole. Therefore, $\frac{4}{7} > \frac{3}{9}$. When comparing two fractions close to 1, use distance from 1 as your benchmark. Example: Which is greater, $\frac{6}{7} or \frac{8}{9}$? $\frac{6}{7}$ is $\frac{1}{7}$ away from 1 whole. $\frac{8}{9} is \frac{1}{9}$ away from 1 whole. Since $\frac{1}{7} > \frac{1}{9}$, then $\frac{6}{7}$ is a greater distance away from 1 whole than $\frac{8}{9}$ so $\frac{8}{9} > \frac{6}{7}$. Students should have experience with fractions such as		Order no more than 3 fractions, decimals, and percents (decimals through thousandths, fractions with denominators of 12 or less), in ascending or descending order.

$\frac{1}{8}$, whose decimal representation is a terminating decimal (e. g., $\frac{1}{8}$ = 0.125) and with fractions such as $\frac{2}{9}$, whose decimal representation does not end but continues to repeat (e. g., $\frac{2}{9}$ = 0.222…). The repeating decimal can be written with ellipses (three dots) as in 0.222… or denoted with a bar above the digits that repeat as in $0.\overline{2}$.		

6.3 **The student will**

a) identify and represent integers;

b) order and compare integers; and

c) identify and describe absolute value of integers.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Integers are the set of whole numbers, their opposites, and zero. Positive integers are greater than zero. Negative integers are less than zero. Zero is an integer that is neither positive nor negative. A negative integer is always less than a positive integer. When comparing two negative integers, the negative integer that is closer to zero is greater. An integer and its opposite are the same distance from zero on a number line. For example, the opposite of 3 is -3. The absolute value of a number is the distance of a number from zero on the number line regardless of direction. Absolute value is represented as $\lvert -6 \rvert = 6$. On a conventional number line, a smaller number is always located to the left of a larger number (e.g., –7 lies to the left of –3, thus –7 < –3; 5 lies to the left of 8 thus 5 is less than 8).	• What role do negative integers play in practical situations? Some examples of the use of negative integers are found in temperature (below 0), finance (owing money), below sea level. There are many other examples. How does the absolute value of an integer compare to the absolute value of its opposite? They are the same because an integer and its opposite are the same distance from zero on a number line.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Identify an integer represented by a point on a number line. Represent integers on a number line. Order and compare integers using a number line. Compare integers, using mathematical symbols (<, >, =). Identify and describe the absolute value of an integer.

6.4 **The student will demonstrate multiple representations of multiplication and division of fractions.**

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Using manipulatives to build conceptual understanding and using pictures and sketches to link concrete examples to the symbolic enhance students' understanding of operations with fractions and help students connect the meaning of whole number computation to fraction computation. Multiplication and division of fractions can be represented with arrays, paper folding, repeated addition, repeated subtraction, fraction strips, pattern blocks and area models. When multiplying a whole by a fraction such as 3 x $\frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: 3 groups the size of $\frac{1}{2}$ of the whole. When multiplying a fraction by a fraction such as $\frac{2}{3} \cdot \frac{3}{4}$, we are asking for part of a part. When multiplying a fraction by a whole number such as $\frac{1}{2}$ x 6, we are trying to find a part of the whole. For measurement division, the divisor is the number of groups. You want to know how many are in each of those groups. Division of fractions can be explained as how many of a given divisor are needed to equal the given dividend. In other words, for $\frac{1}{4} \div \frac{2}{3}$, the	When multiplying fractions, what is the meaning of the operation? When multiplying a whole by a fraction such as 3 x $\frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: 3 groups the size of $\frac{1}{2}$ of the whole. When multiplying a fraction by a fraction such as $\frac{2}{3} \cdot \frac{3}{4}$, we are asking for part of a part. When multiplying a fraction by a whole number such as $\frac{1}{2}$ x 6, we are trying to find a part of the whole. What does it mean to divide with fractions? For measurement division, the divisor is the number of groups and the quotient will be the number of groups in the dividend. Division of fractions can be explained as how many of a given divisor are needed to equal the given dividend. In other words, for $\frac{1}{4} \div \frac{2}{3}$ the question is, "How many $\frac{2}{3}$ make $\frac{1}{4}$?" For partition division the divisor is the size of the group, so the quotient answers the question, "How much is the whole?" or "How much for one?"	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Demonstrate multiplication and division of fractions using multiple representations. Model algorithms for multiplying and dividing with fractions using appropriate representations.

question is, “How many $\frac{2}{3}$ make $\frac{1}{4}$?” For partition division the divisor is the size of the group, so the quotient answers the question, “How much is the whole?” or “How much for one?”		

6.5 The student will investigate and describe concepts of positive exponents and perfect squares.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
In exponential notation, the base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In 8^3, 8 is the base and 3 is the exponent. A power of a number represents repeated multiplication of the number by itself (e.g., $8^3 = 8 \cdot 8 \cdot 8$ and is read "8 to the third power"). Any real number other than zero raised to the zero power is 1. Zero to the zero power (0) is undefined. Perfect squares are the numbers that result from multiplying any whole number by itself (e.g., $36 = 6 \cdot 6 = 6^2$). Perfect squares can be represented geometrically as the areas of squares the length of whose sides are whole numbers (e.g., $1 \cdot 1$, $2 \cdot 2$, or $3 \cdot 3$). This can be modeled with grid paper, tiles, geoboards and virtual manipulatives.	What does exponential form represent? Exponential form is a short way to write repeated multiplication of a common factor such as $5 \times 5 \times 5 \times 5 = 5^4$. What is the relationship between perfect squares and a geometric square? A perfect square is the area of a geometric square whose side length is a whole number.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Recognize and describe patterns with exponents that are natural numbers, by using a calculator. Recognize and describe patterns of perfect squares not to exceed 20^2, by using grid paper, square tiles, tables, and calculators. Recognize powers of ten by examining patterns in a place value chart: $10^4 = 10{,}000$, $10^3 = 1000$, $10^2 = 100$, $10^1 = 10$, $10^0 = 1$.

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- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students develop conceptual and algorithmic understanding of operations with integers and rational numbers through concrete activities and discussions that bring meaning to why procedures work and make sense.

Students develop and refine estimation strategies and develop an understanding of when to use algorithms and when to use calculators. Students learn when exact answers are appropriate and when, as in many life experiences, estimates are equally appropriate.

Students learn to make sense of the mathematical tools they use by making valid judgments of the reasonableness of answers.

Students reinforce skills with operations with whole numbers, fractions, and decimals through problem solving and application activities.

6.6 **The student will**

a) multiply and divide fractions and mixed numbers; and

b) estimate solutions and then solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of fractions.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Simplifying fractions to simplest form assists with uniformity of answers. Addition and subtraction are inverse operations as are multiplication and division. It is helpful to use estimation to develop computational strategies. For example, $2\frac{7}{8} \cdot \frac{3}{4}$ is about of 3, so the answer is between 2 and 3. When multiplying a whole by a fraction such as $3 \cdot \frac{1}{2}$, the meaning is the same as with multiplication of whole numbers: 3 groups the size of $\frac{1}{2}$ of the whole. When multiplying a fraction by a fraction such as $\frac{2}{3} \cdot \frac{3}{4}$, we are asking for part of a part. When multiplying a fraction by a whole number such as $\frac{1}{2} \cdot 6$, we are trying to find a part of the whole.	How are multiplication and division of fractions and multiplication and division of whole numbers alike? Fraction computation can be approached in the same way as whole number computation, applying those concepts to fractional parts. What is the role of estimation in solving problems? Estimation helps determine the reasonableness of answers.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Multiply and divide with fractions and mixed numbers. Answers are expressed in simplest form. Solve single-step and multistep practical problems that involve addition and subtraction with fractions and mixed numbers, with and without regrouping, that include like and unlike denominators of 12 or less. Answers are expressed in simplest form. Solve single-step and multistep practical problems that involve multiplication and division with fractions and mixed numbers that include denominators of 12 or less. Answers are expressed in simplest form.

6.7 The student will solve single-step and multistep practical problems involving addition, subtraction, multiplication, and division of decimals.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Different strategies can be used to estimate the result of computations and judge the reasonableness of the result. For example: What is an approximate answer for 2.19 ÷ 0.8? The answer is around 2 because 2 ÷ 1 = 2. Understanding the placement of the decimal point is very important when finding quotients of decimals. Examining patterns with successive decimals provides meaning, such as dividing the dividend by 6, by 0.6, by 0.06, and by 0.006. Solving multistep problems in the context of real-life situations enhances interconnectedness and proficiency with estimation strategies. Examples of practical situations solved by using estimation strategies include shopping for groceries, buying school supplies, budgeting an allowance, deciding what time to leave for school or the movies, and sharing a pizza or the prize money from a contest.	What is the role of estimation in solving problems? Estimation gives a reasonable solution to a problem when an exact answer is not required. If an exact answer is required, estimation allows you to know if the calculated answer is reasonable.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Solve single-step and multistep practical problems involving addition, subtraction, multiplication and division with decimals expressed to thousandths with no more than two operations.

6.8 The student will evaluate whole number numerical expressions, using the order of operations.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
The order of operations is a convention that defines the computation order to follow in simplifying an expression. The order of operations is as follows: First, complete all operations within grouping symbols*. If there are grouping symbols within other grouping symbols, do the innermost operation first. Second, evaluate all exponential expressions. Third, multiply and/or divide in order from left to right. Fourth, add and/or subtract in order from left to right. * Parentheses ( ), brackets [ ], braces {}, and the division bar – as in $\frac{3+4}{5+6}$ should be treated as grouping symbols. The power of a number represents repeated multiplication of the number (e.g., $8^3 = 8 \cdot 8 \cdot 8$). The base is the number that is multiplied, and the exponent represents the number of times the base is used as a factor. In the example, 8 is the base, and 3 is the exponent. Any number, except 0, raised to the zero power is 1. Zero to the zero power is undefined.	What is the significance of the order of operations? The order of operations prescribes the order to use to simplify expressions containing more than one operation. It ensures that there is only one correct answer.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Simplify expressions by using the order of operations in a demonstrated step-by-step approach. The expressions should be limited to positive values and not include braces { } or absolute value | |. Find the value of numerical expressions, using order of operations, mental mathematics, and appropriate tools. Exponents are limited to positive values.

In the middle grades, the focus of mathematics learning is to

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- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students develop the measurement skills that provide a natural context and connection among many mathematics concepts. Estimation skills are developed in determining length, weight/mass, liquid volume/capacity, and angle measure. Measurement is an essential part of mathematical explorations throughout the school year.

Students continue to focus on experiences in which they measure objects physically and develop a deep understanding of the concepts and processes of measurement. Physical experiences in measuring various objects and quantities promote the long-term retention and understanding of measurement. Actual measurement activities are used to determine length, weight/mass, and liquid volume/capacity.

Students examine perimeter, area, and volume, using concrete materials and practical situations. Students focus their study of surface area and volume on rectangular prisms, cylinders, pyramids, and cones.

6.9 The student will make ballpark comparisons between measurements in the U.S. Customary System of measurement and measurements in the metric system.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Making sense of various units of measure is an essential life skill, requiring reasonable estimates of what measurements mean, particularly in relation to other units of measure. 1 inch is about 2.5 centimeters. 1 foot is about 30 centimeters. 1 meter is a little longer than a yard, or about 40 inches. 1 mile is slightly farther than 1.5 kilometers. 1 kilometer is slightly farther than half a mile. 1 ounce is about 28 grams. 1 nickel has the mass of about 5 grams. 1 kilogram is a little more than 2 pounds. 1 quart is a little less than 1 liter. 1 liter is a little more than 1 quart. Water freezes at 0°C and 32°F. Water boils at 100°C and 212°F. Normal body temperature is about 37°C and 98°F. Room temperature is about 20°C and 70°F. Mass is the amount of matter in an object. Weight is the pull of gravity on the mass of an object. The mass of an object remains the same regardless of its location. The weight of an object changes dependent on the gravitational pull at its location. In everyday life, most people are actually interested in determining an object's mass, although they use the term *weight*, as shown by the questions: "How much does it weigh?" versus "What is its mass?" The degree of accuracy of measurement required is determined by the situation. Whether to use an underestimate or an overestimate is	What is the difference between weight and mass? Weight and mass are different. Mass is the amount of matter in an object. Weight is the pull of gravity on the mass of an object. The mass of an object remains the same regardless of its location. The weight of an object changes dependent on the gravitational pull at its location. How do you determine which units to use at different times? Units of measure are determined by the attributes of the object being measured. Measures of length are expressed in linear units, measures of area are expressed in square units, and measures of volume are expressed in cubic units. Why are there two different measurement systems? Measurement systems are conventions invented by different cultures to meet their needs. The U.S. Customary System is the preferred method in the United States. The metric system is the preferred system worldwide.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Estimate the conversion of units of length, weight/mass, volume, and temperature between the U.S. Customary system and the metric system by using ballpark comparisons. Ex: 1 L ≈ 1qt. Ex: 4L ≈ 4 qts. Estimate measurements by comparing the object to be measured against a benchmark.

determined by the situation. Physically measuring objects along with using visual and symbolic representations improves student understanding of both the concepts and processes of measurement.		

6.10 **The student will**

a) define pi (π) as the ratio of the circumference of a circle to its diameter;

b) solve practical problems involving circumference and area of a circle, given the diameter or radius;

c) solve practical problems involving area and perimeter; and

d) describe and determine the volume and surface area of a rectangular prism.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Experiences in deriving the formulas for area, perimeter, and volume using manipulatives such as tiles, one-inch cubes, adding machine tape, graph paper, geoboards, or tracing paper, promote an understanding of the formulas and facility in their use.† The perimeter of a polygon is the measure of the distance around the polygon. Circumference is the distance around or perimeter of a circle. The area of a closed curve is the number of nonoverlapping square units required to fill the region enclosed by the curve. The perimeter of a square whose side measures s is 4 times s ($P = 4s$), and its area is side times side ($A = s^2$). The perimeter of a rectangle is the sum of twice the length and twice the width [$P = 2l + 2w$, or $P = 2(l + w)$], and its area is the product of the length and the width ($A = lw$). The value of pi (□) is the ratio of the circumference of a circle to its diameter. The ratio of the circumference to the diameter of a circle is a constant value, pi (□), which can be approximated by measuring various sizes of circles. The fractional approximation of pi generally used is .	What is the relationship between the circumference and diameter of a circle? The circumference of a circle is about 3 times the measure of the diameter. What is the difference between area and perimeter? Perimeter is the distance around the outside of a figure while area is the measure of the amount of space enclosed by the perimeter. What is the relationship between area and surface area? Surface area is calculated for a three-dimensional figure. It is the sum of the areas of the two-dimensional surfaces that make up the three-dimensional figure.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Derive an approximation for pi (3.14 or) by gathering data and comparing the circumference to the diameter of various circles, using concrete materials or computer models. Find the circumference of a circle by substituting a value for the diameter or the radius into the formula $C = \square d$ or $C = 2\square r$. Find the area of a circle by using the formula $A = \square r^2$. Apply formulas to solve practical problems involving area and perimeter of triangles and rectangles. Create and solve problems that involve finding the circumference and area of a circle when given the diameter or radius. Solve problems that require finding the surface area of a rectangular prism, given a diagram of the prism with the necessary dimensions labeled. Solve problems that require finding the volume of a rectangular prism given a diagram of the prism with the necessary dimensions labeled.

The decimal approximation of pi generally used is 3.14. The circumference of a circle is computed using $C = \pi d$ or $C = 2\pi r$, where *d* is the diameter and *r* is the radius of the circle. The area of a circle is computed using the formula $A = \pi r^2$, where *r* is the radius of the circle. The surface area of a rectangular prism is the sum of the areas of all six faces ($SA = 2lw + 2lh + 2wh$). The volume of a rectangular prism is computed by multiplying the area of the base, B, (length x width) by the height of the prism ($V = lwh = Bh$). †Revised March 2011		

In the middle grades, the focus of mathematics learning is to

- build on students' concrete reasoning experiences developed in the elementary grades;
- construct a more advanced understanding of mathematics through active learning experiences;
- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students expand the informal experiences they have had with geometry in the elementary grades and develop a solid foundation for the exploration of geometry in high school. Spatial reasoning skills are essential to the formal inductive and deductive reasoning skills required in subsequent mathematics learning.

Students learn geometric relationships by visualizing, comparing, constructing, sketching, measuring, transforming, and classifying geometric figures. A variety of tools such as geoboards, pattern blocks, dot paper, patty paper, miras, and geometry software provides experiences that help students discover geometric concepts. Students describe, classify, and compare plane and solid figures according to their attributes. They develop and extend understanding of geometric transformations in the coordinate plane.

Students apply their understanding of perimeter and area from the elementary grades in order to build conceptual understanding of the surface area and volume of prisms, cylinders, pyramids, and cones. They use visualization, measurement, and proportional reasoning skills to develop an understanding of the effect of scale change on distance, area, and volume. They develop and reinforce proportional reasoning skills through the study of similar figures.

Students explore and develop an understanding of the Pythagorean Theorem. Mastery of the use of the Pythagorean Theorem has far-reaching impact on subsequent mathematics learning and life experiences.

The van Hiele theory of geometric understanding describes how students learn geometry and provides a framework for structuring student experiences that should lead to conceptual growth and understanding.

Level 0: Pre-recognition. Geometric figures are not recognized. For example, students cannot differentiate between three-sided and four-sided polygons.

Level 1: Visualization. Geometric figures are recognized as entities, without any awareness of parts of figures or relationships between components of a figure. Students should recognize and name figures and distinguish a given figure from others that look somewhat the same. (This is the expected level of student performance during grades K and 1.)

Level 2: Analysis. Properties are perceived but are isolated and unrelated. Students should recognize and name properties of geometric figures. (Students are expected to transition to this level during grades 2 and 3.)

Level 3: Abstraction. Definitions are meaningful, with relationships being perceived between properties and between figures. Logical implications and class inclusions are understood, but the role and significance of deduction is not understood. (Students should transition to this level during grades 5 and 6 and fully attain it before taking algebra.)

Level 4: Deduction. Students can construct proofs, understand the role of axioms and definitions, and know the meaning of necessary and sufficient conditions. Students should be able to supply reasons for steps in a proof. (Students should transition to this level before taking geometry.)

6.11 **The student will**

a) identify the coordinates of a point in a coordinate plane; and

b) graph ordered pairs in a coordinate plane.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
In a coordinate plane, the coordinates of a point are typically represented by the ordered pair (x, y), where x is the first coordinate and y is the second coordinate. However, any letters may be used to label the axes and the corresponding ordered pairs. The quadrants of a coordinate plane are the four regions created by the two intersecting perpendicular number lines. Quadrants are named in counterclockwise order. The signs on the ordered pairs for quadrant I are (+,+); for quadrant II, (–,+); for quadrant III, (–, –); and for quadrant IV, (+,–). In a coordinate plane, the origin is the point at the intersection of the x-axis and y-axis; the coordinates of this point are (0,0). For all points on the x-axis, the y-coordinate is 0. For all points on the y-axis, the x-coordinate is 0. ● The coordinates may be used to name the point. (e.g., the point (2,7)). It is not necessary to say "the point whose coordinates are (2,7)".	Can any given point be represented by more than one ordered pair? The coordinates of a point define its unique location in a coordinate plane. Any given point is defined by only one ordered pair. In naming a point in the plane, does the order of the two coordinates matter? Yes. The first coordinate tells the location of the point to the left or right of the y-axis and the second point tells the location of the point above or below the x-axis. Point (0, 0) is at the origin.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Identify and label the axes of a coordinate plane. Identify and label the quadrants of a coordinate plane. Identify the quadrant or the axis on which a point is positioned by examining the coordinates (ordered pair) of the point. Graph ordered pairs in the four quadrants and on the axes of a coordinate plane. Identify ordered pairs represented by points in the four quadrants and on the axes of the coordinate plane. Relate the coordinate of a point to the distance from each axis and relate the coordinates of a single point to another point on the same horizontal or vertical line.† †Revised March 2011

6.12 The student will determine congruence of segments, angles, and polygons.

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Congruent figures have exactly the same size and the same shape. Noncongruent figures may have the same shape but not the same size. The symbol for congruency is $\cong$. The corresponding angles of congruent polygons have the same measure, and the corresponding sides of congruent polygons have the same measure. The determination of the congruence or noncongruence of two figures can be accomplished by placing one figure on top of the other or by comparing the measurements of all sides and angles. Construction of congruent line segments, angles, and polygons helps students understand congruency.	Given two congruent figures, what inferences can be drawn about how the figures are related? The congruent figures will have exactly the same size and shape. • Given two congruent polygons, what inferences can be drawn about how the polygons are related? Corresponding angles of congruent polygons will have the same measure. Corresponding sides of congruent polygons will have the same measure.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Characterize polygons as congruent and noncongruent according to the measures of their sides and angles. Determine the congruence of segments, angles, and polygons given their attributes. Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate. Apply these techniques in the context of solving practical and mathematical problems.† †Revised March 2011

6.13 The student will describe and identify properties of quadrilaterals.

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A quadrilateral is a closed planar (two-dimensional) figure with four sides that are line segments. A parallelogram is a quadrilateral whose opposite sides are parallel and opposite angles are congruent. A rectangle is a parallelogram with four right angles. Rectangles have special characteristics (such as diagonals are bisectors) that are true for any rectangle. To bisect means to divide into two equal parts. A square is a rectangle with four congruent sides or a rhombus with four right angles. A rhombus is a parallelogram with four congruent sides. A trapezoid is a quadrilateral with exactly one pair of parallel sides. The parallel sides are called *bases*, and the nonparallel sides are called *legs*. If the legs have the same length, then the trapezoid is an isosceles trapezoid. A kite is a quadrilateral with two pairs of adjacent congruent sides. One pair of opposite angles is congruent. Quadrilaterals can be sorted according to common attributes, using a variety of materials. Quadrilaterals can be classified by the number of parallel sides: a parallelogram, rectangle, rhombus, and square each have two pairs of parallel sides; a trapezoid has only one pair of parallel sides; other quadrilaterals have no parallel sides. Quadrilaterals can be classified by the measures of their	Can a figure belong to more than one subset of quadrilaterals? Any figure that has the attributes of more than one subset of quadrilaterals can belong to more than one subset. For example, rectangles have opposite sides of equal length. Squares have all 4 sides of equal length thereby meeting the attributes of both subsets.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Sort and classify polygons as quadrilaterals, parallelograms, rectangles, trapezoids, kites, rhombi, and squares based on their properties. Properties include number of parallel sides, angle measures and number of congruent sides. Identify the sum of the measures of the angles of a quadrilateral as 360°.

angles: a rectangle has four 90° angles; a trapezoid may have zero or two 90° angles. Quadrilaterals can be classified by the number of congruent sides: a rhombus has four congruent sides; a square, which is a rhombus with four right angles, also has four congruent sides; a parallelogram and a rectangle each have two pairs of congruent sides. A square is a special type of both a rectangle and a rhombus, which are special types of parallelograms, which are special types of quadrilaterals. The sum of the measures of the angles of a quadrilateral is 360°. A chart, graphic organizer, or Venn Diagram can be made to organize quadrilaterals according to attributes such as sides and/or angles.		

In the middle grades, the focus of mathematics learning is to

- build on students' concrete reasoning experiences developed in the elementary grades;
- construct a more advanced understanding of mathematics through active learning experiences;
- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students develop an awareness of the power of data analysis and probability by building on their natural curiosity about data and making predictions.

Students explore methods of data collection and use technology to represent data with various types of graphs. They learn that different types of graphs represent different types of data effectively. They use measures of center and dispersion to analyze and interpret data.

Students integrate their understanding of rational numbers and proportional reasoning into the study of statistics and probability.

Students explore experimental and theoretical probability through experiments and simulations by using concrete, active learning activities.

6.14 **The student, given a problem situation, will**

a) construct circle graphs;

b) draw conclusions and make predictions, using circle graphs; and

c) compare and contrast graphs that present information from the same data set.

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To collect data for any problem situation, an experiment can be designed, a survey can be conducted, or other data-gathering strategies can be used. The data can be organized, displayed, analyzed, and interpreted to answer the problem. Different types of graphs are used to display different types of data. Bar graphs use categorical (discrete) data (e.g., months or eye color). Line graphs use continuous data (e.g., temperature and time). Circle graphs show a relationship of the parts to a whole. All graphs include a title, and data categories should have labels. A scale should be chosen that is appropriate for the data. A key is essential to explain how to read the graph. A title is essential to explain what the graph represents. Data are analyzed by describing the various features and elements of a graph.	What types of data are best presented in a circle graph? Circle graphs are best used for data showing a relationship of the parts to the whole.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Collect, organize and display data in circle graphs by depicting information as fractional. Draw conclusions and make predictions about data presented in a circle graph. Compare and contrast data presented in a circle graph with the same data represented in other graphical forms.

6.15 **The student will**

a) describe mean as balance point; and

b) decide which measure of center is appropriate for a given purpose.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Measures of center are types of averages for a data set. They represent numbers that describe a data set. Mean, median, and mode are measures of center that are useful for describing the average for different situations. Mean works well for sets of data with no very high or low numbers. Median is a good choice when data sets have a couple of values much higher or lower than most of the others. Mode is a good descriptor to use when the set of data has some identical values or when data are not conducive to computation of other measures of central tendency, as when working with data in a yes or no survey. The mean is the numerical average of the data set and is found by adding the numbers in the data set together and dividing the sum by the number of data pieces in the set. In grade 5 mathematics, mean is defined as fair- share. Mean can be defined as the point on a number line where the data distribution is balanced. This means that the sum of the distances from the mean of all the points above the mean is equal to the sum of the distances of all the data points below the mean. This is the concept of mean as the balance point. Defining mean as balance point is a prerequisite for understanding standard deviation.	What does the phrase "measure of center" mean? This is a collective term for the 3 types of averages for a set of data – mean, median, and mode. What is meant by mean as balance point? Mean can be defined as the point on a number line where the data distribution is balanced. This means that the sum of the distances from the mean of all the points above the mean is equal to the sum of the distances of all the data points below the mean. This is the concept of mean as the balance point.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Find the mean for a set of data. Describe the three measures of center and a situation in which each would best represent a set of data. Identify and draw a number line that demonstrates the concept of mean as balance point for a set of data.

The median is the middle value of a data set in ranked order. If there are an odd number of pieces of data, the median is the middle value in ranked order. If there is an even number of pieces of data, the median is the numerical average of the two middle values. The mode is the piece of data that occurs most frequently. If no value occurs more often than any other, there is no mode. If there is more than one value that occurs most often, all these most-frequently-occurring values are modes. When there are exactly two modes, the data set is bimodal.		

6.16 **The student will**

a) compare and contrast dependent and independent events; and

b) determine probabilities for dependent and independent events.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
The probability of an event occurring is equal to the ratio of desired outcomes to the total number of possible outcomes (sample space). The probability of an event occurring can be represented as a ratio or the equivalent fraction, decimal, or percent. The probability of an event occurring is a ratio between 0 and 1. A probability of 0 means the event will never occur. A probability of 1 means the event will always occur. A simple event is one event (e.g., pulling one sock out of a drawer and examining the probability of getting one color). Events are independent when the outcome of one has no effect on the outcome of the other. For example, rolling a number cube and flipping a coin are independent events. The probability of two independent events is found by using the following formula: $P(A \text{ and } B) = P(A) \cdot P(B)$ Ex: When rolling two number cubes simultaneously, what is the probability of rolling a 3 on one cube and a 4 on the other? $P(3 \text{ and } 4) = P(3) \cdot P(4) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$	How can you determine if a situation involves dependent or independent events? Events are independent when the outcome of one has no effect on the outcome of the other. Events are dependent when the outcome of one event is influenced by the outcome of the other.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Determine whether two events are dependent or independent. Compare and contrast dependent and independent events. Determine the probability of two dependent events. Determine the probability of two independent events.

Events are dependent when the outcome of one event is influenced by the outcome of the other. For example, when drawing two marbles from a bag, *not* replacing the first after it is drawn affects the outcome of the second draw. The probability of two dependent events is found by using the following formula: $P(A \text{ and } B) = P(A) \cdot P(B \text{ after } A)$ Ex: You have a bag holding a blue ball, a red ball, and a yellow ball. What is the probability of picking a blue ball out of the bag on the first pick and then *without* replacing the blue ball in the bag, picking a red ball on the second pick? $P(\text{blue } \textit{and } \text{red}) = P(\text{blue}) \cdot P(\text{red } \textit{after } \text{blue}) = \frac{1}{3} \cdot \frac{1}{2} = \frac{1}{6}$		

In the middle grades, the focus of mathematics learning is to

- build on students' concrete reasoning experiences developed in the elementary grades;
- construct a more advanced understanding of mathematics through active learning experiences;
- develop deep mathematical understandings required for success in abstract learning experiences; and
- apply mathematics as a tool in solving practical problems.

Students in the middle grades use problem solving, mathematical communication, mathematical reasoning, connections, and representations to integrate understanding within this strand and across all the strands.

Students extend their knowledge of patterns developed in the elementary grades and through life experiences by investigating and describing functional relationships.

Students learn to use algebraic concepts and terms appropriately. These concepts and terms include *variable, term, coefficient, exponent, expression, equation, inequality, domain,* and *range*. Developing a beginning knowledge of algebra is a major focus of mathematics learning in the middle grades.

Students learn to solve equations by using concrete materials. They expand their skills from one-step to two-step equations and inequalities.

Students learn to represent relations by using ordered pairs, tables, rules, and graphs. Graphing in the coordinate plane linear equations in two variables is a focus of the study of functions.

6.17 The student will identify and extend geometric and arithmetic sequences.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Numerical patterns may include linear and exponential growth, perfect squares, triangular and other polygonal numbers, or Fibonacci numbers. Arithmetic and geometric sequences are types of numerical patterns. In the numerical pattern of an arithmetic sequence, students must determine the difference, called the *common difference*, between each succeeding number in order to determine what is added to each previous number to obtain the next number. Sample numerical patterns are 6, 9, 12, 15, 18, □; and 5, 7, 9, 11, 13, □. In geometric number patterns, students must determine what each number is multiplied by to obtain the next number in the geometric sequence. This multiplier is called the *common ratio*. Sample geometric number patterns include 2, 4, 8, 16, 32, …; 1, 5, 25, 125, 625, …; and 80, 20, 5, 1.25, … Strategies to recognize and describe the differences between terms in numerical patterns include, but are not limited to, examining the change between consecutive terms, and finding common factors. An example is the pattern 1, 2, 4, 7, 11, 16,□	What is the difference between an arithmetic and a geometric sequence? While both are numerical patterns, arithmetic sequences are additive and geometric sequences are multiplicative.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Investigate and apply strategies to recognize and describe the change between terms in arithmetic patterns. Investigate and apply strategies to recognize and describe geometric patterns. Describe verbally and in writing the relationships between consecutive terms in an arithmetic or geometric sequence. Extend and apply arithmetic and geometric sequences to similar situations. Extend arithmetic and geometric sequences in a table by using a given rule or mathematical relationship. Compare and contrast arithmetic and geometric sequences. Identify the common difference for a given arithmetic sequence. Identify the common ratio for a given geometric sequence.

6.18 The student will solve one-step linear equations in one variable involving whole number coefficients and positive rational solutions.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
A one-step linear equation is an equation that requires one operation to solve. A mathematical expression contains a variable or a combination of variables, numbers, and/or operation symbols and represents a mathematical relationship. An expression cannot be solved. A term is a number, variable, product, or quotient in an expression of sums and/or differences. In $7x^2 + 5x - 3$, there are three terms, $7x^2$, $5x$, and 3. A coefficient is the numerical factor in a term. For example, in the term $3xy^2$, 3 is the coefficient; in the term z, 1 is the coefficient. Positive rational solutions are limited to whole numbers and positive fractions and decimals. An equation is a mathematical sentence stating that two expressions are equal. A variable is a symbol (placeholder) used to represent an unspecified member of a set.	When solving an equation, why is it necessary to perform the same operation on both sides of an equal sign? To maintain equality, an operation performed on one side of an equation must be performed on the other side.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representation to** Represent and solve a one-step equation, using a variety of concrete materials such as colored chips, algebra tiles, or weights on a balance scale. Solve a one-step equation by demonstrating the steps algebraically. Identify and use the following algebraic terms appropriately: *equation*, v*ariable, expression, term,* and *coefficient*.

6.19 **The student will investigate and recognize**

a) the identity properties for addition and multiplication;

b) the multiplicative property of zero; and

c) the inverse property for multiplication.

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UNDERSTANDING THE STANDARD (Background Information for Instructor Use Only)	ESSENTIAL UNDERSTANDINGS	ESSENTIAL KNOWLEDGE AND SKILLS
Identity elements are numbers that combine with other numbers without changing the other numbers. The additive identity is zero (0). The multiplicative identity is one (1). There are no identity elements for subtraction and division. The additive identity property states that the sum of any real number and zero is equal to the given real number (e.g., $5 + 0 = 5$). The multiplicative identity property states that the product of any real number and one is equal to the given real number (e.g., $8 \cdot 1 = 8$). Inverses are numbers that combine with other numbers and result in identity elements. The multiplicative inverse property states that the product of a number and its multiplicative inverse (or reciprocal) always equals one (e.g., $4 \cdot \ = 1$). Zero has no multiplicative inverse. The multiplicative property of zero states that the product of any real number and zero is zero. Division by zero is not a possible arithmetic operation. Division by zero is undefined.	How are the identity properties for multiplication and addition the same? Different? For each operation the identity elements are numbers that combine with other numbers without changing the value of the other numbers. The additive identity is zero (0). The multiplicative identity is one (1). What is the result of multiplying any real number by zero? The product is always zero. • Do all real numbers have a multiplicative inverse? No. Zero has no multiplicative inverse because there is no real number that can be multiplied by zero resulting in a product of one.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections, and representations to** Identify a real number equation that represents each property of operations with real numbers, when given several real number equations. Test the validity of properties by using examples of the properties of operations on real numbers. Identify the property of operations with real numbers that is illustrated by a real number equation. NOTE: The commutative, associative and distributive properties are taught in previous grades.

6.20 The student will graph inequalities on a number line.

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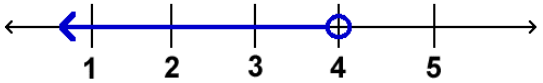
Inequalities using the < or > symbols are represented on a number line with an open circle on the number and a shaded line over the solution set. Ex: x < 4  When graphing $x \leq 4$ fill in the circle above the 4 to indicate that the 4 is included. Inequalities using the $\leq or \geq$ symbols are represented on a number line with a closed circle on the number and shaded line in the direction of the solution set. The solution set to an inequality is the set of all numbers that make the inequality true. It is important for students to see inequalities written with the variable before the inequality symbol and after. For example x > -6 and 7 > y.	In an inequality, does the order of the elements matter? Yes, the order does matter. For example, x > 5 is not the same relationship as 5 > x. However, x > 5 is the same relationship as 5 < x.	**The student will use problem solving, mathematical communication, mathematical reasoning, connections and representation to** Given a simple inequality with integers, graph the relationship on a number line. Given the graph of a simple inequality with integers, represent the inequality two different ways using symbols (<, >, ≤, ≥).