M2C3 MATH MODELING LESSON OVERVIEW

LESSON TITLE: PUNCH PARTY PLANNER

STANDARDS ALIGNMENT:

Grade 3	Grade 4	Grade 5
3.NF.A.1 Understand a fraction (1/b) as the quantity formed by one part when a whole is partitioned into b equal parts; understand a fraction a/b as the quantity formed by a parts of size 1/b **3.NF.A.3** Compare two fractions with the same numerator or the same denominator by reasoning about their size. Recognize that comparisons are valid only when the two fractions refer to the same whole.	**4.NF.A.2** Compare two fractions by comparing to a benchmark fraction. **4.NF.B.3** a. Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. d. Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.	**5.NF.A.2** Solve word problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators by using a variety of representations, equations, and visual models to represent the problem. **5.NF.A.4** Apply and extend previous understands of multiplication to multiply a fraction or whole number by a fraction.
MP: 1 Make sense of problem and persevere in solving them. **MP: 3** Construct viable arguments and critique the reasoning of others. **MP: 4** Model with Mathematics	**MP: 1** Make sense of problem and persevere in solving them. **MP: 3** Construct viable arguments and critique the reasoning of others. **MP: 4** Model with Mathematics	**MP: 1** Make sense of problem and persevere in solving them. **MP: 3** Construct viable arguments and critique the reasoning of others. **MP: 4** Model with Mathematics

CONNECTIONS (Consider while planning):

• Previous Math Knowledge: *What prior math knowledge and experiences does this lesson consider and/or build on?*

- Understanding of benchmark fractions (e.g., 1/3, ½, ¼).
- Adding and multiplying fractions to create multiples of fractions (e.g., ¼ + ¼ + ¼ = ¾).
- Understanding that the whole can be composed of repeated fractions (e.g., the whole bottle of juice has multiple ½ C servings).
- Understanding mixed fractions (e.g., 1¼, 3½), adding fractions that sum to a mixed fraction, multiplying mixed fractions, or multiplying fractions that result in a mixed fraction.
- Equivalencies related to liquid measurement/volume (e.g., 8 oz. = 1 Cup).

• Cultural/Community/Family Connections: *How does the lesson connect to, or build on the knowledge, practices, or experiences of children and families? On community contexts??*

- Student experiences attending or planning parties with family, at school, or with community groups
- Experience with recipes, cooking/baking, serving size, batch, making more than one batch, measuring cups.

- Knowledge of how juices and sparking water are sold

• Language Considerations: *How does this lesson connect and distinguish between everyday language and math language? What might be specialized vocabulary used in this lesson? Connections to home language?*

- Some students may be unfamiliar with serving, batch (multiple servings), measuring cups, or sparkling water.
- Rate language may arise (e.g., 8 servings **per** bottle; 12 servings per batch).

TASK VARIATIONS:

Routine 1: Mathematizing World - Open Ended (10 minute) - [Introduce Punch Party Task: Slide 2.]

- Use slides 1 and 2 to engage students in thinking about making punch for a party. Have you every made punch (fruit punch)? Have you helped your family make punch? (Depending on students experience you may want to watch the video to help them understand how to make punch or have them talk about their favorite family recipes.)
- What do you notice? What does this picture make you wonder about? Brief class discussion.

Routine 2: Mathematizing World - Specific Questions (20 minute) Sensemaking and assumption building. If you were going to make punch what would you need to know.

- What questions do you have that you could use mathematics to answer?
- What information do you need to find out to answer those questions?
- What assumptions could you make? What assumptions are reasonable?
- Elicit ideas related to the different amounts of punch.

Routine 3: Full Modeling Task (60-90 minute) Students participate in entire modeling cycle

Task Version A: Help me plan a punch party for tomorrow! Create a recipe that includes 3 juices and a sparkling water for a party.

- Recipe rules:
  - Measurements need to be multiples of the measuring cups we have – Cup sizes are unit fractions ¼, 1/3, ½, and 1.
  - Sparkling water must be more than 1 cup, but less than 2 cups
  - All juices must be less than one cup
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Task Version B: Help me plan a punch party for tomorrow! Create a recipe that includes 3 juices and a sparkling water for a party.

- Recipe rules:
  - Measurements need to be multiples of the measuring cups we have – Cup sizes are unit and non-unit fractions ¼, 1/3, ½, 2/3, ¾, and 1.
  - Sparkling water must be more than 1 cup, but less than 2 cups
  - All juices must be less than one cup

Task Version C: Help me plan a punch party for tomorrow! Create a recipe that includes 3 juices and a sparkling water for a party.

- Recipe rules:
  - Measurements need to be multiples of the measuring cups we have – Cup sizes are left blank. **You choose fractions students will work with.**
  - Sparkling water must be more than 1 cup, but less than 2 cups
  - All juices must be less than one cup

Task Versions A and B:

- To help me bring enough ingredients, your plan must show:
  1. Your assumptions and decisions
  2. How your recipe follows the punch recipe rules
  3. How much punch your recipe makes
  4. How many batches (copies) of your recipe do we need to make so all of us can have a serving of punch?
- Extension:
  5. How much sparkling water do I need to buy?
  6. How much of each juice do I need to buy?
  7. How much could that cost?

POSSIBLE ASSUMPTIONS:

All students will be in attendance.
All will drink the punch.
Each serving size will be more than 1 cup (or whatever specified number the problem solver decides).
Different flavors of sparkling water and juice can be used.
The recipe will serve 2 people (or whatever the initial recipe states).
We will make 30 servings (or a specified number that the class decides).
The teacher and other adults in the building will attend the party

ANTICIPATED STUDENT STRATEGIES/MODELS:

1. Recipe: 1 ¼ C sparkling water, ½ C lemonade, ¼ C orange juice, ½ C apple juice.
1 ¼ + ½ + ¼ + ½ = 2 ½ C
Recipe makes 2 ½ C of punch.
Recipe serves 2 people.
2. Recipe: 2/3 apple, 2/3 orange, 2/3 pineapple, 1 ½ sparkling water.
2/3 + 2/3 + 2/3 + 1 ½ = 3 ½ C of liquid.
Makes 2 servings.
3. Strategy with extension - Recipe: ¾ C mango juice, ¾ C strawberry juice, ¾ C kiwi juice, 1 ¼ C sparkling water.
¾ + ¾ + ¾ + 1 ¼ = 3 ½ Cups. Recipe makes 3 ½ Cups of punch, serves 2 people, so each serving is 1 ¾ C.
Need 18 batches to serve 36 servings.
Multiply each ingredient by 18 and compare to amount per bottle.
Decide need to purchase: 2 bottles of kiwi, 1 bottle of mango, 2 bottles of strawberry, 6 bottles of sparkling water.
Extension: Find prices from local store, and calculate total cost.

MATERIALS NEEDED:

Punch Party_Lesson Slides
Punch Party_Student Task

Realia: Bottles of sparkling water and juice or store flyers with this information and pricing. Students can look at the total number of ounces, total servings in the bottle, typical serving size, and cups sizes (e.g., Solo cups).

Lesson Outline
Lesson Launch

Show slide 2 and ask students if they have every made party punch. Discuss favorite party punches.
Show the video and ask students what would they use to make party punch. You could also have students look at the different punch picture and guess what juices might have been used to make the punch.

Show and discuss the task:

What do we know?
What do we need to know? (possible student responses)
- How many students will be at the party?
- Is the teacher drinking punch?
- How many other adults?
- How much juice/ sparkling water is in each bottle? (Could use realia here)

What do we assume or decide?
- Assumptions are needed for any question where information is not readily available
- For example, students may need to assume the serving size each person will receive.

Make sure the students understand the difference between recipe, serving size and batches (copies of the recipe) to make enough punch for everyone.

Lesson Explore
Students work on task in small groups. Stop as needed to clarify information or to check in.
Students focused on formulating a model, and using their model to solve the problem.
Prompt students to make assumptions explicit, and to think about how their assumptions impact their model.

Lesson Summary
Students share solutions, with questions and comments from peers. During the share out, students work on validating their models – does the model make sense and work for the scenario? Is a complete plan presented? Or is refinement needed?

For Extension: Sample ingredients needed: 2 bottles of kiwi, 1 bottle of mango, 2 bottles of strawberry, 6 bottles of sparkling water. Find prices from local store, and calculate total cost.