Table of Contents

CMS Mathematics Philosophy of Assessment

At the 7th and 8th grade level, one of our primary concerns is preparing and transitioning students to the high school. To this end we do not use the rubric-based grading system of the elementary schools, but rather use a traditional letter grading system like the high school and most colleges where grades over a quarter are averaged. The difference between the high school and middle school is that the middle school gives no overall semester grade. This gives students a clean slate each quarter academically.

Averaging grades makes sense at this level because of the sheer volume of skills that we expect students to learn. There may be a skill that students are expected to master in a day or two rather than by the end of the year. By averaging grades we also get a clear picture of overall student performance. This is not to say that grades on an individual topic should not be evaluated by the teacher, but instead that level of data analysis is reserved for just that: analysis. The teacher is expected to be able to know what skills a student is struggling with through the use of their assessments, both informal and formal, but this assessment is more formative in nature while reporting grades is more summative in nature.

For this summative averaging of grades to accurately assess the standards that we are to teach, an assessment should not be counted towards a final grade unless mastery of the topic is to be expected. This means that we feel no completion grades should be used towards a final summative grade. Completion grades are useful and necessary tools as formative assessment, but should not contribute to the final summative grade.

To aid in the assessment process, the following guidelines are given as a starting place for developing an accurate grading system. A category to track is given followed by the percentage of a student's overall grade that it should have. A general description of the category follows that. Each type of assessment should be tracked somehow by the teacher to help provide the most accurate and detailed description possible of a student's learning.

Homework Completion (0%): It is useful to know the overall percentage of homework or assignment completion. As we know, practice doesn't make perfect, but it does make a habit. Without practicing skills correctly, students will not gain mastery over a topic. Homework is one method of accomplishing this practice, however, homework should also be a place where students have the freedom to make mistakes and corrections with no penalty. The idea of completion is more tied to the effort that a student is putting forth. Just as a horse can be led to water but not forced to drink, so a student can be exposed and guided academically, but if he or she doesn't give his or her best effort, the academic gains will be negligible. The education process is a multi-partner process in which the student is perhaps the most crucial element.

Computation (0%): We are dedicated to students having a solid foundation in basic arithmetic. We have found that students who struggle with basic arithmetic in turn struggle with deciding when to apply those operations to given problem situations. This includes computation by hand (meaning no calculator use) of addition, subtraction, multiplication, and division of natural numbers (positive whole numbers), integers (negative numbers), decimals, and fractions. However, since these skills are below grade level, these assessments should only be used in a formative manner helping to decide on interventions for students and not used towards their final grade.

One method of using the computation assessments is to give the students a daily warm-up of around 5 questions dealing with one specific skill such as whole number division. Once a week, after the students have had

practice, give a computation assessment on that skill. This leads to a quarter by quarter approach where whole number operations are covered during the 1st Quarter, integer operations during 2nd Quarter, decimal operations during 3rd Quarter, and fraction operations during 4th Quarter.

Another strategy of use would be to use a 5 question warm-up each day so that one overall topic is covered each week. The first week could be whole number operations (adding on Monday, subtracting on Tuesday, multiplying on Wednesday, dividing on Thursday). The second week could be integer operations and so forth. In this way, all the topics could be covered by the midterm of first quarter and interventions on specific areas of concern could begin. The process could be repeated twice a quarter so that growth can be shown.

Homework Accuracy (10%): At some point, after corrections have been made and correct practice has been achieved, homework or assignments should be graded for accuracy. Again, this is after the point that a student is expected to master a topic and therefore homework accuracy is not likely to be a daily grading task. For example, once a week homework assignments can be collected and the teacher can grade 10 random problems from all of the assignments while informally assessing the rest. This provides structure and a timely goal for students on their homework. Partial credit (meaning half credit) is usually only given for strictly computational errors.

Problem Solving (10%): Problem solving skills should be developed throughout the year, but specifically practicing problem solving similar to the ISAT Extended Response is critical to students being prepared for that portion of the state test. It is our view that an extended response problem dealing with the current topic/skill of study should be incorporated on a weekly basis. Two sample rubrics beyond the actual ISAT rubric for grading these are provided. (PS Rubric 1, PS Rubric 2, ISAT Rubric) These problems should be multi-step problems (meaning that more than one mathematical operation needs to occur to get the answer) where students must write a detailed explanation of what they did and why they did it. Helping students understand how to write a step-by-step guide to their problem solving process and then justifying that process is very important, but this should not be divorced from the actual mathematical understanding that student has of a topic or skill. This is meant to be a more holistic assessment tool. Problem solving could occur in groups, partners, or individually and could be timed (usually about 20 minutes) in class or given as take home assignments as the teacher sees fit.

Weekly Quiz (30%): We feel it is important to have a weekly formal formative assessment so that the teacher has a formal piece of data to help decide which students need more help, which students are ready for enrichment, where the class should head next, etc. A weekly quiz should be around 25 questions (20-33 depending on the skills assessed) where approximately 3 to 5 of those questions are review questions from previous weeks. The review questions help determine retention of information by students and the questions on the current topic can be used in a formative manner as previously stated. The weekly quizzes may vary between multiple choice and short response, but we have found that short response more accurately demonstrate student mastery of a topic. Also partial credit on a quiz question is usually only given when a strictly computational error is made. For example, if a student used the formula $A = bh$ to find the area of triangle, he would lose full credit. However, if a student was asked to find the area of a rectangle and did $A = bh = 8 * 7 = 65\ m^2$, partial credit would be given. These quizzes are not provided as they should be designed to fit where the class is at during that given week which could vary from teacher to teacher and from year to year. One additional expectation for weekly quizzes is to provide a few questions that are enrichment or extension questions of the current skills so that students who are above grade level can demonstrate their depth of understanding.

Unit Pre-Test (0%): This test should be given at the beginning of a unit to see where students currently are in their understanding of the upcoming topics. This is a primary tool in determining differentiated instruction needs and showing student growth throughout a unit of study. In order to best utilize this test, it should be graded in a timely manner because it is strictly formative in nature. Unit pre-tests are provided and are common assessments across the 8th grade.

Unit Post-Test (30%): This assessment tool is summative in nature and should demonstrate a student's understanding and retention of the skills presented in the unit. Student growth can also be shown through comparison with the pre-test. Unit post-tests are provided and are common assessments across the 8th grade.

Quarter Exam (10%): At the high school level student's have comprehensive semester exams and the quarter exams help prepare students for those semester exams. The quarter exams are common across the 8th grade and are multiple choice to allow students to work through the test in a timely manner. The second quarter exam also covers material from the first quarter. The third quarter exam only covers third quarter material, while the fourth quarter covers both the third and fourth quarter material.

Project (10%): A comprehensive, hands-on project should be given each quarter. It is anticipated that this project may take up to a week per quarter to complete and may be used as a review of content for a unit post-test or review for a quarter exam. Ideally, significant class time would be devoted to the project, but realistically class time is limited and much of the project will fall to the students to accomplish outside of class. Sample quarter projects are provided as well as rubrics for grading those projects.

Completion Grades: In general, completion grades should only be used as informal, formative assessments. They should not count towards a student's overall grade because they do not actually assess the mastery or understanding of a particular skill or topic. They are a loose measure of student's work habits because they merely indicate that a student completes tasks but don't show the quality of that work.

Extra Credit: The purpose of extra credit is to raise a student's grade beyond what he or she has achieved through "regular" credit. Unfortunately, adding extra credit leads to a false inflation of that student's grade so that it no longer accurately reflects their level of understanding. If a student is behind in a skill or topic, it may be beneficial for that student to do extra work in that area, but that would be an intervention. As such the grade would either be averaged with other grades on the same skill or topic. If a student is ahead in his or her level of understanding about a skill or topic, it may be beneficial for that student to do extra work in that area, but that would be an enrichment activity. As such the grade would not be counted towards the student's overall grade because it would not reflect the grade level standards. Hence, extra credit has either no place in a grading scheme or at least an extremely limited role.

Partial Credit: Partial credit may be useful in some cases, especially complex problems. For example, if a student is asked to determine the cost to fill a 16 in. x 25 in. x 10 in. water tank when water costs $0.79 per cubic inch, it would make sense to give the student partial credit for finding the volume correctly even if the final cost was incorrect since this question would likely be included in a unit of study covering volume. It is also probably easiest to always give half credit rather than trying to count every individual step of work separately (especially since students will solve problems using multiple methods). However, if partial credit is always given, it effectively makes the lowest grade possible for a student to receive a 50%. This means that a student could miss eight out of ten problems, normally a 20% F score, but with partial credit this would be a 60% D-. This again leads to inaccurate assessment of student understanding and mastery of the content standards. Therefore partial credit should be used only in situations where there are multiple steps expected in the problem or when a student makes a purely computational error such as 2 * 3 = 5. What solutions will receive partial credit should also be determined ahead of time so that the students are aware ahead of time.

Zeros: Many teachers are tempted to not include zeros in a grade because of how much they hurt a student's average. However, if students do not do the work, they have actually have demonstrated 0% understanding through that particular assessment. This does not mean we should be content leaving that zero in the grade book, but should reinforce the fact that we need multiple measures of understanding for a student. Interventions should occur for those students who do have zeros with the goal of truly measuring their understanding, but this must be balanced with some form of penalty (see the late work section) so as not to enable the students. We do not want to teach the students that it is acceptable to not do work until they decide they want to do it.

Late Work: At the high school level, there are varied late work penalties. These penalties range from late work not being accepted at all to work received one day late yielding a -50% to that particular grade. In preparing our students for the high school, we need to train our students to turn work in on time. A suggested penalty would be giving a -10% per day late (giving the students nearly two weeks to make-up work for at least some credit) or -20% per day late (giving students a week). Unfortunately, we cannot *completely* divorce work habits from our assessments especially since we should be teaching good work habits.

Re-Tests: Often, after an intervention, students may re-test in a specific skill or topic. The question is whether that re-test should completely replace the previous assessment or whether it should be averaged with the previous score. The problem with a complete replacement of a score is that this method promotes retaking a test until a student gets a high enough score and then never assessing that skill or concept again. That is not an accurate assessment of what students truly understand as much as it is a promotion of rote learning just to "get the grade". The total replacement of scores also teaches students that they don't have to study or try on a test because they know they can always just retake the test at a later date. Instead, averaging the scores acknowledges the previous struggle and the growth that the student has made at the same time. Re-tests should only be offered once to promote responsibility on the student's part.

Test Corrections: It is very useful for students to correct their tests, homework, or other assessments. However, by giving students credit back for those corrections it is again raising the lowest score a student could get usually to a 50% since most teachers give half credit back. Since students are normally getting help from parents, teachers, or peers on these corrections, it is not an accurate assessment of their level of understanding or mastery of a topic or skill. This is a useful informal, formative assessment, but should not change a student's summative grade in any way.

Showing Work: We feel it is important for students to show work on any problem possible. This means rather than asking, "Do I have to show work?", we should train students to ask, "How can I show work?" The purpose for this is to help us, the teachers, truly understand what the student is thinking. There will be times when it may not be possible to show work, but for full credit on assessments, students should show work including any work that they did on a calculator.

Grading Scale: While CMS uses the typical 90/80/70/60 grade system, there is no determination of what constitutes a plus or minus for each grade. For all 8th grade math classes we use the following grade system which rounds each grade to the nearest hundredth:

100% – 98%	A+	77.99% – 72%	C
97.99% – 92%	A	71.99% – 70%	C-
91.99% – 90%	A-	69.99% – 68%	D+
89.99% – 88%	B+	67.99% – 62%	D
87.99% – 82%	B	61.99% – 60%	D-
81.99% – 80%	B-	59.99% – 0%	F
79.99% – 78%	C+		

While this grading scheme is ambitious, we feel it necessary to accurately determine a student's mathematical understanding through varied types of assessments and to be able to provide teachers, students, parents, and RtI committees with useful data for decision making.

CMS Mathematics Philosophy of Best Practice

While it is impossible to cover best practice issues comprehensively here, a succinct summary will be provided. Also, the Common Core Standards have also provided best practice guidelines that should be utilized.

Calculator Use: While it is our intention that students have a thorough knowledge of computation by the time they reach the 8th grade, we want to minimize the impact of their computational struggles on their learning of the 8th grade standards. We feel the calculator should be accessible to students most times except when deemed unnecessary by the teacher. However, the calculator is a tool, not a crutch. Students should not be dependent on a calculator to the point where their mental math skills deteriorate. To this end, the majority of the Unit Post-Tests have been written in a such a way so that students should not need to use a calculator.

Varied Instruction: Teachers are expected to provide instruction for students in various methods. This does not mean that every lesson or topic must be presented in multiple ways, but rather that an overall attempt to reach different types of learners is made. Well designed, interactive lectures may play a crucial role in the mathematics classroom as there are many times when students simply need information before moving forward. However, discovery based learning, physical models, and visual aids should also be utilized in order to maximize the impact of the learning experience.

Varied Assessment: In the grading system outline, we provide for multiple forms of assessment including multiple choice, short response, extended response, and project based learning opportunities. Both formative and summative assessments are expected to be tracked despite the fact that all assessments do not contribute to an overall final grade for a student. Also, each assessment should utilize multiple levels of Bloom's taxonomy instead of just knowledge and comprehension. Ideally assessments would also provide opportunities for students who are above grade level to demonstrate that fact.

Homework: Correct practice of skills is necessary for mastery of those skills to occur and homework is an important part of this. Students should be spending time at home on a daily basis practicing the skills they are learning. However, homework should not take a significant amount of time to complete at home. Twenty to thirty minutes should be sufficient. Homework is a time for practice and should be an environment where students have the freedom to make mistakes and then correct their work. It is practice, not a strict assessment.

Student Interaction: It is an expectation that students are interacting with other students about mathematics. This may occur in the form of one student tutoring another, students studying together for a test, or group work on a project or problem. As students communicate more with each other about mathematics, their understanding deepens. We acknowledge that keeping students focused on the mathematics can be difficult, but still feel that the interaction between students is important.

Study Skills: For students to be successful in academia, they need to learn how to study. A sample sheet for suggestions on how to study specifically for math is provided (How to Study for a Math Test), but modeling for students how to study is important. Give a man a fish and he eats for a day, but teach him to fish and he eats for a lifetime.

Classroom Environment: The classroom should be a safe environment for students to make mistakes. We often learn more from mistakes than getting something correct on the first try. Questions such as, "What would be an incorrect solution to this problem, and why would a student think that?" help to take stress away

from students who are expected to participate in their own learning process. In general, the classroom should have regular routines/procedures to provide structure for students, but the greater the predictability, the lower the impact. This doesn't mean to be unpredictable and random all the time (which then is predictable), but rather that once a routine is established, deviation from that routine can be utilized as needed for greater impact.

Student Participation: The students should be expected to engage in their own education. They need to take ownership. This is not about tricking students with contrived reasons for studying math or making entertainment the goal of education. Rather it is about teaching and modeling for students the appropriate character aspects such as self-discipline, perseverance, courage to ask questions, and being a self-advocate.

Differentiated Instruction: All students are expected to know the 8th grade level standards and should be participating and engaging in those standards. However, if a student shows advanced knowledge in a particular topic, opportunities for advanced instruction should be provided. This may be in the form of self-guided study, tutoring other students in the skills (which provides the chance for more in-depth knowledge of that skill as the student has to teach it and communicate about it), alternative projects, or other teacher guided instruction.

Interventions: With the amount of assessments suggested at the 8th grade level, there are ample opportunities to determine when students need interventions for specific skills or topics. This may not mean that students have a specific time set aside during the school day throughout the year, but as the need for intervention varies, a student may only need a few days of extra help or instruction to catch up on a topic. Liberal use of Tier I interventions should be implemented. Also, interventions should address the root issue of a student's need. For example, a student who does not turn in homework on time won't benefit from extra time to complete homework if they are not wisely utilizing the time available to them. Rather the intervention should focus on how to use the time available more efficiently. If a student struggled with getting homework done on time because it takes them more time to process and think through problems, then extra time before or after school would be a useful intervention.

Notes: Traditionally students are expected to take notes during class over material. These notes can be used as a study tool for tests and possibly even used during a test. For better or worse, we are living in an age where we are not expected to know how to perform tasks as much as we are expected to be able to find or figure out how to perform tasks. One way this could be implemented in the classroom is to allow students to use notes during a test for a given amount of time or have students make a "cheat sheet" for a test from their notes.

Parent Involvement: It is expected that parents are involved in their student's education process. They are the parents, teachers are not, and as such it is acceptable to place that expectation on parents. However, for parents to be full partners in the education process they need accurate, specific, and timely information. This means that it is important for the teacher to design ways to get information to parents. This may mean a policy of contacting parents whenever there is less than 75% homework completion in a week, sending student work home for signature on a regular basis, weekly emails for parents of students that are particularly struggling, etc.

Record Keeping: Teachers are expected to keep accurate and detailed records on student progress. Part of this is the grading system, but it may also be useful to keep all assessed student work in a folder or portfolio throughout a quarter. This does not mean that parents cannot see the assessed work, but rather that there should be a central repository for the actual student work so that the teacher, student, or parent can access the information whenever needed to see specific issues.

Design of the Curriculum Map and How to Use It

The curriculum map's structure is fairly straight forward. Each unit map starts with the tentative timetable of how long it should take to teach and approximately when during the year it should happen. The units are designed around the Clusters from the Common Core Standards and as such the first item in the table is the standard number which references back to the Common Core Standard that it comes from. The letters represent the Domain and the number the Standard within each Cluster.

Then there is the essential question associated with that specific Standard. Within each unit, there are a few essential questions meant to stir thought towards the cohesion of each Cluster.

The concepts listed are nouns that are meant to be topics of learning while the skills are the verbs, or expected student outcomes. The skills are the most specific requirements for each unit.

The assessments column lists common assessments as well as other assessment options. For the 8th grade, we have pre- and post-tests for each unit. These are meant to be common assessments across the 8th grade and are designed to show growth. Also included in this column are quarter exams designed to prepare students for high school semester exams. These are meant to be common assessments across the 8th grade as well. Beyond that, there is the unit item bank which is meant to be a repository for questions that could be used for weekly quizzes, homework, etc. Whether it's with formative or summative assessments, this item bank is meant to be a resource to help teachers design those assessments.

The final category should offer educators options for teaching the skills in multiple ways. For example, textbook sections that cover the skills are offered in this section since using the textbook is one way to accomplish student learning. Extended response problems, sometimes referred to as problem solving, are also listed here. Perhaps the most useful are the student notes. These notes can be posted online for students to access at home for extra help with topics/skills covered in class. Included in those student notes are a few practice problems and a brief mini-lesson on an enrichment topic with practice problems for that enrichment topic as well.

Note that both Pre-Algebra and Algebra curriculum maps follow. Pre-Algebra is the first map followed by Algebra.

8th Grade Pre-Algebra Unit 1: Real Numbers

Approximate Duration of Study: 2 weeks **When to Study:** Quarter 1

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.NS.1	What is the value of writing numbers in decimal form?	Decimal expansion	• Convert fractions to decimal and decimals to fractions	• Unit Pre-Test • Unit Item Bank	• Student Notes: Converting fractions to decimal • Holt Middle School Math Course 3: 3-1 • Enrichment: Converting percents
8.NS.2	How can we represent numbers with decimal expansions that don't terminate or repeat?	Irrational numbers	• Identify if a number is rational or irrational (ex. π, e) also know that $\overline{\text{ }}$ is irrational (8.EE.2))	• Unit Item Bank	• Student Notes: Identifying irrational numbers • Holt Middle School Math Course 3: 3-10 • Enrichment: Identify real numbers
			• Use square root symbol to identify if a number is rational or irrational	• Unit Item Bank	• Student Notes: Identifying irrational numbers • Holt Middle School Math Course 3: 3-10 • Enrichment: Identify real numbers
		Rational number representations	• Approximate irrational numbers with a rational number	• Unit Item Bank	• Student Notes: Approximating irrational numbers • Extended Response: Farmer Fencing Fiasco Part 1 • Holt Middle School Math Course 3: 3-9 • Enrichment: Simplify irrational numbers (e.g. $\sqrt{\overline{\text{ }}}$, factor method, perfect square method)
			• Compare irrational numbers using rational approximations	• Unit Item Bank	• Student Notes: Comparing/ordering irrationals • Extended Response: Farmer Fencing Fiasco Part 2 • Enrichment: --
			• Order irrational numbers using rational approximations	• Unit Item Bank	• Student Notes: Comparing/ordering irrationals • Enrichment: --
			• Locate irrational numbers on a number line using rational approximations	• Unit Item Bank	• Student Notes: Locating irrationals on a number line • Holt Middle School Math Course 3: 3-9 • Enrichment: Rationalizing square roots
			• Estimate values of expressions with irrational numbers using rational approximations	• Unit Post-Test • Unit Item Bank	• Student Notes: Estimating values of expressions • Holt Middle School Math Course 3: 3-9 • Enrichment: Evaluating irrational expressions

Vocabulary: Square Root, Rational Numbers, Irrational Numbers

8th Grade Pre-Algebra Unit 2: Radicals and Exponents

Approximate Duration of Study: 4 Weeks **When to Study:** Quarter 1

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.EE.1	How can we represent integer exponents in multiple ways?	Positive exponents	• Multiply/Divide/Power to a Power exponents with a common base	• Unit Pre-Test • Unit Item Bank	• Student Notes: Operations with exponents • Holt Middle School Math Course 3: 2-7 • Enrichment: Monomial simplification
		Negative exponents	• Represent negative exponents in fraction form	• Unit Item Bank	• Student Notes: Negative exponents • Holt Middle School Math Course 3: 2-8 • Enrichment: Monomials with negative exponents
			• Multiply/Divide/Power to a Power exponents with a common base with negative exponent solutions	• Unit Item Bank	• Student Notes: Negative exponents operations • Enrichment: Negative exponent monomial simplification
8.EE.2	What is the relationship between exponents and roots?	Evaluation of roots	• Evaluate square roots of small perfect squares	• Unit Item Bank	• Student Notes: Evaluation of roots • Extended Response: The Block Patio • Holt Middle School Math Course 3: 3-8 • Enrichment: N^{th} roots
			• Evaluate cube roots of small perfect cubes	• Unit Item Bank	• Student Notes: Evaluation of roots • Enrichment: N^{th} roots
		Exponent equations	• Solve $x^2 = p$ when p is a rational number	• Unit Item Bank	• Student Notes: Solving exponent equations • Extended Response: The Picture Frame • Enrichment: Solving root equations
			• Solve $x^3 = p$ when p is a rational number	• Unit Item Bank	• Student Notes: Solving exponent equations • Enrichment: Solving root equations
8.EE.3	How does our decimal number system relate to powers of ten?	Estimation of numbers using powers of ten	• Estimate a number using a single digit times a power of ten	• Unit Item Bank	• Student Notes: Estimating large and small numbers • Enrichment: Solving binomials squared
			• Estimate how many times bigger one such number is than another	• Unit Item Bank	• Student Notes: How many times bigger? • Extended Response: The Cost of China • Enrichment: Solving binomials cubed

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.EE.4	How can scientific notation help us understand big and small numbers?	Scientific notation	• Express standard notation in scientific notation	• Unit Item Bank	• Student Notes: Scientific notation • Holt Middle School Math Course 3: 2-9 • Enrichment: Solving vertex form quadratics
			• Express scientific notation in standard notation	• Unit Item Bank	• Student Notes: Scientific notation • Holt Middle School Math Course 3: 2-9 • Enrichment: Solving vertex form quadratics
			• Determine appropriate units of measure given scientific notation	• Unit Item Bank	• Student Notes: Determining units of measure • Enrichment: Unit conversions
		Scientific notation operations	• Perform operations with scientific notation and standard notation (mixed)	• Unit Item Bank	• Student Notes: Scientific notation operations • Extended Response: The Trip to Mars • Enrichment: --
			• Interpret scientific notation from technology	• Unit Post-Test • Unit Item Bank	• Student Notes: Scientific notation • Enrichment: --
Vocabulary: Exponent, Cube Root, Scientific Notation					

8th Grade Pre-Algebra Unit 3: Proportions and Lines

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 2

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.EE.5	What is the relationship between slope and proportions?	Proportions and unit rates	• Graph proportional relationship ($^{y}/_{x} = {}^{a}/_{b}$ implies $y = {}^{a}/_{b} * x$)	• Unit Pre-Test • Unit Item Bank	• Student Notes: Graphing proportional relationships • Extended Response: Trading Bananas • Enrichment: Graphing proportions with a y-intercept
			• Interpret slope as the lowest terms proportion in a relationship (unit rate)	• Unit Item Bank	• Student Notes: Slope as proportion ratio • Enrichment: Negative slope and proportions
			• Compare two different representations of proportional relationships (graph, table, equation, story, etc.)	• Unit Item Bank	• Student Notes: Compare proportion representations • Extended Response: Comparing Race Cars • Enrichment: --
8.EE.6	What is the relationship between slope and proportions?	Slope	• Use similar triangles to prove that the slope is the same between any two points on a non-vertical line (because we assume that slope is well-defined)	• Unit Item Bank	• Student Notes: Slope is the same • Enrichment: Slope formula
			• Derive the slope-intercept form of an equation through the origin	• Unit Item Bank	• Student Notes: Slope-intercept form • Enrichment: Equation given two points
			• Derive the slope-intercept form of an equation through a y-intercept of *b*	• Unit Post-Test • Unit Item Bank • Quarter Project • Quarter Exam	• Student Notes: Slope-intercept form • Enrichment: Equation given two points
Vocabulary: Proportion, Unit Rate, Slope, Similar					

8th Grade Pre-Algebra Unit 4: Linear Equations and Systems of Equations

Approximate Duration of Study: 5 Weeks **When to Study:** Quarter 2

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.EE.7	How do we determine the value of a variable?	Multi-step equations with one variable	• Solve equations by combining like terms and that require the distributive property	• Unit Pre-Test • Unit Item Bank	• Student Notes: Solving equations algebraically • Student Notes: Algebraic word problems • Extended Response: The Super Sock Sale • Holt Middle School Math Course 3: 10-2 and 10-3 • Enrichment: Solving equations graphically
			• Solve equations with infinite and no solutions	• Unit Item Bank	• Student Notes: Infinite and no solutions • Holt Middle School Math Course 3: 10-3 • Enrichment: Solving absolute value equations
			• Give examples of equations with one solution, no solution, and infinite solutions	• Unit Item Bank	• Student Notes: Creating equations • Enrichment: --
8.EE.8	How can we solve equations with two variables?	Systems of equations	• Estimate solutions to systems of equations graphically, understanding that the solution is the point of intersection	• Unit Item Bank	• Student Notes: Solving systems graphically • Enrichment: Infinite and no solution systems graphically
			• Solve systems of equations algebraically via substitution, elimination, or inspection (for infinite or no solutions).	• Unit Item Bank	• Student Notes: Solving systems with substitution • Student Notes: Solving systems with elimination • Student Notes: Solving systems with inspection • Holt Middle School Math Course 3: 10-6 • Enrichment: Solving vertical or horizontal line systems
			• Solve real-world system of equations problems	• Unit Post-Test • Unit Item Bank	• Student Notes: Solving systems word problems • Extended Response: The Pumpkin Patch • Holt Middle School Math Course 3: 10-6 • Enrichment: Complicated word problems
Vocabulary: Inverse Operations, Empty Set, Infinite Solutions, Distributive Property					

8th Grade Pre-Algebra Unit 5: Introduction to Functions

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 2

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.F.1	How can we use the concept of a function machine to understand mathematical relationships?	Functions	• Understand the concept of a function as a rule of each input yielding exactly one output *(function notation not required)*	• Unit Pre-Test • Unit Item Bank	• Student Notes: Intro to functions • Holt Middle School Math Course 3: 12-4 • Extended Response: Cell Phone Companies • Enrichment: Using function notation • Technology: VLM Function Machine
			• Graph a function using ordered pairs of (input, output)	• Unit Item Bank	• Student Notes: Graphing functions • Holt Middle School Math Course 3: 12-4 • Enrichment: Discover the function rule from a graph
8.F.2	How can functions be represented in multiple ways?	Function representations	• Compare function properties using multiple representations (graph, table, equation, story, etc.)	• Unit Item Bank	• Student Notes: Comparing functions • Extended Response: Comparing Race Cars Part 2 • Enrichment: --
8.F.3	What are the defining characteristics of a linear function?	Linear functions	• Interpret equations of the form $y = mx + b$ as linear functions	• Unit Item Bank	• Student Notes: Linear functions • Holt Middle School Math Course 3: 12-5 • Enrichment: Quadratic functions
		Non-linear functions	• Give examples of non-linear functions and justify why they are non-linear	• Unit Post-Test • Unit Item Bank	• Student Notes: Non-linear functions • Activity: Filling a bottle • Holt Middle School Math Course 3: 12-6 and 12-7 • Enrichment: Exponential functions
Vocabulary: Function, Domain, Range, Dependent Variable, Independent Variable, Linear, Non-Linear					

8th Grade Pre-Algebra Unit 6: Function Modeling

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 3

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.F.4	How can functions be used to model situations?	Functions	• Construct a function to model a linear relationship	• Unit Pre-Test • Unit Item Bank	• Student Notes: Construct a linear function • Holt Middle School Math Course 3: 12-5 • Enrichment: Construct a non-linear function
		Rate of change	• Determine the rate of change (slope) and initial value from a description of the relationship	• Unit Item Bank	• Student Notes: Slope and y-intercepts of functions • Holt Middle School Math Course 3: 12-5 • Enrichment: Finding the vertex of a quadratic
			• Determine the rate of change (slope) and initial value from two (x,y) points given graphically or in a table	• Unit Item Bank	• Student Notes: Functions from points • Holt Middle School Math Course 3: 12-5 • Enrichment: Parabola from three points
8.F.5	How can graphs to be used to describe function relationships?	Function graphs	• Use a function graph to qualitatively describe a relationship between two quantities	• Unit Item Bank	• Student Notes: Describing a graph (and local max/min) • Activity: Identifying Qualitative Graphs • Enrichment: Describing non-linear graphs
			• Sketch a graph given a verbal description of a function relationship	• Unit Post-Test • Unit Item Bank • Quarter Exam • Quarter Project	• Student Notes: Sketching a graph • Holt Middle School Math Course 3: 12-5 • Enrichment: --
Vocabulary: Rate of Change, Initial Value					

8th Grade Pre-Algebra Unit 7: Congruence and Similarity

Approximate Duration of Study: 4 Weeks **When to Study:** Quarter 3

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.G.1	What effects do transformations have on lines, segments, and angles?	Transformations	• Verify experimentally that rotations, reflections, and translations take lines to lines, segments to segments of same length, angles to angles of same measure, and parallel lines to parallel lines	• Unit Pre-Test • Unit Item Bank	• Student Notes: An experiment with transformations • Holt Middle School Math Course 3: 5-7 • Enrichment: --
8.G.2	What makes figures congruent?	Congruence	• Understand that two-dimensional figures are congruent if a sequence of rotations, reflections, and translations takes one to the other	• Unit Item Bank	• Student Notes: More experiments • Holt Middle School Math Course 3: 5-6 • Enrichment: Congruence through equal measurements
			• Given two congruent figures, describe the series of rotations, reflections, and translations to take one figure to the other	• Unit Item Bank	• Student Notes: More experiments • Enrichment: --
8.G.3	What effects do transformations have on coordinates?	Transformations	• Describe the effect of translations, rotations, reflections, and dilations on two-dimensional figures using coordinates	• Unit Item Bank	• Student Notes: Transformations on coordinates • Holt Middle School Math Course 3: 5-7 and 7-5 • Enrichment: Reflection formula

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.G.4	What makes figures similar?	Similarity	• Understand that two-dimensional figures are similar if a sequence of dilations, rotations, reflections, and translations takes one to the other	• Unit Item Bank	• Student Notes: Similarity • Holt Middle School Math Course 3: 7-6 • Enrichment: Similarity through proportionality
			• Given two similar figures, describe the series of dilations, rotations, reflections, and translations to take one figure to the other	• Unit Item Bank	• Student Notes: Similarity experiments • Enrichment: --
8.G.5	What can we learn from the angles of triangles?	Angle sum	• Use informal arguments to find the sum of the interior angles of a triangle	• Unit Item Bank	• Student Notes: Sum of the angles of triangles • Holt Middle School Math Course 3: 5-3 • Enrichment: Sum of the angles of a polygon
			• Use informal arguments to find the exterior angle of a triangle is equal to the sum of the remote interior angles	• Unit Item Bank	• Student Notes: Sum of exterior angles • Enrichment: Exterior angles of a polygon
		Parallel lines and transversals	• Identify congruent angles when parallel lines are cut by a transversal	• Unit Item Bank	• Student Notes: Parallel lines cut by a transversal • Holt Middle School Math Course 3: 5-2 • Enrichment: --
		Similarity	• Derive the angle-angle criterion for similarity of triangles	• Unit Post-Test • Unit Item Bank	• Student Notes: Similar triangles • Holt Middle School Math Course 3: 7-6 • Enrichment: --
Vocabulary: Transformation, Reflection, Rotation, Translation, Dilation, Congruent, Similar, Alternate Interior Angles, Alternate Exterior Angles, Corresponding Angles, Vertical Angles, Supplementary Angles					

8th Grade Pre-Algebra Unit 8: Pythagorean Theorem

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 4

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.G.6	How do we know the Pythagorean Theorem is true?	Pythagorean theorem	• Give a proof for the Pythagorean Theorem	• Unit Pre-Test • Unit Item Bank	• Student Notes: Pythagorean theorem • Holt Middle School Math Course 3: 6-3 • Enrichment: Pythagorean inequalities
			• Give a proof for the converse of the Pythagorean Theorem	• Unit Item Bank	• Student Notes: Pythagorean converse • Holt Middle School Math Course 3: 6-3 • Enrichment: Triangle inequality
8.G.7	How can we use the Pythagorean Theorem?	Pythagorean theorem	• Apply the Pythagorean Theorem to find unknown side lengths in right triangles in two-dimensional real world and mathematical situations	• Unit Item Bank	• Student Notes: Application of Pythagorean theorem • Holt Middle School Math Course 3: 6-3 • Enrichment: Multi-step applications
			• Apply the Pythagorean Theorem to find unknown side lengths in right triangles in three-dimensional real world and mathematical situations	• Unit Item Bank	• Student Notes: 3D applications • Holt Middle School Math Course 3: 6-3 • Enrichment: Multi-step applications
8.G.8	How can the Pythagorean Theorem be applied to the coordinate plane?	Pythagorean theorem	• Use the Pythagorean Theorem to find the distance between two points on the coordinate plane *(optional: distance formula)*	• Unit Post-Test • Unit Item Bank • Quarter Exam • Quarter Project	• Student Notes: Distance between points • Holt Middle School Math Course 3: 6-3 • Enrichment: Distance formula • Activity: Pythagorean theorem and transformations
Vocabulary: Pythagorean Theorem, Right Triangle					

8th Grade Pre-Algebra Unit 9: Volume of Rounded Objects

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 4

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.G.9	How can we determine the volume of objects?	Volume	• Know and apply the volume formula for cylinders *($V = \pi r^2 h$)*	• Unit Pre-Test • Unit Item Bank	• Student Notes: Volume of cylinders • Holt Middle School Math Course 3: 6-6 • Enrichment: Surface area of cylinders
			• Know and apply the volume formula for cones *($V = {}^1/_3 \pi r^2 h$)*	• Unit Item Bank	• Student Notes: Volume of cones • Holt Middle School Math Course 3: 6-7 • Enrichment: Surface area of cones
			• Know and apply the volume formula for spheres *($V = {}^4/_3 \pi r^3$)*	• Unit Post-Test • Unit Item Bank	• Student Notes: Volume of spheres • Holt Middle School Math Course 3: 6-10 • Enrichment: Surface area of spheres
Vocabulary: Cylinder, Cone, Sphere, Volume					

8th Grade Pre-Algebra Unit 10: Patterns in Bivariate Data

Approximate Duration of Study: 4 Weeks **When to Study:** Quarter 4

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.SP.1	How can a scatter plot be used to help interpret data?	Scatter plots	• Construct scatter plots for bivariate measurement data	• Unit Pre-Test • Unit Item Bank	• Student Notes: Constructing scatter plots • Holt Middle School Math Course 3: 4-7 • Enrichment: Misleading data presentation
			• Interpret scatter plots by investigating patterns including clustering, outliers, positive or negative association, and linear or non-linear association	• Unit Item Bank	• Student Notes: Analyzing scatter plots • Holt Middle School Math Course 3: 4-7 • Enrichment: Misleading data presentation
8.SP.2	How can we use a straight line to model bivariate data?	Scatter plots	• For scatter plots with a linear association, informally draw a line of best fit	• Unit Item Bank	• Student Notes: Line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Median-median points
			• Informally assess the line of best fit by judging the closeness of data points to the line	• Unit Item Bank	• Student Notes: Line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Median-median points
8.SP.3	How can we use a straight line to predict outcomes?	Scatter plots	• Find the equation for a line of best fit	• Unit Item Bank	• Student Notes: Line of best fit equation • Holt Middle School Math Course 3: 11-7 • Enrichment: Using median-median points for line of best fit
			• Use the equation of the line of best fit to solve problems in context	• Unit Item Bank	• Student Notes: Extrapolating with line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Finding distance of a point to a line
			• Interpret slope and the y-intercept of the equation in context	• Unit Item Bank	• Student Notes: Analyzing line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Finding distance of a point to a line

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.SP.4	How can we determine a relationship in data using frequency	Frequency	• Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects.	• Unit Item Bank	• Student Notes: Collecting two-way data tables • Holt Middle School Math Course 3: 4-7 • Enrichment: Venn diagrams
			• Use relative frequencies calculated for rows or columns to describe possible association between the two variables.	• Unit Post-Test • Unit Item Bank • Quarter Exam • Quarter Project	• Student Notes: Looking for patterns • Enrichment: Venn diagrams
Vocabulary: Scatter Plot, Bivariate Data, Positive Association , Negative Association, Linear Association, Non-Linear Association, Clustering, Outlier, Line of Best Fit, Two-Way Table, Frequency, Relative Frequency					

8th Grade Algebra Unit 1: Reasoning between Quantities and with Equations

Approximate Duration of Study: 4 Weeks **When to Study:** Quarter 1

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
N.Q.1	How do units guide our actions in problem solving?	Units	• Use units to guide to a solution	• Unit Pre-Test •	• Extended Response: Speeding Ticket
			• Choose and interpret units in formulas	•	•
			• Choose and interpret scale and origin in data display	•	•
N.Q.2			• Define appropriate quantities for the purpose of descriptive modeling	•	•
N.Q.3			• Choose a level of accuracy of appropriate to limitations on measurement when reporting quantities	•	•
A.SSE.1	How do we understand expressions?	Expressions *(linear and exponential only)*	• Interpret parts of an expression, such as terms, factors, and coefficients in context	•	•
			• Interpret complicated expressions by viewing one or more of their parts as a single entity	•	•
N.RN.1			• Derive rules for rational exponents	•	•
N.RN.2			• Rewrite expressions with radicals and rational exponents	•	•

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
A.CED.1	How can we represent numeric relationships?	Modeling with equations *(linear and exponential)*	• Create equations and inequalities in one variable and use them to solve problems by substituting values	•	• Extended Response: How Many Beads
A.CED.2		Modeling with equations *(linear and exponential)*	• Create equations in two or more variables to represent relationship between quantities	•	•
		Graphing *(linear and exponential)*	• Graph equations on coordinate axes with labels and scales	•	•
A.CED.3		Modeling with equations *(linear only)*	• Represent constraints by equations or inequalities	•	•
			• Represent constraints by systems of EQ or InEQ	•	•
			• Interpret solutions as viable or non-viable	•	•
A.REI.1	How can we find solutions when a numeric relationship exists?	Inverse Operations *(linear only)*	• Explain each step in solving a simple equation	•	• HRW Algebra One Course 2: 1-3, 1-4, 1-5
			• Construct an argument to justify a solution method	•	• HRW Algebra One Course 2: 1-3, 1-4, 1-5
A.REI.3		*(include simple exponential solving like)*	• Solve linear EQ and InEQ in one variable including ones with variable coefficients	•	• HRW Algebra One Course 2: 1-3, 1-4, 1-5
A.CED.4	How can we highlight a given value?	Algebraic manipulation *(linear only)*	• Rearrange a formula to highlight a variable of interest	• Unit Post-Test	•
Vocabulary: Scale, origin, term, coefficient, constant, factor, radical, rational					

8th Grade Algebra Unit 2: Systems of Equations and Graphical Solutions

Approximate Duration of Study: 4 Weeks **When to Study:** Quarter 1

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.EE.8 / A.REI.6	How can we solve equations with two unknowns?	Systems of Equations	• Estimate solutions to systems of equations graphically, understanding that the solution is the point of intersection	• Unit Pre-Test	• Student Notes: Solving systems graphically • HRW Algebra One Course 2: 2-3 • Enrichment: Infinite and no solution systems graphically
			• Solve systems of equations algebraically via substitution, elimination, or inspection (for infinite or no solutions).	•	• Student Notes: Solving systems with substitution • HRW Algebra One Course 2: 2-4 • Student Notes: Solving systems with elimination • HRW Algebra One Course 2: 2-5 • Student Notes: Solving systems with inspection • HRW Algebra One Course 2: 2-6 • Enrichment: Solving vertical or horizontal line systems
			• Solve real-world system of equations problems	•	• Student Notes: Solving systems word problems • Extended Response: The Pumpkin Patch • Enrichment: Complicated word problems
A.REI.5			• Prove that replacing one equation with the sum of that equation and a multiple of the other yields the same solution	•	•
A.REI.10	How can graphical representations help us solve equations?	Graphing Equations	• Understand that a graph represents a solution set *(graph linear and exponential only)*	•	•
A.REI.11			• Use graphs to solve by understanding the - coordinate of the intersection point(s) is the solution *(linear and exponential only)*	•	• HRW Algebra One Course 2: 2-3

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
A.REI.12	How can graphical representations help us solve inequalities?	Graphing Inequalities	• Graph solutions to linear inequalities as half planes	•	• HRW Algebra One Course 2: 2-7
			• Graphs solutions to a system of linear inequalities as the intersection of half planes	• Unit Post-Test • Quarter Project • Quarter Exam	• HRW Algebra One Course 2: 2-7
Vocabulary: Infinite solutions, no solution					

8th Grade Algebra Unit 3: Basic Functions

Approximate Duration of Study: 2 Weeks **When to Study:** Quarter 2

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.F.1 / F.IF.1	How can we use the concept of a function machine to understand mathematical relationships?	Function Definitions	• Understand the concept of a function as a rule of each input in the domain yielding exactly one output in the range *(function notation required and examine linear and exponential functions only)*	• Unit Pre-Test	• Student Notes: Intro to functions • Holt Middle School Math Course 3: 12-4 • Extended Response: Cell Phone Companies • Technology: VLM Function Machine
F.IF.2			• Evaluate functions for input in their domain	•	•
8.F.1 / F.IF.1			• Graph a function using ordered pairs of (input, output) and	•	• Student Notes: Graphing functions • Holt Middle School Math Course 3: 12-4 • Enrichment: Discover the function rule from a graph
8.F.2 / F.IF.9	How can functions be represented in multiple ways?	Function representations	• Compare function properties using multiple representations (graph, table, equation, story, etc.)	•	• Student Notes: Comparing functions • Extended Response: Comparing Race Cars Part 2 • Extended Response: Sum of Digits
8.F.3	What are the defining characteristics of a linear function?	Linear functions	• Interpret equations of the form $y = mx + b$ as linear functions	•	• Student Notes: Linear functions • Holt Middle School Math Course 3: 12-5
		Non-linear functions	• Give examples of non-linear functions and justify why they are non-linear	• Unit Post-Test	• Student Notes: Non-linear functions • Activity: Filling a bottle • Holt Middle School Math Course 3: 12-6 and 12-7

8th Grade Algebra Unit 4: Functions

Approximate Duration of Study: 5 Weeks **When to Study:** Quarter 2

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.F.4 / F.IF.4 / F.IF.6 / F.LE.2	How can functions be used to model situations?	Constructing Functions	• Construct a function to model a linear relationship	• Unit Pre-Test	• Student Notes: Construct a linear function • HRW Algebra One Course 2: 2-2 • Enrichment: Construct a non-linear function
F.LE.1a / F.LE.1b			• Prove that linear functions grow by equal differences over equal intervals and recognize those situations	•	• HRW Algebra One Course 2: 2-2
F.BF.1 / F.LE.2			• Construct a function to model an exponential relationship	•	• HRW Algebra One Course 2: 6-5 • Extended Response: Dropping the Ball *(should complete together as it is a complicated solution)*
F.LE.1a/ F.LE.1c			• Prove that exponential functions grow by equal factors over equal intervals and recognize those situations	•	• HRW Algebra One Course 2: 6-5
F.IF.3 / F.BF.2 / F.LE.2			• Construct a function to model arithmetic (linear) and geometric (exponential) sequences both recursively and explicitly	•	•
F.LE.5			• Interpret the parameters of a function in context	•	•
F.BF.3		Transformation of Functions	• Consider and for linear and exponential functions *If time consider and*	•	•

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.F.4 / F.IF.4 / F.IF.6	What is rate of change?	Rate of change	• Determine the rate of change (slope) and initial value from a description of a linear relationship	•	• Student Notes: Slope and y-intercepts of functions • Holt Middle School Math Course 3: 12-5 • Enrichment: Finding the vertex of a quadratic
			• Determine the rate of change (slope) and initial value from two (x,y) points given graphically or in a table	•	• Student Notes: Functions from points • Holt Middle School Math Course 3: 12-5 • Enrichment: Parabola from three points
			• Estimate the rate of change from the graph	•	•
			• Calculate the average rate of change over an interval *(linear and exponential)*	•	•
8.F.5 / F.IF.4	How can graphs to be used to describe function relationships?	Function graphs	• Use a function graph to qualitatively describe a relationship between two quantities	•	• Student Notes: Describing a graph (and local max/min) • Activity: Identifying Qualitative Graphs • Enrichment: Describing non-linear graphs
			• Sketch a graph given a verbal description of a function relationship	•	• Student Notes: Sketching a graph • Holt Middle School Math Course 3: 12-5 • Enrichment: --
F.IF.7			• Graph linear and exponential functions and describe key features of the graph	•	•
F.LE.3			• Observe with graphs and tables that exponential growth is greater than linear	•	•
F.IF.5	How does the domain of a function affect its graph?	Function Domain	• Relate the domain to the graph *(such as integer domains producing points rather than lines)*	• Unit Post-Test • Quarter Project • Quarter Exam	•
Vocabulary: Function, domain, range, recursion					

8th Grade Algebra Unit 5: Descriptive Statistics

Approximate Duration of Study: 5 Weeks **When to Study:** Quarter 3

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
S.ID.1	How can we best interpret and represent data?	Data Representation	• Represent data with plots on a number line (dot plots, histograms, box plots)	• Unit Pre-Test	• Box plot grapher • Histogram grapher
S.ID.2 / S.ID.3		Data Comparison	• Use center (mean, median) and shape (interquartile range, standard deviation) to compare data sets	•	•
S.ID.3		Outliers	• Determine the effects of outliers on center and shape	•	•
8.SP.1	How can we use functions to model and interpret bivariate data?	Scatter plots	• Construct scatter plots for bivariate measurement data	•	• Student Notes: Constructing scatter plots • Holt Middle School Math Course 3: 4-7 • Enrichment: Misleading data presentation
			• Interpret scatter plots by investigating patterns including clustering, outliers, positive or negative association, and linear or non-linear association	•	• Student Notes: Analyzing scatter plots • Holt Middle School Math Course 3: 4-7 • Enrichment: Misleading data presentation
8.SP.2 / S.ID.6b / S.ID.6c			• For scatter plots with a linear association, informally draw a line of best fit	•	• Student Notes: Line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Median-median points
			• Informally assess the line of best fit by judging the closeness of data points to the line and analyzing residuals	•	• Student Notes: Line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Median-median points

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
8.SP.3 / S.ID.6a	How can we use functions to model and interpret bivariate data?	Scatter plots	• Use technology to find a function of best fit for data *(linear or exponential)*	•	• Student Notes: Line of best fit equation • Holt Middle School Math Course 3: 11-7 • Enrichment: Using median-median points for line of best fit
			• Use the equation of the line of best fit to solve problems in context *(use informal line of best fit and technology)*	•	• Student Notes: Extrapolating with line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Finding distance of a point to a line
S.ID.7			• Interpret slope and the y-intercept of the equation in context	•	• Student Notes: Analyzing line of best fit • Holt Middle School Math Course 3: 11-7 • Enrichment: Finding distance of a point to a line
S.ID.8		Correlation and Causation	• Compute and interpret the correlation coefficient of a linear line of best fit for a data set	•	•
S.ID.9			• Distinguish between correlation and causation	•	•
8.SP.4 / S.ID.5	How can we determine a relationship in data using frequency	Frequency	• Construct and interpret a two-way table summarizing data on two categorical variables collected from the same subjects (including joint (the whole table), marginal (frequency in row or column), and conditional relative frequencies (frequency over total data points))	•	• Student Notes: Collecting two-way data tables • Holt Middle School Math Course 3: 4-7 • Enrichment: Venn diagrams
			• Use relative frequencies calculated for rows or columns (marginal frequencies) to describe possible association between the two variables	• Unit Post-Test	• Student Notes: Looking for patterns • Enrichment: Venn diagrams
Vocabulary: Scatter Plot, Bivariate Data, Positive Association , Negative Association, Linear Association, Non-Linear Association, Clustering, Outlier, Line of Best Fit, Two-Way Table, Frequency, Joint Frequency, Marginal Frequency, Conditional Relative Frequency, Correlation Coefficient, Causation, Residuals					

8th Grade Algebra Unit 6: Equivalent Expressions and Equation Operations

Approximate Duration of Study: 3 Weeks **When to Study:** Quarter 3

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
A.SEE.1	How can we better understand expressions and equations?	Quadratic Expressions	• Interpret parts of a quadratic expression such as terms, factors, and coefficients in context	• Unit Pre-Test	•
			• Interpret complicated expressions by viewing one or more parts as a single entity	•	•
A.CED.2		Graphing Equations	• Create quadratic equations in two variables to represent relationships and graph those equations	•	• HRW Algebra One Course 2: 8-1
A.SEE.3a/ A.SEE.3b		Quadratic Equations	• Factor a quadratic to reveal zeros	•	• HRW Algebra One Course 2: 7-5, 7-6, 7-7
			• Complete the square to reveal max/min	•	• HRW Algebra One Course 2: 8-2
A.SEE.2 / A.CED.4			• Use structure to rewrite expressions *(write quadratics in standard and vertex form)*	•	•
A.SEE.3c		Exponential Equations	• Use properties of exponents to rewrite exponential functions	•	•
A.APR.1 / F.BF.1b	How can we perform operations with polynomials?	Polynomials *(linear and quadratic only)*	• Know that polynomials are closed under add, subtract, and multiply	•	•
			• Add, subtract, and multiply polynomials	• Unit Post-Test • Quarter Project • Quarter Exam	• HRW Algebra One Course 2: 6-2, 7-2, 7-4
Vocabulary: Quadratics, Polynomials					

8th Grade Algebra Unit 7: Solving Quadratics

Approximate Duration of Study: 3 Weeks **When to Study:** Quarter 4

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
A.REI.4	How can we solve problems with quadratics?	Quadratic Equations	• Solve quadratics by factoring	• Unit Pre-Test	• HRW Algebra One Course 2: 8-4
			• Solve quadratics by completing the square	•	• HRW Algebra One Course 2: 8-4
			• Derive the quadratic formula from completing the square	•	• HRW Algebra One Course 2: 8-5
			• Solve quadratics using the quadratic formula	•	• HRW Algebra One Course 2: 8-5
A.REI.7		Quadratic Systems	• Solve a system of a linear and a quadratic graphically	•	•
			• Solve a system of a linear and a quadratic algebraically	•	•
A.CED.1		Quadratic Inequalities	• Solve quadratic inequalities in one variable	•	• HRW Algebra One Course 2: 8-6
			• Solve quadratic inequalities in two variables by graphing	• Unit Post-Test	• HRW Algebra One Course 2: 8-6
Vocabulary: Quadratics, Polynomials					

8th Grade Algebra Unit 8: Quadratic Functions and Modeling

Approximate Duration of Study: 5 Weeks **When to Study:** Quarter 4

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
N.RN.3	How do rational numbers relate to irrational numbers?	Real Numbers	• Explain the sum or product of rationals is rational	• Unit Pre-Test	•
			• Explain the sum of rational and irrational is irrational	•	•
			• Explain the product of rational and irrational is irrational	•	•
8.G.6	How do we know the Pythagorean Theorem is true?	Pythagorean theorem	• Give a proof for the Pythagorean Theorem	•	• Student Notes: Pythagorean theorem • HRW Algebra One Course 2: 9-4 • Enrichment: Pythagorean inequalities
			• Give a proof for the converse of the Pythagorean Theorem	•	• Student Notes: Pythagorean converse • HRW Algebra One Course 2: 9-4 • Enrichment: Triangle inequality
8.G.7	How can we use the Pythagorean Theorem?		• Apply the PT to find unknown side lengths in 2D real world and mathematical situations	•	• Student Notes: Application of Pythagorean theorem • HRW Algebra One Course 2: 9-4 • Enrichment: Multi-step applications
			• Apply the PT to find unknown side lengths in 3D real world and mathematical situations	•	• Student Notes: 3D applications • HRW Algebra One Course 2: 9-4 • Enrichment: Multi-step applications
8.G.8			• Use the PT to find the distance between two points on the coordinate plane *(optional: distance formula)*	•	• Student Notes: Distance between points • HRW Algebra One Course 2: 9-4 • Enrichment: Distance formula • Activity: Pythagorean theorem and transformations

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
F.IF.4 / F.IF.7a / F.IF.8a	How do graphs help us understand quadratic functions?	Quadratic Graphs	• Interpret key features including where function is increasing, decreasing, positive, negative, and has symmetry, max/min	•	•
			• Sketch a quadratic function given a verbal description	•	•
F.IF.9			• Compare properties of two quadratic functions using graphs, tables, equations, and descriptions	•	•
F.LE.3			• Observe with graphs and tables that exponential growth is greater than linear or quadratic	•	•
F.IF.5		Domain	• Relate the domain to the graph of a quadratic	•	•
F.IF.6		Rate of Change	• Estimate and calculate the average rate of change over an interval on a quadratic	•	•
F.IF.7b	How can we best interpret other functions?	Other Graphs	• Graph square root, cube root, piece-wise defined, step, and absolute value functions and compare to linear, quadratic, and exponential graphs	•	• HRW Algebra One Course 2: 1-6
F.IF.8b			• Use properties of exponents to interpret exponential functions including determining if there is exponential growth or decay	•	• HRW Algebra One Course 2: 6-5

CCS	Essential Question	Concept	Skills	Assessments	Helpful Strategies and Resources
F.BF.1a	How can we build new functions?	Creating Quadratics	• Determine a quadratic expression to represent a context	•	•
F.BF.3		Transform-ation of Functions	• Consider and for quadratic functions *If time consider and*	•	•
F.BF.4		Inverse Functions	• Find the inverse function of linear equations and simple quadratics by restricting the domain	• Unit Post-Test • Quarter Project • Quarter Exam	•
Vocabulary: Piece-Wise Defined Functions, Step Functions, Absolute Value Functions, Inverse Functions					