Alignment to CR-SE Frameworks

Amplify Desmos Math exists to help every student learn math and love learning math. To accomplish that goal, we worked to create an engaging, high-quality curriculum, but we know that in order to build a curriculum that is engaging and high-quality for all students we need to design experiences that are culturally responsive and inclusive. We want all students to see themselves as capable mathematicians and to recognize the brilliance of their own and their classmates' ideas about math. ADM NY not only provides students with opportunities to express their thinking in different and interesting ways, it also offers windows for students to see into the experiences of the people and communities around them.

Amplify Desmos Math New York is proud to exemplify the philosophies and principles in the New York City Department of Education Definition of Culturally Responsive-Sustaining Framework and the New York State Culturally Responsive-Sustaining Education Framework. The values described in these documents and NYC Theory of Action for Mathematics Teaching and Learning are brought to life in the ADM NY program. We have centered our response on both these documents and the CR-SE in New York City Public Schools in Mathematics document.

The NY State CR-SE Framework notes the following four principles that ground the state in centering the classroom as a culturally responsive and sustaining environment:

- Welcoming and Affirming Environment
- High Expectations and Rigorous Instruction
- Inclusive Curriculum and Assessment
- Ongoing Professional Learning

We are proud to offer an inclusive curriculum centered on rigorous instruction. Our resources also help teachers create a welcoming and affirming environment, and our collaborative tools set the stage for ongoing, informative professional learning centered around student brilliance in mathematics. In short, the entire Amplify Desmos Math New York classroom experience is designed from the ground-up to guide students in developing deep conceptual understanding that emerges from their individual and collective immersion in contextualized problem-solving tasks that draw upon personal experience and insights.

Alignment to the NYC DOE CR-SE in Mathematics Guide

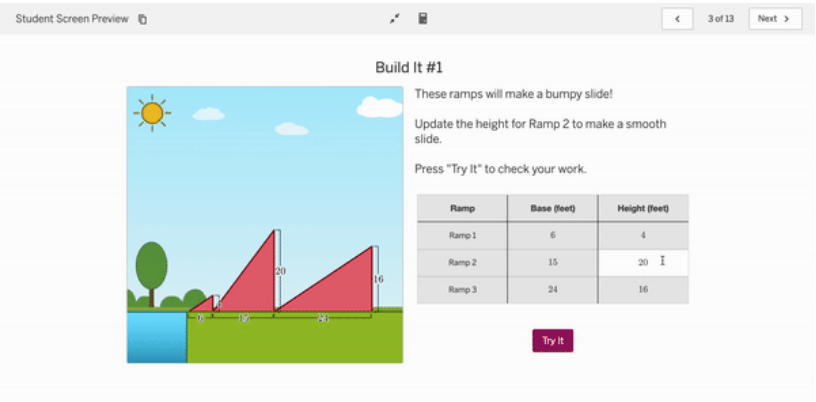
To further demonstrate Amplify Desmos Math New York's commitment to the New York City Public Schools values, we have referenced the *Culturally Responsive-Sustaining Education in New York City Public Schools in Mathematics* framework. This submission includes a subset of units and lessons from our program. This document highlights components of these units that align with the expectations in the framework, as well as examples from other units to demonstrate that our alignment to these principles is universal through our program.

The *NYC DOE CR-SE in NYCPS in Mathematics* provides insight into the aspects that New York City Public Schools value in mathematics curriculum and pedagogy through the New York City Theory of Action for Mathematics Teaching and Learning, as well as the Design Principles for Mathematics Education that are Culturally Responsive and Sustaining. We've included how our program philosophically aligns with the Theory of Action in the table below.

NYC Theory of Action for Mathematics Teaching & Learning

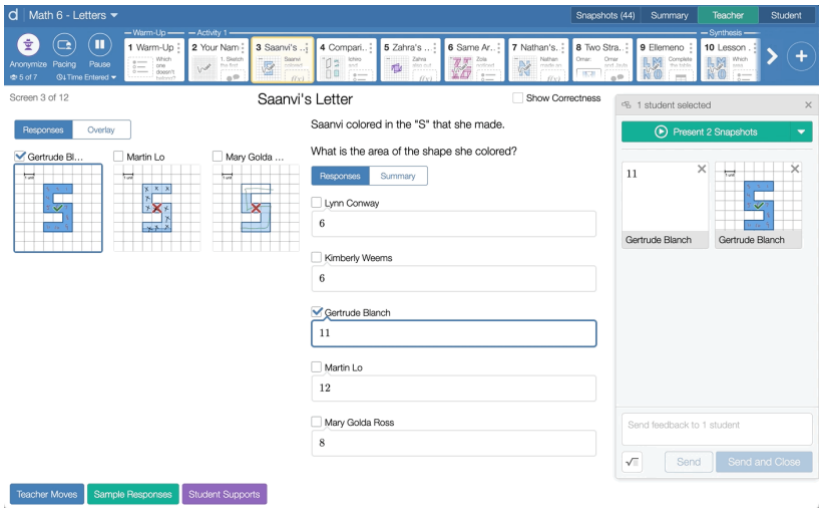
1. **Students learn mathematics best when they become math doers instead of mere answer-getters.**

   ADM NY is a problem-based learning curriculum, where students explore content in context. We show students what their mathematical ideas mean in those contexts and without judgment, give them the freedom to revise their thinking and the incentive to build on their earlier ideas.



2. Students engage in a productive struggle with cognitively-demanding mathematical concepts and analyze their own and their peers' thinking as it develops.

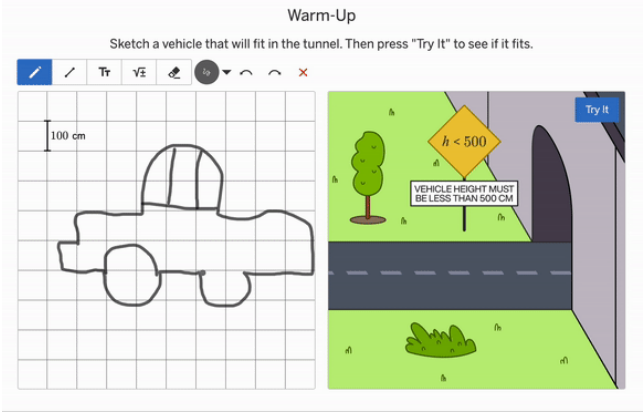
Student thinking is a powerful resource in **ADM NY** classrooms, and our lessons and collaborative digital tools are centered around highlighting students' experiences, strengths, and knowledge of math through rigorous tasks - for the benefit of the entire class. For example, the ADM NY Snapshot Tool, allows teachers to display a variety of student solutions and thinking to help facilitate classroom discussions. Mathematical discourse that is grounded in student work helps students see the value of theirs and their classmates' thinking.



3. Teachers facilitate instruction that is student-centered, coherent, connected, focused, and oriented toward sense-making.

Our program is centered on sense-making and rooted in interpretive feedback. ADM NY interpretive feedback goes beyond telling students whether they are wrong or right.

- We don't tell students if their sketch is correct; we animate the sketch to see if it will pass through a tunnel.
- We don't say if a student's paint ratio is the correct one, we mix the colors for you.
- We don't say if a student's slope is correct; we use it to land a plane.



4. In these classrooms, all students have a sense of belonging and the opportunity to create networks of understandings that empower them to make effective use of mathematics in the classroom and beyond.

Our dashboard conversation tools allow teachers to display anonymized student responses as they come in. This fosters rich discussion, and creates shared understanding of math. Students are empowered when they see how their thinking is used to drive learning in their classroom. We leverage student-to-student routines as well, such as Challenge Creator, where students create

mathematical challenges for each other and solve one another's, cultivating an asset-based sense of belonging and community.

Design Principles for Mathematics Education that are Culturally Responsive and Sustaining

The *NYC DOE CR-SE in NYCPS in Mathematics* includes the Design Principles for Mathematics Education that are Culturally Responsive and Sustaining. The principles outlined in this document are rooted in the same philosophical underpinnings as Amplify Desmos Math New York. From that document:

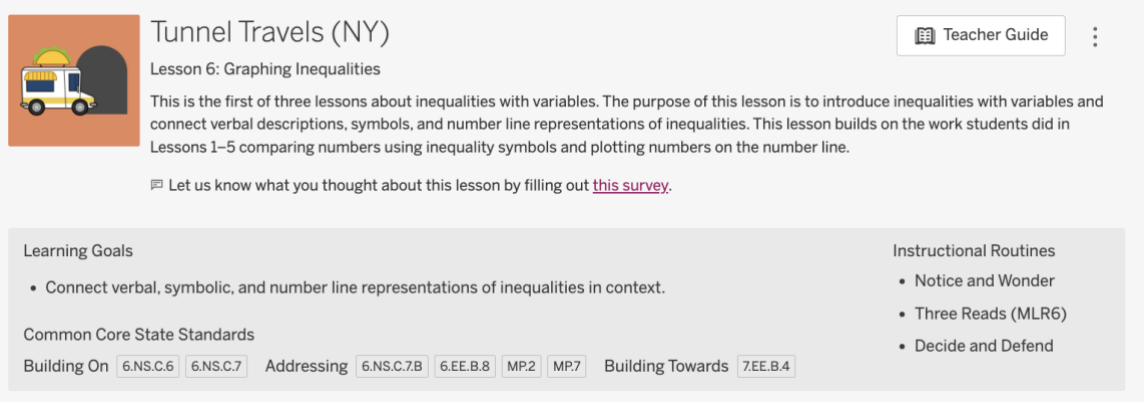
> *Culturally responsive-sustaining mathematics pedagogy is grounded in the following three principles:*
> - *Promoting Pedagogical Knowledge and Mathematical Thinking*
> - *Leveraging Cultural and Linguistic Funds of Knowledge*
> - *Attending to Issues of Power and Social Justice in Mathematics Education (Aguirre, 2013).*

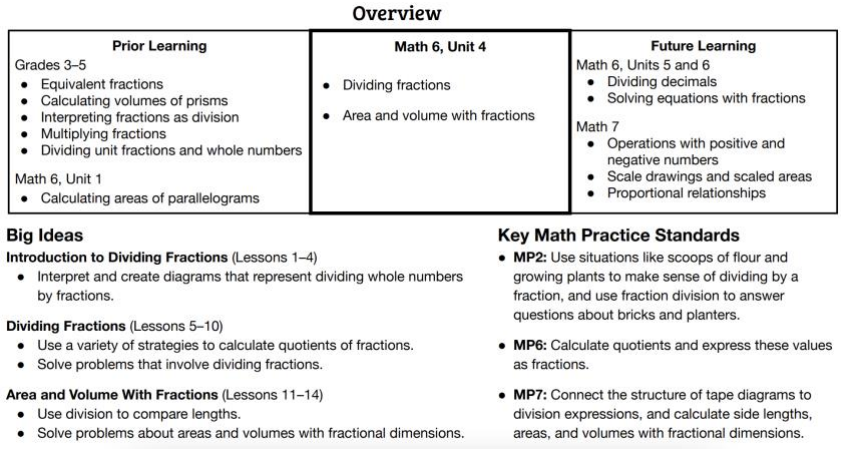
Below we have outlined Amplify Desmos Math New York's intentional program design and its alignment with these principles. For each item, we've included a brief summary of how we intentionally design for this element at the programmatic level.

Promotive Pedagogical Knowledge and Mathematical Thinking

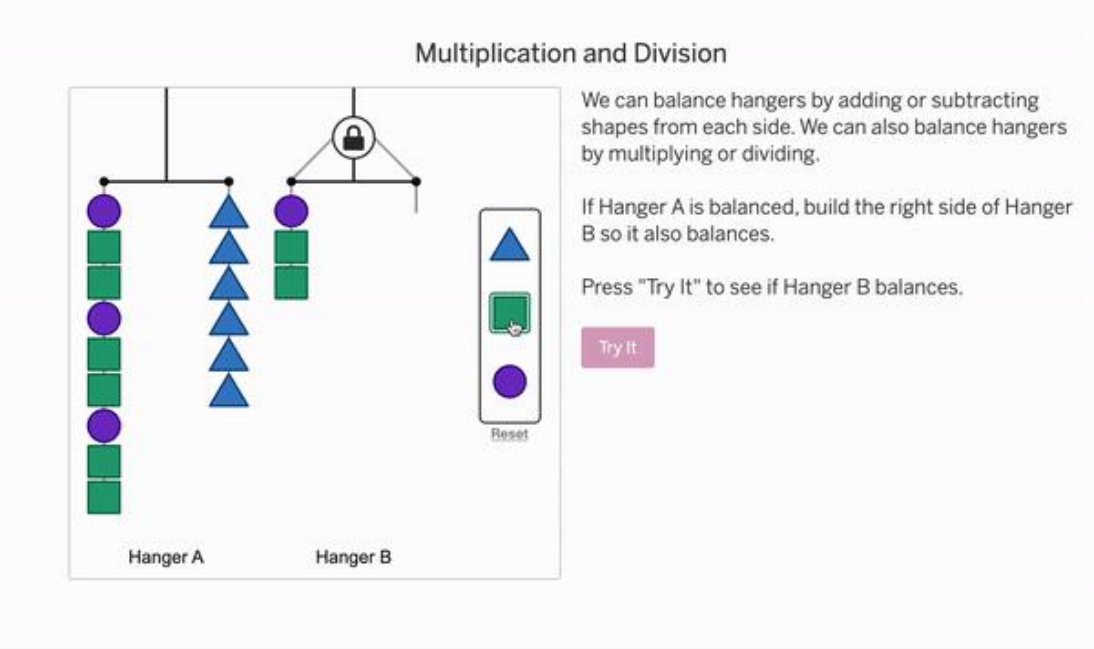
The *NYC DOE CR-SE in NYCPS in Mathematics* includes several components critical to the development of mathematical thinking, specifically:

1. The Standards for Mathematical Practice
    - **ADM NY:** ADM NY is designed with intentional development of each of the Standards for Mathematical Practice. Each lesson addresses one more SMP, and the Unit Overview page highlights the key Math Practice Standards for the unit.





2. Mathematics pedagogy
    - **ADM NY:** We believe that students are creative, knowledgeable, and brilliant, and our design principles reflect this belief throughout our program. We center and elevate student learning through rigorous, grade-level tasks that embed content in context. We focus on conceptual understanding and interpretive feedback, welcoming students to share their thinking without judgment.

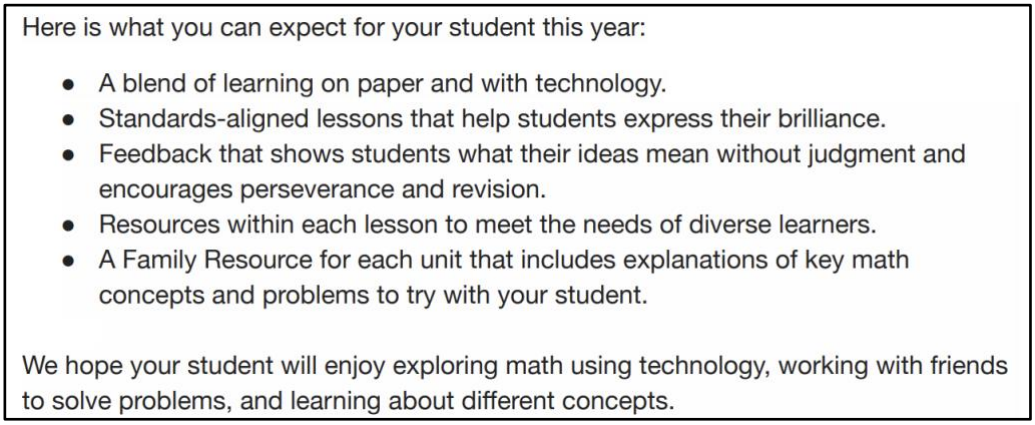


3. Collaboration
    - **ADM NY:** Our program emphasizes both digital and offline collaboration for students and teachers. We design lessons that utilize mathematical routines and structures (e.g. Polygraph and Challenge Creator) that foster student to student collaboration. We also make recommendations for when teachers should have pairs of students share a device to promote greater collaborative discourse. This way, students can refine and hone their understanding in conversation with each other.

Leveraging Cultural and Linguistic Funds of Knowledge

The framework also includes several ideas resources and approaches which can leverage the cultural and linguistic funds of knowledge that students bring to the classroom, including:

1. Collaborating with families as partners in their children's education
    - **ADM NY:** Our unit-level caregiver letters inform guardians about the math that their students are engaging in and welcome them as co-learners along with their students.

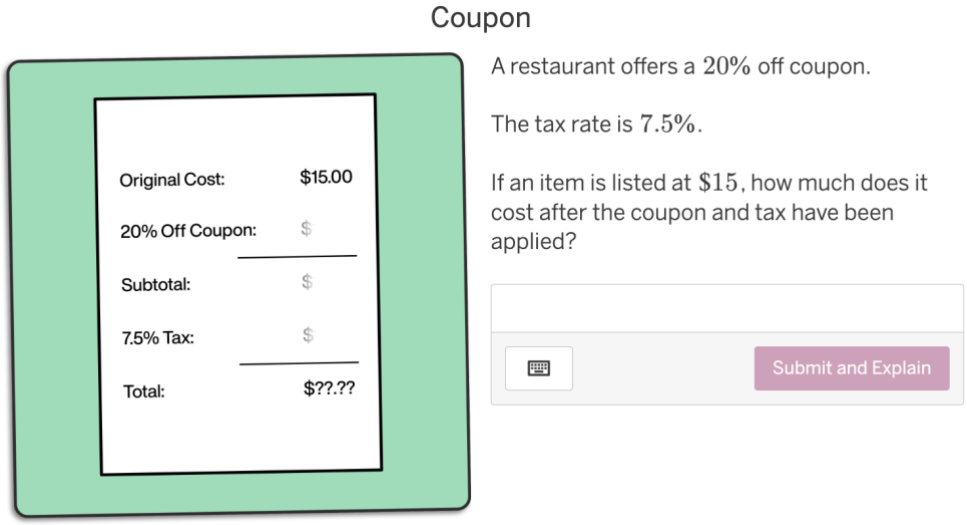


Here is what you can expect for your student this year:

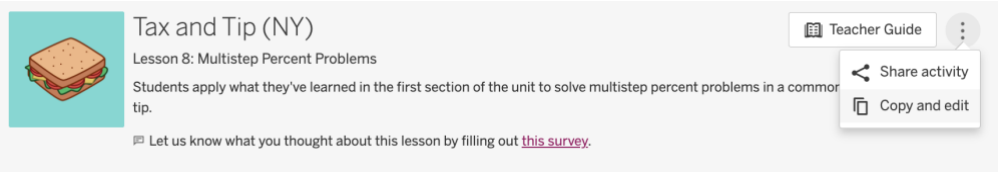
- A blend of learning on paper and with technology.
- Standards-aligned lessons that help students express their brilliance.
- Feedback that shows students what their ideas mean without judgment and encourages perseverance and revision.
- Resources within each lesson to meet the needs of diverse learners.
- A Family Resource for each unit that includes explanations of key math concepts and problems to try with your student.

We hope your student will enjoy exploring math using technology, working with friends to solve problems, and learning about different concepts.

2. Tasks specifically designed to elicit approaches grounded in and informed by student experiences
    - **ADM NY:** Lessons are grounded in context and student experiences play an essential role as part of the learning process. Students are often invited to draw connections to their own experiences in their understanding and interpretation of problems through prompts and visual interactions. Teachers are guided to elicit and leverage students' experiences as lessons unfold to support mathematical identity, value student knowledge, and create a productive disposition toward mathematics.



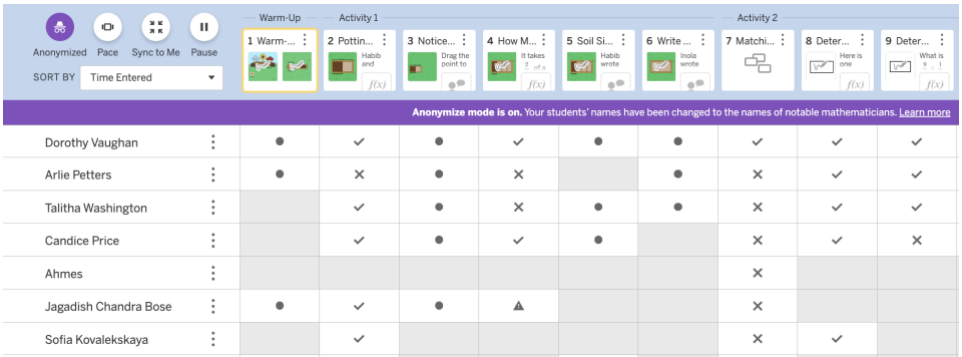
3. Resources for educators to individually, and in collaboration with colleagues, examine the ways their own identities form pedagogies
    - **ADM NY:** The flexible, adaptive, and social nature of the Amplify Desmos Math New York platform allows teachers to modify lessons to fit their contexts and share those lessons with each other to iterate on and improve their practice.



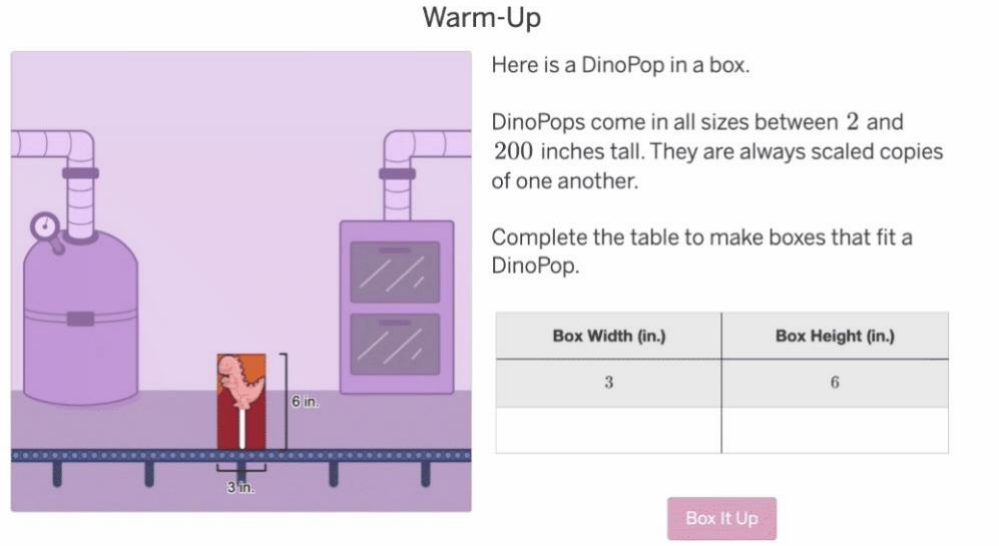
Attending to Issues of Power and Social Justice in Mathematics Education

The final key component of the design principles is how math learning should be designed to reflect and challenge real-world issues of discrimination, power, and social justice. There are several tools mentioned as a way to attend to issues, including:

1. Representation
    - **ADM NY:** Representation is a key design principle of Amplify Desmos Math New York. In our design process, we are intentional with broadening representation in several ways. For example, we aim to have the student names that we use in our lessons represent a wide range of cultural and gender identities. We highlight experiences from lots of different communities to give students windows into other experiences as well as mirrors reflecting their own world. We thoughtfully curated a list of mathematicians, used in our Anonymous mode, that overrepresent identities (race, gender, sexual orientation, etc.) that have been historically excluded in mathematical fields and showcases mathematicians in many different fields, including outside of academia. We are intentional in our design for representation, and iterative. We continually assess our images, contexts, and language to consider how we might improve our processes and make changes to ensure students can see themselves reflected in our program.



2. Strategies and tools for engaging more learners
    - **ADM NY:** Our curriculum is designed to welcome all students with "low floor, high-ceiling" experiences and provide a common entry point, as well as multiple modalities of learning. Our lessons are rooted in interpretive feedback where students can see the meaning of their mathematical ideas. With interpretive feedback, students can feel comfortable to take risks without the fear of being marked incorrect and not knowing why. We also utilize digital tools that allow students to submit written, audio, or pictorial evidence of their responses to prompts. Giving students choice in how they convey their thinking helps promote inclusivity and keeps students engaged with the math.



3. Using the math discipline to inspect and address injustices in society
    - **ADM NY:** In Amplify Desmos Math New York, students engage with the broad spectrum of the human experience through images, names, scenarios, and text. In our lessons, students explore real world contexts where they use math as evidence of justice or injustice, and they consider ways in which they or others can imagine a more just world.

Top Hollywood Salaries in 2019[1]

Women

Name	Salary (millions of $)
Scarlett Johansson	56
Sofia Vergara	44
Reese Witherspoon	35
Nicole Kidman	34
Jennifer Aniston	28

Mean:

MAD: $8.48 million

Men

Name	Salary (millions of $)
Dwayne Johnson	89.5
Chris Hemsworth	76.5
Robert Downey Jr.	66
Akshay Kumar	65
Jackie Chan	58

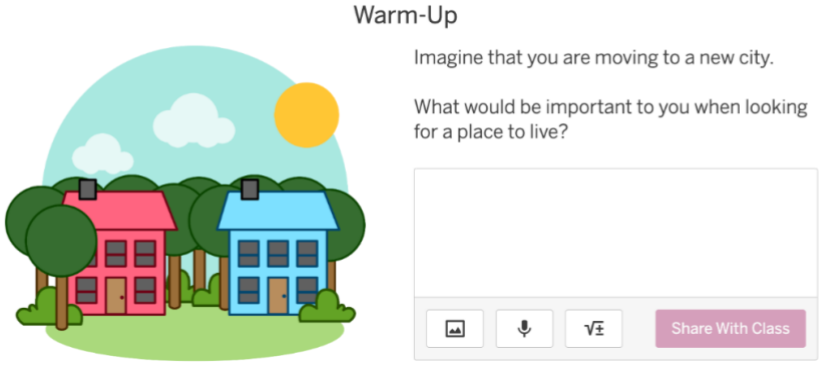
Mean:

MAD:

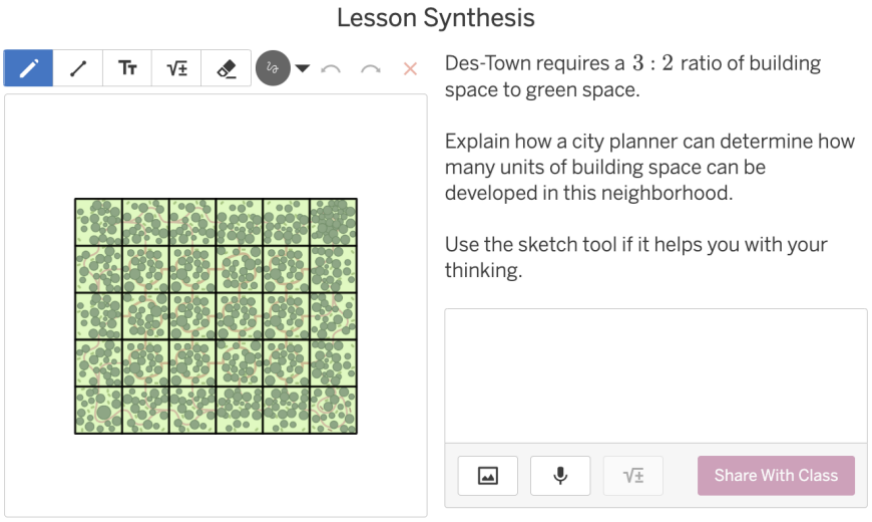
Upon reviewing the provided documentation, including the NY State and City CR-SE Frameworks and the NYCPS CR-SE in Mathematics document, it was immediately clear of how deeply connected and shared the principles of curricular design for equity are between New York State, New York City, and Amplify Desmos

Math New York. The attached appendix utilized the culturally responsive-sustaining task attributes, unit attributes, and contexts to demonstrate how both tasks and units in the submitted units and additional units align to these values.

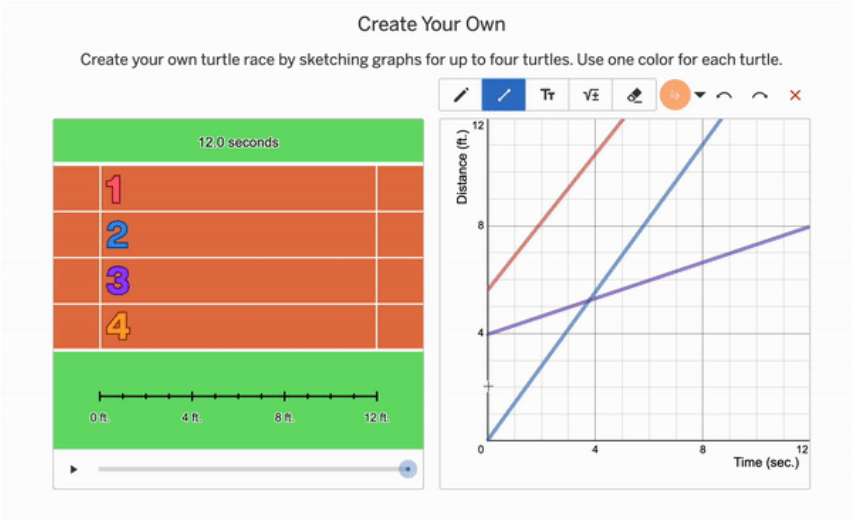
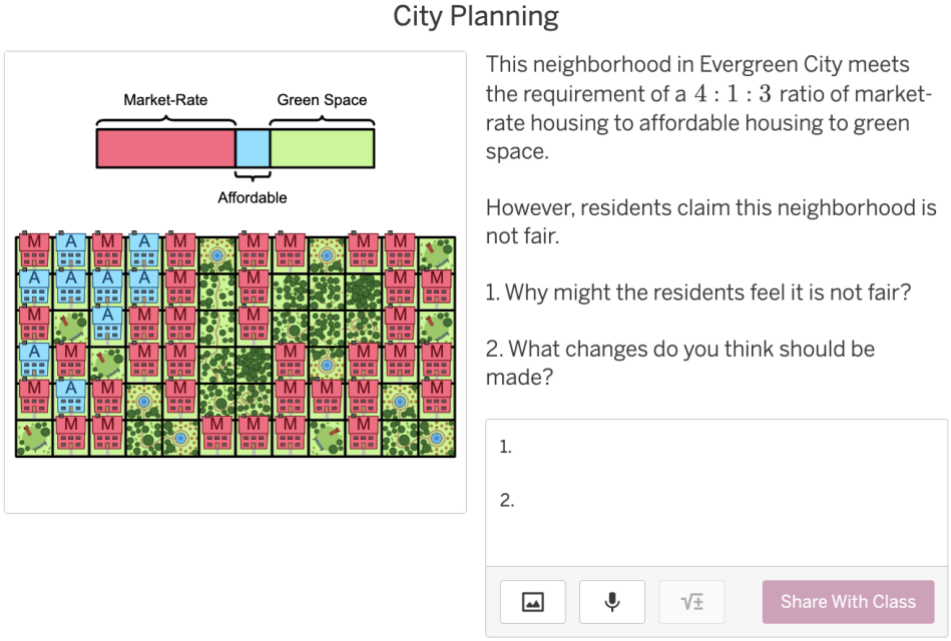
Appendix: Alignment to CR-SE Curriculum Attributes

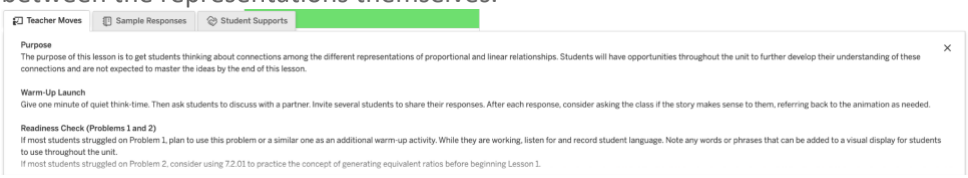
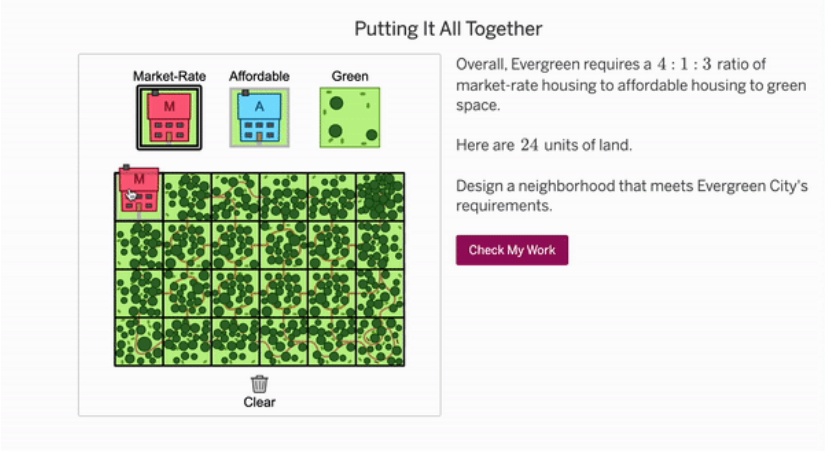
<table>
<tr><th colspan="2">Culturally Responsive-Sustaining Task Attributes</th></tr>
<tr><td colspan="2">To illustrate our alignment to the attributes of culturally responsive-sustaining tasks, we will use two example tasks: 6.2.13 City Planning & 8.3.01 Turtle Time Trials. While these tasks are representative of our approach, they are not unique in their design and utilization of the principles in this table.</td></tr>
<tr><td>Welcoming:
Our math program is intended to nurture an inviting classroom that draws on students' experiences, as well as provide a common entry point for all students.</td><td>City Planning
Students begin this lesson by thinking about the characteristics of neighborhoods and what makes a neighborhood a place they might want to live. This task provides a welcoming entry point to the context of the lesson because all students, regardless of their background, are able to share their own ideas about what they think is important in a community.
 

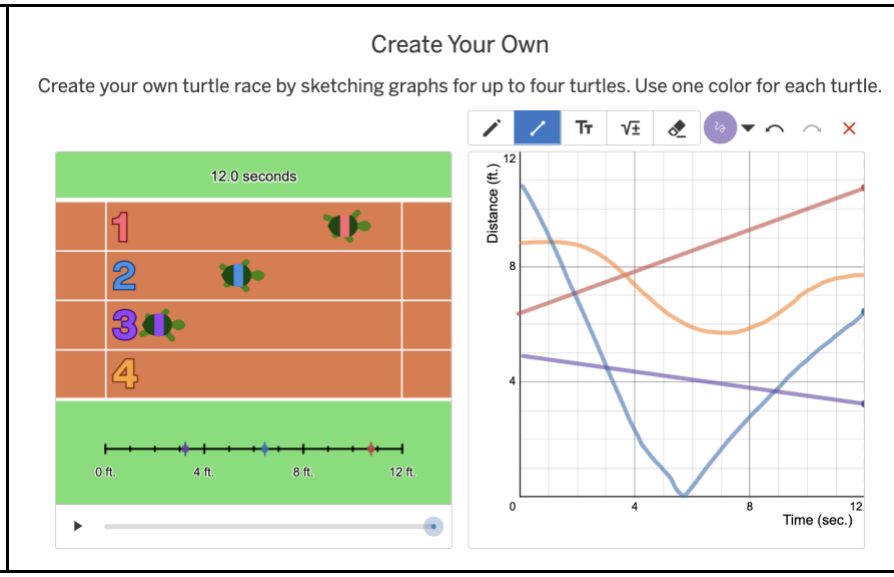
Turtle Time Trials
To begin this lesson, students use their creativity to create their own story about what they see taking place in an animation. Students often highlight details from the animation that support the mathematical concepts present in this lesson in a fun and inviting way. By inviting students to tell a story on this screen, we are providing a window into the student's thinking and creativity.</td></tr>
</table>

<table>
<tr>
<td></td>
<td> 
</td>
</tr>
<tr>
<td>Rigorous:
All Amplify Desmos Math NY lessons were developed with high expectations of students' brilliance and capability of achieving deep conceptual knowledge and the scaffolds needed to get them there.</td>
<td>City Planning
In this lesson, students calculate missing parts given the whole in part-to-part ratio relationships and extend their knowledge of ratios to consider ratios with three parts. This enables them to determine whether or not neighborhoods meet city requirements for the ratio of affordable housing to market-rate housing. The grade-level content with which they engage is embedded in meaningful context, with scaffolding that engages students in cognitively-demanding tasks.
 

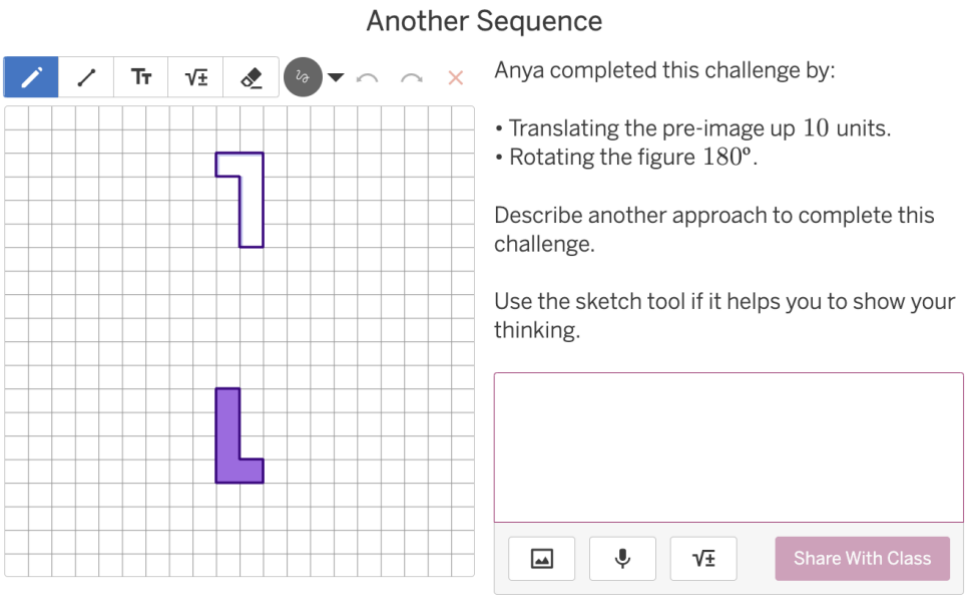
Turtle Time Trials
Throughout the lesson, students draw connections among different methods of representing proportional relationships. The lesson centers around a race between turtles of differing constant speeds. After first encountering this context with an animation, students analyze and create other representations of the same scenario: number lines, graphs, tables, and equations. When students create their graph, interpretive feedback gives meaning to their</td>
</tr>
</table>

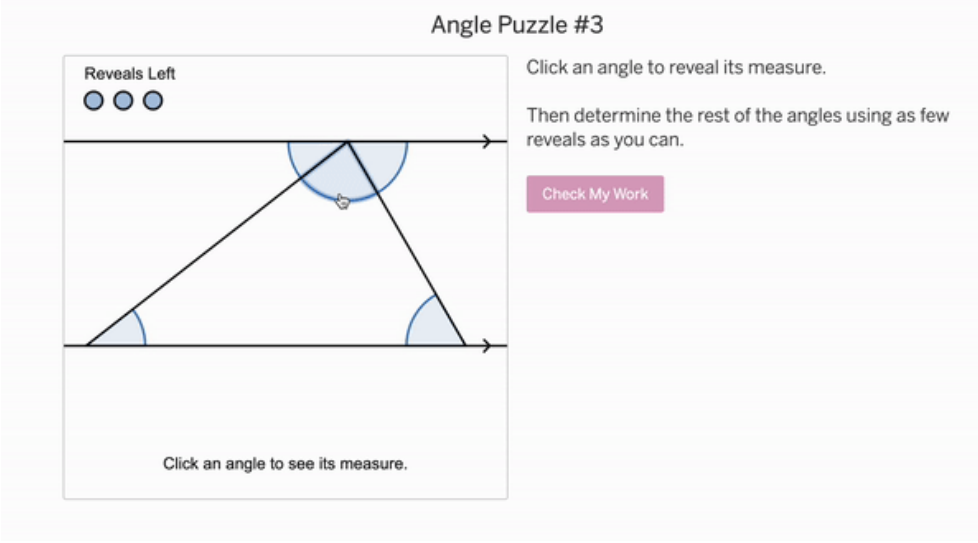
	mathematical thinking and allows them to revise or experiment with their thinking. 
Interconnected: Ensures that mathematical ideas are not learned in a vacuum by providing opportunities for students to make connections . Possible connections can include other mathematical concepts, other content areas, real-world contexts, and cultural and linguistic funds of knowledge.	**City Planning** As community planners, students use mathematics to support what they think is a fair representation of market rate, affordable housing, and green space. Students use what they've learned about ratios and their own personal knowledge to analyze different neighborhoods for their respective demographics. Students empathize with the perspectives of the community members who live in a neighborhood that follows the government regulations and who call out inequity. Students must use their own personal knowledge and what they've learned about ratios to understand why inequity is still possible when planners follow government regulations. 

	Turtle Time Trials Our Tell a Story routine asks students to watch a brief animation and write a short story about what happens in that animation. Storytelling is an element of culturally responsive teaching as verbal expressiveness is a central cultural theme in oral cultural traditions. Later in the lesson, the synthesis task draws out the connections between the context and different mathematical representations as well as the connections between the representations themselves. 
Sustaining: Empowers students through explicitly and implicitly accessing student experiences, choices, and agency . Centers students' identity, perspective, ideas, and experiences as core assets to the task.	**City Planning** Throughout the lesson, students have the opportunity to use their creativity alongside city requirements to design their own neighborhood. This task allows students to bring their own perspectives about what is important to the design of a neighborhood. Further, students use what they've learned about ratios and inequity to determine what changes they would make to the layout of the neighborhood in order to make it a more equitable place to live.  **Turtle Time Trials** Students create their own graphs and are provided with interpretive feedback by showing the turtle race that corresponds to their graph. The focus of this lesson is linear relationships, but this task gives students the power to create any type of relationship they want.

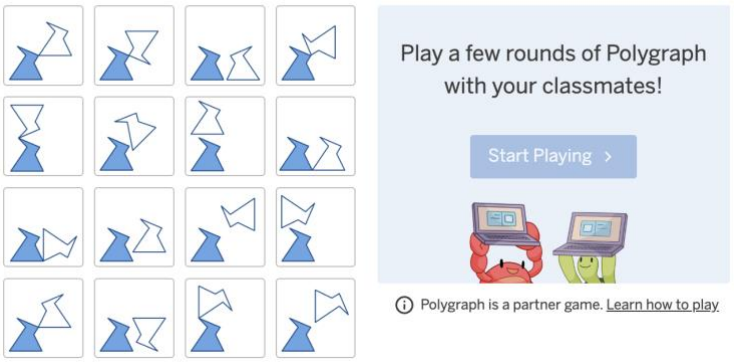
	

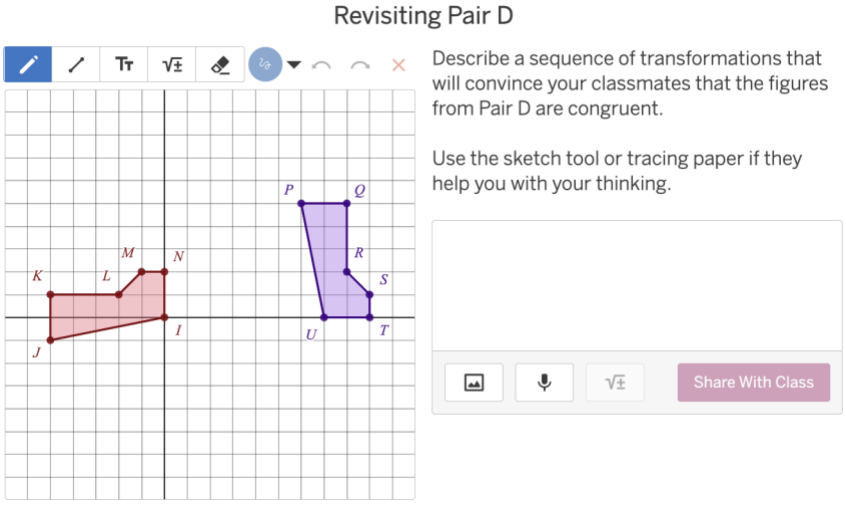
Culturally Responsive-Sustaining Unit Attributes	
To illustrate our alignment to the attributes of culturally responsive-sustaining tasks, we will use two example units: 8.1: Rigid Transformations and Congruence & 7.2: Introducing Proportional Relationships. Like tasks, these units are not unique in their design. 8.1: Rigid Transformations and Congruence: In this unit, students 1) describe transformations on a grid, 2) define congruence using rigid transformations, and 3) use transformations to discover new angle relationships. 7.2: Introducing Proportional Relationships: In this unit students recognize and represent proportional relationships in tables, equations, and graphs, and use proportional relationships to solve real world problems.	
Flexible: Amplify Demos Math units are flexible in how they elicit student thinking, be it through different engagement strategies, paths for solutions, or methods of representation.	Lessons are designed to highlight and celebrate different ways to solve a problem. In 8.1.03 Transformation Golf, students engage in a series of challenges where they are tasked to turn one figure into another through a series of transformations. Each of the challenges can be solved multiple ways. On screen 5, students consider one student's solution and are asked to create another approach. The digital screens play out the solution path that students define so that students can see the results of their mathematical thinking and offer the opportunity to revise (or experiment with) their solutions.

<table>
<tr>
<td></td>
<td>


In lesson 8.1.12 Puzzling It Out, students have the opportunity to choose what and how much information is revealed to them in order to solve a puzzle. Since students can choose what information they want to know, there are multiple ways to approach a problem. Students can be strategic in their thinking in order to challenge themselves to use fewer reveals.


</td>
</tr>
<tr>
<td>Promotes Discourse: We've designed our classroom facilitation tools to make fostering conversations easier and more</td>
<td>Digital and Interpersonal Discourse:
The teacher dashboard allows teachers to see student work in real time. The snapshots tool allows teachers to collect student ideas to facilitate the 5 Practices, and allows teachers to display anonymized student work. Students often work in pairs sharing one device as they proceed through the lesson together, promoting student-to-student discourse. When a student submits a text response, they can read three other responses from their classmates so that they can learn from the thinking of their classmates.</td>
</tr>
</table>

purposeful. Some of these tools are teacher-facing while others are more student-facing.	Lessons are designed to center student thinking and discourse using a mix of language types. In 8.1.02 Spinning, Flipping, Sliding students are paired with a classmate to play Polygraph with images. One person chooses a card, and their partner asks yes-or-no questions in order to identify their card from a field of 16 cards. Between rounds, students answer questions that focus their attention on vocabulary and strategy. Warm-Up  In lesson 7.2.02 Balloon Floats, Screen 4, students are invited to discuss with a partner two different strategies to complete tables when given a proportional relationship, including using a scale factor and using a unit rate. The screen provides teacher supports to help students understand the two strategies, draw connections to the strategies that students may have used previously, and discuss with their peers. Two Strategies Here are two different strategies for finding the number of balloons for the rubber duck. Discuss how Ariel and Emma would use their strategies to finish their tables. **Ariel's Strategy** 	Object	Weight (oz.)	Number of Balloons
---	---	---
Lightbulb	2	6
Rubber Duck	10 (×5)	30 (×5)
Toy Bear	6	
Carrot	3	| **Emma's Strategy** | Object	Weight (oz.)	Number of Balloons
---	---	---
Lightbulb	2	6 (×3)
Rubber Duck	10	30 (×3)
Toy Bear	6	
Carrot	3		 In lesson 7.2.12 Water Efficiency, teachers are supported in using the mathematical language routine Critique, Correct, and Clarify to help students

	attend to precision in their descriptions of quantities. **Instructional Routines** **Critique, Correct, Clarify (Help a Friend)** This routine is intended to help students communicate conceptual errors and ambiguities in language, as well as to model the process they might go through as they refine their own work. Students do more than just error analysis; they consider both the author's mathematical thinking as well as how they communicate their ideas. This routine is adapted from Jeff Zwiers and his colleagues (2017).
Language Rich: Our units are designed to allow students to constantly engage with mathematical ideas in concert with the academic and discipline-specific vocabulary to describe them.	In lesson 8.1.07 Are They Congruent? students use informal language to describe when two shapes are the same and then as a class develop a formal definition of congruence. Agreeing upon and formulating the definition of congruence requires careful use of precise language (MP6) and builds upon all of the student experiences in the unit: moving shapes and trying to make them match up.  In Lessons 1–3 of unit 7.2, students explore using the constant of proportionality and scale factor methods for completing tables. In 7.2.03 Sugary Drinks, teachers are supported in using the mathematical language routine Collect and Display routine to create a class definition for constant of proportionality. **Instructional Routines** **Collect and Display (Class Definition)** This routine is intended to gather the language students use to describe new terms and strategies so that they can refer to and build on them during future discussions. Students' own words become the reference for developing new math language and ideas. Many teachers use students' language to create a class definition of a new term or to build anchor charts for new concepts. This routine is adapted from Jeff Zwiers and his colleagues (2017). In lesson 7.2.11 Four Representations students create and write a detailed description of a proportional relationship between quantities that they choose. They will use the interactive structure of the mathematical language routine Stronger and Clearer Each Time to strengthen and clarify their ideas and their descriptions.

	Instructional Routines **Stronger and Clearer Each Time** This routine is intended to help students develop their ideas and language. It is a structured opportunity for students to refine both their ideas and their verbal or written expression of those ideas. This routine is adapted from Jeff Zwiers and his colleagues (2017).
Metacognitive: Metacognition is interwoven throughout units in routines that help students consider how they learn and empower them to use that knowledge in the future.	Student Summaries at the end of every lesson asks students to self-evaluate how well they understood the math of the lesson and how they felt about learning math in that lesson. How well did you understand the math in this lesson?  How did you feel about learning math in this lesson?  This is the math we wanted you to understand: • I can explain where to find the constant of proportionality as a value in a table. • I can write equations to represent proportional relationships. The Reflection and Synthesis activity takes place at the end of each unit. The goal of this activity is for students to 1) be purposeful, strategic, and goal-oriented about learning, 2) connect different ideas from the unit and across units, 3) revisit ideas from the unit in order to make revisions and reflect on their growth.  Reflection and Synthesis (NY) Here are six optional activities for students to engage in at the end of a unit to synthesize and/or reflect on their learning from the unit. Notes: • **Select one to two tasks** for students to complete before or after the End-Unit Assessment. • Many tasks invite students to refer to the Student Goals and Glossary, which can be downloaded from the Unit Overview page at the beginning of each unit.

Culturally Responsive-Sustaining Contexts	
Familiar contexts (mirrors): *Allowing students to build upon their existing understandings about the world in order to explore mathematical relationships and use mathematics to understand situations that*	**Lunch Waste**: Students use their personal experiences and the different kinds of ratio reasoning they've learned to make sense of a common experience: school lunch and food waste. **Mixing Paint, Part 1**: Students use paint mixtures as a context for thinking about how ratios compare to one another. **Animal Brains**: Students use their intuition about whether heavier

are relevant to their lives.	animals have heavier brains as a launching point to analyze and interpret bivariate data.
Unfamiliar contexts (windows): *Broadening students' exposure to other cultures and other patterns of thinking, and allowing them to apply mathematics as a tool to make sense of the world.*	**Rice Ratios**: students use equivalent ratios to adapt rice recipes from around the world. **Tessellate**: Students examine tessellations, especially those that are common in Islamic art and architecture. **A Country as a Village**: Students use rates and percentages to analyze characteristics of countries' populations.
NYC contexts: *Leveraging the diversity and vibrancy of NYC and providing opportunities for students to use mathematics to understand the city where they live, making cross-disciplinary connections wherever it is supportive to the learning.*	**Subway Fares**: Students use tables, graphs, and equations to help customers make decisions about what type of subway card to buy. **Asthma Rates**: Students analyze real data about asthma rates. They generate random samples and use those samples to compare the asthma rates of different places in New York. **City Lights**: Students add, subtract, and express numbers in scientific notation in the context of determining the proper amount of electricity to produce and distribute to pairs of cities.
Math as its own context: *Deepening students' abstract thinking skills, sparking curiosity about mathematics, and developing their ability to see, predict, generalize, and communicate patterns.*	**Exploring Parallelograms**: Students develop and name their own strategies for calculating area of parallelograms. **Is It a Circle?:** Students generate characteristics that define a circle before exploring the circumference and area of circles later in the unit. **Are Angles Enough?:** Students examine angle measurements in triangles to determine whether or not two triangles are similar.
Social justice contexts: *Giving students the opportunity to use mathematics to understand and address local and global priorities as well as current and historical inequities in society, making cross-disciplinary connections wherever it is supportive to the learning.*	**Hollywood Part 3**: Students use what they have learned about measures of center and spread to compare the percentage of words spoken by women and men in top-grossing movie **Grocery Prices:** The purpose of this activity is for students to learn a new strategy for calculating percentages of a number: using decimal representation. Students also consider the cost of groceries in different places and the possible impact on families who spend a greater percentage of their income on groceries. **Minimum Wage:** Students make sense of a complex story about one person working as a server in a restaurant and then use that story to determine whether or not they believe the current system of determining pay for tipped workers is fair.