Curriculum Sample Template – 8 Pages Max. (12 pages for integrated ELA sample)

Grade Level	9	**Content Area**	Mathematics
Course Title (grades 9-12 Only)	Algebra 1		
Expected Prior Knowledge *List the knowledge/skills mastered earlier in the year that are foundational to the mastery of the Required Standard(s).*	Students will already be able to: • Multiply, divide, and reduce fractions (4.NF.1)(4.NF.4)(5.NF.4)(5.NF.7) • Calculate unit rates (7.RP.1) • Graph proportional relationships, compare proportional relationships, and relate unit rates to slope (8.EE.5)		
Alignment to Program of Instruction *Describe how the methods of instruction found in this sequence of lessons align to the Program of Instruction described in the application package.*	In this lesson students are required to apply the math concepts learned to real world situations and utilize them in a project that mirrors real world uses for the math. Students will be actively engaged in their learning by participating in classroom and group discussion about the content and describing how and why they solved problems the way they did. Vocabulary will be pre taught to ensure that the words used are not the reason for not understanding the content. Students will be supported in the beginning of the lessons and gradually released to do the tasks on their own. Sheltering techniques that include a language component in leach lesson and clearly stating the learning objective to students are included. Prior knowledge is activated early in the unit to help students understand the new content.		
Standard Number* and Description *The standard number and description of the Required Standard(s) being instructed and assessed to mastery in the curriculum sample.*	N-Q.A.1 - Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays.		
Materials/Resources Needed *List all items the teacher and students will need for the entire sequence of instruction (excluding common consumables)*	• Their personal academic glossary – a document carried around by all students to all classes where they enter their own words • Their math journal – a notebook where they take notes daily in a standard form.		

* ***Standard Number****: For English Language Arts (Reading and Writing), use Grade, Strand, Standard (e.g., 3.RI.2). For K-8 Math, use Grade, Domain, Cluster, Standard (e.g., 6.EE.B.7). For HS Math, use Conceptual Category-Domain, Cluster, Standard (e.g., A-REI.C.6).*

Lesson (add as needed)	**Instructional Strategies -** *List and describe teacher actions, lesson by lesson, which will provide students with opportunities to engage the grade-level rigor defined by the Required Standard(s). Indicate alignment of instructional strategies to specific component(s) or content/skill(s) of the Required Standard/component.*	**Student Activities -** *Describe the activities, lesson by lesson, in which students will engage to allow them to master the grade-level rigor defined by the Required Standard(s). Indicate alignment of student activities to specific component(s) or content/skill(s) of the Required Standard/component.*
1	**1. Introduce unit and project –** Teacher will introduce the unit by posing the questions: "You want to plan and give a birthday party for your friend. You talk to your other friends and they say they would be happy to split the cost, if you will do the planning. What information will you need to make the party a success? How could you know how much money to charge each person?" Discussion follows. Teacher then introduces the project they will be working on as they will be planning a party and dividing the cost among the guests. **2. Pre-teach vocabulary –** Teacher gives students the words: unit, rate, dimension, analysis, per (as rate and division), by (as multiplication), of (as multiplication), **3. Access Prior Knowledge –** Teacher reviews Multiplication and division of fractions, rates, common units, metric units and prefixes, and factoring out fractions to cancel out common factors. Does examples of each, and has students practice.	1. Students discuss in small groups the question, and give their best answers 2. Students enter vocabulary words into their Personal Academic Glossary 3. Students take notes and do practice problems. **Alignment to content/skills of Required Standard:** This lesson will give students the foundational skills necessary to understand how to use units to guide their problem solving. It will give them the necessary vocabulary background to understand the concepts of units and dimensional analysis.
2	**1. Anticipatory Set –** Question on board: "If you are travelling 40 miles per hour, and you drive for 2 hours, how far did you drive?" Teacher then gives the answer (80 mi) and asks a student how they got the answer. **2. Learning Objective –** SWBAT understand units as a factor and preform multiplication and division on quantities that include units. **3. Instructional Input –** Teacher introduces the idea of a unit as a factor of a number. (Just like the expression 3x means that there are three of the quantity x, 3 mi means that there are three of the distance called a mile.) Because units are factors of a number they can be multiplied, divided, and canceled out in fractions like numerical or variable factors. Teacher will also give students some common conversions to put in their notes in anticipation for the next day. **4. Modeling/Check for Understanding –** Teacher will do one problem to model how to do them, then do some problems and cold call students for next steps. For example: 2 m * 3 m = 6 m^2 ; 25 mi ÷ .5 h = 50 mi/h; 45 mi/h * 3 h = 135 mi **5. Guided Practice –** Teacher will give some problems for students to work out for students to practice multiplying, dividing, and canceling units out and will circulate the room to monitor progress. **6. Independent Practice –** Teacher gives students a set of problems to	1. Students solve the problem and explain their solution when called on. 2. Students write date and learning objective in their notes. 3. Students take notes and ask questions about the ideas and copy common conversions in their notes. 4. Students will work out problems in their notes and ask questions to gain understanding. Students will show understanding by being able to answer questions when called upon. 5. Students work problems out as teacher works them out on the board in their notes. 6. Students work out problems individually and turn in as exit ticket. **Alignment to content/skills of Required Standard:** Understanding units as a factor and being able to perform operations on them is fundamental to being able to use units to solve multi-step problems involving units.

	work out that are similar to the guided practice to work on independently and be turned in as an exit ticket and formative assessment.	
3	**1. Anticipatory Set –** Question on board: "How many minutes are in a year?" Teacher then plays the song *Seasons of Love* from the musical *Rent* which gives the answer (525,600 min) and asks a student how they got the answer. **2. Learning Objective –** SWBAT use conversion factors to convert between units and use multiple conversion factors to solve problems. **3. Instructional Input –** Teacher introduces the idea that equivalent quantities in different units can be put in rational form to make a conversion factor equal to 1 and prove this by setting up an equation and solving it in both direction. (Example: 60 min = 1 hour; Divide both sides by 60 min to get 1 = 1 hour/60 min; then separately divide both sides by 1 hour to get 60 min/1 hour = 1) Teacher then demonstrates how to use a conversion factor to convert from one unit to another and how multiple conversion factors can be strung together and multiplied though to make more complicated conversions (Like figuring out how many minutes are in a year or how many ft/s are 45 mi/h.) Teacher explains that rates can be thought of as conversion factors. ($15/h means that that individual can exchange one hour of work for $15, or mathematically speaking, $15 = 1 hour of work.) **4. Modeling/Check for Understanding** – Teacher will do one problem to model how to do them, then do some problems and cold call students for next steps. For example: Work out how many minutes are in a year; how much money it will cost to drive to Albuquerque given a car's gas mileage, the cost of gas, and the miles from Phoenix to Albuquerque, NM. **5. Guided Practice –** Teacher will give some problems for students to work out for students to practice using dimensional analysis and will circulate the room to monitor student progress. **6. Independent Practice –** Teacher tells the students to look up their favorite pizza shop on their phone, and find out how much a large pizza is. Then asks each student to calculate how much money the pizzas will cost based on how many friends they invite and how many pieces on average each person will eat. Students show this work out the door as an exit ticket.	1. Students solve the problem and explain their solution when called on. 2. Students write date and learning objective in their notes. 3. Students take notes and ask questions about the ideas. 4. Students will work out problems in their notes and ask questions to gain understanding. Students will show understanding by being able to answer questions when called upon. 5. Students work problems out as teacher walks around the room to monitor progress. 6. Students work out how much the pizzas will cost individually and show it on the way out the door as an exit ticket. **Alignment to content/skills of Required Standard:** Being able to convert from one unit to another and perform dimensional analysis satisfies the first part of the standard: "Use units as a way to understand problems and to guide the solution of multi-step problems."
4	**1. Anticipatory Set –** Question on board: "Look up how much money you will spend based on the number of friends you invite from yesterday. Graph the information as a point on the coordinate plane where the number of people you invite is on the x-axis, and the cost in dollars in on the y-axis. Draw a line from the point (0,0) to your (people, cost) point. What do you think the slope of that line represents?" Teacher then gives	1. Students will create the graph and answer the question. Then students will discuss their answers. 2. Students write date and learning objective in their notes.

	the answer (The cost per person for pizza.) and asks a student how they got the answer and why they think it's right. **2. Learning Objective –** SWBAT choose and interpret units consistently in formulas and use units in a graph to interpret the rate (slope) of the graph. **3. Instructional Input –** After going over the Anticipatory Set, the teacher will show students how slope is the same as rate, and how we can graph the relationship between two quantities by graphing them. For example: By graphing the distance a car moving at constant speed has traveled over time, we can derive the car's speed by finding the slope. The teacher will then show the students how by tracking their units consistently, they can know if they are correct in their math when using formulas. For example: If when trying to calculate the time it will take to travel 150 miles at 60 miles/hour, and you multiply distance*rate versus dividing distance/rate, you will end up with miles^2/hour which is not the unit you were looking for, so you know something went wrong. So, by consistently tracking units, you can derive the way to solve many problems, even if there isn't a specified formula. **4. Modeling/Check for Understanding** – Teacher will work out some examples on the board first by showing how slope, rate, and conversion factors are related, and can be graphed. Then shows how by being consistent and deliberate with units you can figure out many things and also detect errors. Then the teacher does some problems and cold calls on students for the next steps. For example: graph miles per gallon of a car, or wages earned over time, show how chemistry problems (that they presumably don't know yet) can be solved using dimensional analysis if they check that their units are consistent. **5. Guided Practice –** Teacher will give students several problems to graph and others to figure out complicated conversions. Teacher will circulate the room to monitor progress. **6. Independent Practice –** Teacher will ask students to calculate the cost for whatever food and drink they will buy for the party and calculate the cost per person using dimensional analysis, then make a graph that shows the money received as a function of the number of people who pitch in. The teacher will check the work on the way out of the door as an exit ticket.	**Alignment to content/skills of Required Standard:** Being able to check their work by analyzing their units, and to interpret slope in a graph as a rate or conversion factor satisfies the second part of the standard: "choose and interpret units consistently in formulas." 3. Students take notes and ask questions about the ideas. 4. Students will work out problems in their notes and ask questions to gain understanding. Students will show understanding by being able to answer questions when called upon. 5. Students work problems out as teacher walks around the room to monitor progress. 6. Students work out how much the food and drinks will cost at the party and create a graph the shows how much money will be collected as a function of how many people pitch in.
5	**1. Anticipatory Set –** Question on board: "Graph the point (150, 6) on the coordinate plane. How many pieces of graph paper does it take?" Ask several students to share their answer. Discuss the differences.	1. Students will attempt to plot the point and participate in the discussion of why it doesn't work out very well with a 1:1 scale.

	2. Learning Objective – SWBAT choose and interpret the scale and the origin in graphs and data displays. **3. Instructional Input –** Continue the discussion by revealing that it could have been done on one piece of graph paper by scaling the y axis to 10 units per box. The teacher will explain that it is usually best to create a graph that falls within 15 or so units on the x and y axis. The teacher will explain how it is perfectly acceptable, and encouraged for them to scale a graph so that it's easy to read. The y-intercept of most graphs is called its origin, and is important because it shows some constant quantity if there is one. For example, most rental schemes have a base or membership fee, then a rental rate that's a function of the time you have the thing rented. **4. Modeling/Check for Understanding** – Teacher will show how some graphs become unmanageable if they aren't scaled. For example: The US Dollar v. the Colombian Peso graph would be useless without scaling (1 USD = ~2000 COP). A graph that had the COP side scaled so that 1 tick was 2000 COP would be much easier to read. At the same time, the teacher will mention how that particular graph has the origin of the graph at the point (0,0) because 0 USD is equal to 0 COP. The teacher will then model how the origin on many graphs is a telling point. For example: A graph that shows a car driving at constant speed with an origin other than d=0 shows that the graph starts some distance away from the place where distance is being measured from. Or a rental rate graph will show the cleaning fee or the membership fee if the graph starts at a point other than $=0. The teacher will cold call students for next steps and to check for understanding. **5. Guided Practice –** The teacher will give some equations to be graphed that need to be scaled to be legible and some pre-made graphs from real world situations and ask students to interpret the origin of the graph. Teacher will circulate around the room to monitor student progress. **6. Independent Practice –** The teacher will ask students to graph the same graph as the day before and make sure that the scale is appropriate. This will be turned in.	2. Students will write the date and Learning Objective in their notes. 3. Students will take notes and ask clarifying questions in their notebook. 4. Students will take notes on the examples modeled, and ask questions to clarify the concepts. Students will show understanding by being able to answer questions when called upon. 5. Students work problems out as teacher walks around the room to monitor progress. 6. Students will work independently on scaling their party planning graph and turn in their calculations and graph as a formative assessment. **Alignment to content/skills of Required Standard:** Being able to choose a scale for a graph and interpret the origin satisfies the last part of this standard. "Choose and interpret the scale and the origin in graphs and data displays."
S.A.	*Provide an opportunity for the student to complete the summative assessment items which is clearly separate from instruction and guided or independent practice, and in which the student is assessed independently. In the Student Activities column, provide a brief description of the summative assessment (S.A.) items that will allow students to demonstrate mastery of the rigor of the Required Standard(s)/components, and the context in which the items will be*	An optional review period may be conducted before the end of unit test. Students will take an end of unit test immediately following the unit. The test will be free response and taken individually and take about 1 class period. Students will have the use of a scientific calculator: either their own, or one provided to them. Smart phones will not be allowed to be used as a calculator. It will be a closed note test. The skills addressed in the standard will be assessed a second time (at least) in a Quarterly

	administered.	Common Assessment at the end of the quarter.

Summative Assessment Items and Scoring: *Below, provide at least three Summative Assessment Items that together accurately measure student mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard(s). For each assessment item, provide an answer key or scoring rubric which clearly describes how assessment items are to be scored and how points will be awarded, such that mastery of the application of the content and/or skills as defined by the grade-level rigor in the Required Standard is clearly demonstrated by an acceptable score.*

Summative Assessment Item 1 (clearly identify answer key/scoring rubric, and acceptable score):

Shelly wants to plan a trip to Los Angeles. The distance from Phoenix to L.A. is 372 Miles, The price of gas is $2.15 per gallon, and her car gets 30 miles per gallon. Calculate the cost of gas for the trip, and show all your work.

KEY:

The set up should look like:

$$\frac{372\ miles}{1} \times \frac{1\ gal}{30\ miles} \times \frac{\$2.15}{1\ gal} = \$26.66$$

Scoring:

3 Points – Setting up the calculation correctly (in any order that works).

Partial credit may be awarded. Subtract 1 point for each occurrence of: missing unit(s), incorrect term(s)

1 point – Calculating the correct answer (with unit).

Summative Assessment Item 2 (clearly identify answer key/scoring rubric, and acceptable score):

The Ideal Gas Law is represented by the equation PV=nRT; where P = Pressure, V = volume, n = the number of moles of gas, T = temperature, and R= the universal gas constant which is: $\frac{82\ mL \cdot atm}{mol \cdot K}$

Calculate the pressure (in atm) of 5 mol of gas in a 3 L container at a temperature of 273 K.

KEY:

Students should rearrange the equation to be $P = \frac{nRT}{V}$.

Then the set up should look like this:

$\frac{5\ mol}{1} \times \frac{273\ K}{1} \times \frac{82\ mL{\cdot}atm}{mol{\cdot}K} \times \frac{1}{3\ L} \times \frac{1\ L}{1000\ mL} = 14.924\ atm$ (Rounding to 15 atm is acceptable.)

Scoring:

3 Points – Setting up the calculation correctly (in any order that works).

Partial credit may be awarded. Subtract 1 point for each occurrence of: missing unit(s), incorrect term(s)

1 point – Calculating the correct answer (with unit).

Summative Assessment Item 3 (clearly identify answer key/scoring rubric, and acceptable score): (add as needed):

The exchange rate between the US Dollar (USD) and the Japanese Yen (JPY) is 120 JPY per 1 USD.

a) Graph the relationship with USD on the x-axis and JPY on the y-axis on the graph paper provided.

b) Write one complete sentence explaining why you chose the scale that you did.

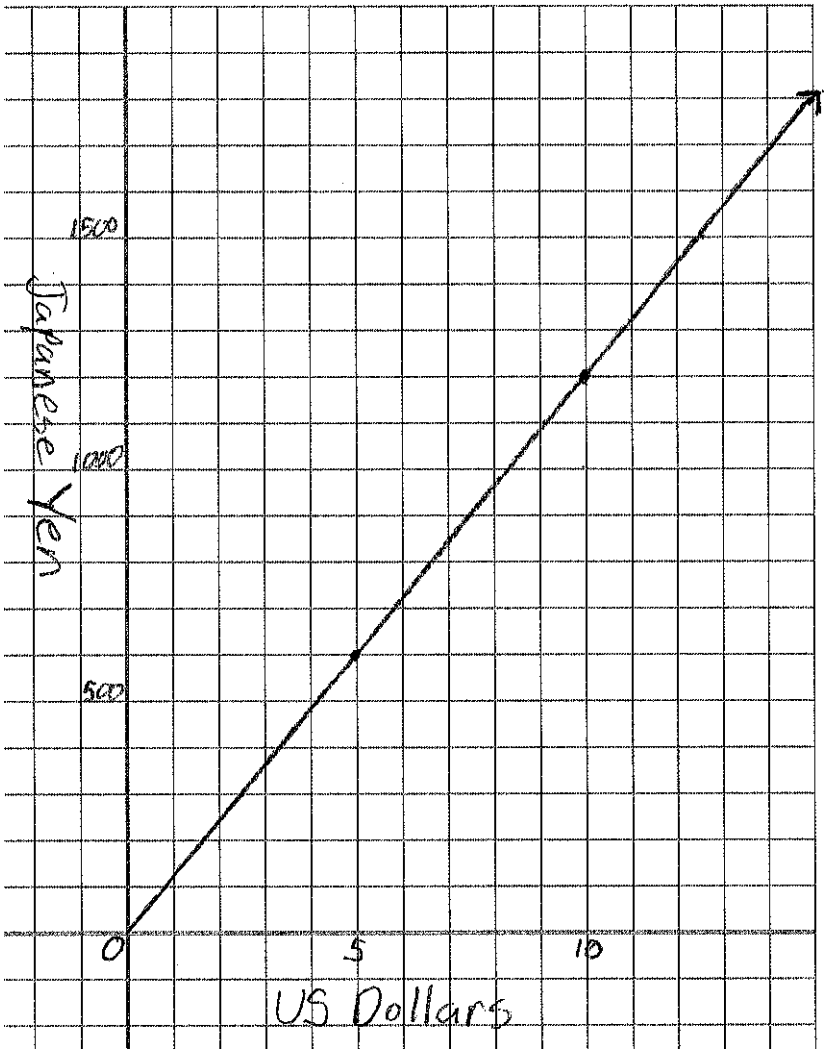
c) Could you graph the same relationship with JPY on the x-axis and USD on the y-axis? Explain your answer.

KEY:

a) Correct if slope is correct (m=120) and graph is scaled to fit on one sheet of paper such that the graph can be read to see 10 USD = 1200 JPY. (Graph is shown at right.)

b) Correct if students uses a complete sentence to explain that they chose the scale so the graph would fit on one page and be legible for multiple values of USD.

c) Yes because the proportion is a conversion factor and since 1 USD = 120 JPY the slope (or rate) can be flipped and therefore so can the axes.



Scoring:
2 points for part a)

Partial credit may be awarded. Subtract 1 point for each occurrence of: missing unit(s), incorrect term(s)

1 point each for parts b) and c)

12 Points Total, mastery = 9 points or better.