M2C3 MATH MODELING LESSON OVERVIEW

LESSON TITLE: BUYING MARSHMALLOWS FOR THE 4th GRADE CAMPING TRIP

STANDARDS ALIGNMENT

GRADE 3	GRADE 4	GRADE 5
3.OA.A.3 Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities. **3.OA.B.5** Apply properties of operations as strategies to multiply and divide. Properties include commutative and associative properties of multiplication and the distributive property. (Students do not need to use the formal terms for these properties.) **3.OA.C.7** Fluently multiply and divide within 100. **3.OA.D.8** Solve two-step word problems using the four operations. Represent these problems using equations with a letter standing for the unknown quantity.	**4.NBT.B.4** Fluently add and subtract multi-digit whole numbers using a standard algorithm. **4.NBT.B.5** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. **4.OA.A.3** Solve multistep word problems using the four operations, including problems in which remainders must be interpreted. Understand how the remainder is a fraction of the divisor. Represent these problems using equations with a letter standing for the unknown quantity.	**5.OA.A.1** Use parentheses and brackets in numerical expressions, and evaluate expressions with these symbols. **5.OA.A.2** Write simple expressions that record calculations with numbers, and interpret numerical expressions without evaluating them (e.g., express the calculation "add 8 and 7, then multiply by 2" as 2 x (8 + 7). **5.NBT.B.5** Fluently multiply multi-digit whole numbers using a standard algorithm.
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 equal groups, repeated addition and multiplication
- Understanding of the remainders (i.e., if there are leftover people, more marshmallows are

needed)

• 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 camping with family, girl/boy scouts, community groups
- Experience roasting marshmallows, making S'Mores
- Knowledge of how marshmallows are sold (packages, bags)

• 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 S'Mores, or what it means to roast a marshmallow.
- The lesson materials include links to short videos that explain these activities
- Rate language may arise (e.g., 3 marshmallows **per** person; 2 marshmallows **per** S'More)

Modeling Task: How many marshmallows do we need to buy for the 4th grade camping trip?

Make a plan that would help the camp organizers to buy enough marshmallows with few leftovers.
- Use pictures, words and numbers to show your plan.
- List your assumptions
- Explain how other groups could use your plan to figure out how many marshmallows they need.

Routine 1: Mathematizing World - Open Ended (10 minute) - Building background knowledge and connecting to funds of knowledge. [Show images of students camping – Slide 2]

- What do you notice? What do these pictures make you wonder about? Brief class discussion.
- What questions do you have? What would you need to do to answer those questions?

Routine 2: Mathematizing World - Specific Math Questions (20 minute) Sensemaking and assumption building. [Show slide 3] Elicit and/or pose ***specific questions that can be answered using mathematics;*** consider using anchor chart to record "math" questions using questions stems - How much? How many? How much more/less;

Elicit questions about buying enough marshmallows for a camping trip.

- What questions do you have that you could use mathematics to answer?
- What information do you need to find out how much something costs?
- What information do you need to find out how many people will go camping?

Make a plan to answer your question. Identify the information you need to collect, how you would collect that information and how you would use mathematics to answer the question.

Routine 3: **Full Modeling Task (60-90 minute) Students participate in entire modeling cycle**
In Task A students will determine how many marshmallows they need to purchase for their camping trip. An extension, Task B, asks students to determine how many candy bars and boxes of graham crackers they need to make S'Mores for the camping trip.

Task A: How many marshmallows do we need to buy for the school camping trip?

Make a plan that would help the camp organizers to buy enough marshmallows with few leftovers.
- Use pictures, words and numbers to show your plan.
- List your assumptions
- Explain how other groups could use your plan to figure out how many marshmallows they need.

Extension
Task B: What would we need to buy if we wanted to make S'Mores for everyone on the camping trip. What would we need to buy in addition to the marshmallows? How much of each item would we need to buy?

For ALL Versions:
Questions to think about:
- What do you ***know*** that can help you figure this out?
- What do you need to ***find out***?
- What ***assumptions*** do you have to make?

POSSIBLE ASSUMPTIONS:

Number of students who will attend the camping trip, and number of adult chaperones.

Not everyone on the camping trip will want a roasted marshmallow

Only students will roast marshmallows, not adult chaperones

If this is a multi-day camping trip, we will only roast marshmallows on one day, or we will roast marshmallows every day

We will use the jumbo, giant marshmallows, so each person might want 2 marshmallows

We will use the medium size marshmallows, so each person might want 3-4 marshmallows

We are going to buy 16oz bags of marshmallows

We are going to buy 12oz bags of marshmallows

Some marshmallows will fall on the ground, or get really burned during roasting, so we need a few extras

To make one S'More you need 1, marshmallow, 1 graham cracker and two pieces of chocolate.

ANTICIPATED STUDENT STRATEGIES/MODELS:
25 students + 4 adult chaperones = 29 people total. All people will eat marshmallows.
The camping trip will last 2 days and nights, we will roast marshmallows both days.
Each person will want 4 medium marshmallows per day (to make 2 S'Mores, with 2 marshmallows on each S'More).

29 people x 4 marshmallows per person per day x 2 days = 232 marshmallows needed total.

Marshmallows come in bags with 48 marshmallows per bag.
48 + 48 + 48 + 48 = 192 marshmallows (4 bags) --- this is not enough
48 + 48 + 48 + 48 + 48 = 240 marshmallows (5 bags) – this is enough, with a few leftovers.

We need 5 bags.

To make S'Mores in addition to the marshmallows you need 1 graham cracker (1/2 for the top and ½ for the bottom) and two pieces of chocolate. Counting the package of graham crackers / package, and the number of packages in a box of crackers 9 crackers / package and 3 packages/ box = 18 crackers/box. There are 12 pieces of chocolate / bar. We could make 18 S'Mores /box of crackers. We could make 6 S'Mores / bar of chocolate.

If we wanted to make S'Mores for 29 people, we would need 2 boxes of graham crackers. 1 box would make 18 S'Mores and 2 boxes would make 36 S'Mores. For the chocolate 6 S'Mores / bar. 4 bars of chocolate = 24 S'Mores, 5 bars would make 30 S'Mores, so we need 5 bars.

MATERIALS NEEDED:

Buying Marshmallows_Student Task

Buying Marshmallows_Lesson Slides

Realia: For example, bags of regular or large size marshmallows to show to the class. Students can look at the serving size information to determine how many marshmallows per bag. Box of graham crackers, bar of chocolate.

Lesson Outline

Lesson Launch
Ask the students if they have ever gone camping. Talk about what they needed to bring with them. What did they eat? Did they ever roast marshmallows? How would they plan for a marshmallow roast if they were in charge of bringing marshmallows for the camping trip?

What do we know?
What do we need to know? (possible student responses)

- How many students are going?
- Is the teacher going?
- How many adults?
- How many nights?
- How many marshmallows does each student get?
- Are families coming?
- Size of marshmallows
- How many marshmallows in a package?

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 number of marshmallows per package, or the number of adults attending the camping trip.

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.

Extension: Plan for S'Mores Formulate model, make assumptions explicit. Revise model to improve if possible.

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? Or is refinement needed?