

M2C3 MATH MODELING LESSON OVERVIEW

LESSON TITLE: Abuelo's Birthday

STANDARDS ALIGNMENT:

GRADE 3	GRADE 4	GRADE 5
<p>3.OA: Represent and solve problems involving multiplication and division.</p> <p>3.OA 3: Use multiplication and division within 100 to solve word problems in situations involving equal groups, arrays, and measurement quantities.</p>	<p>4.OA Use the four operations with whole numbers to solve problems. Gain familiarity with factors and multiples.</p> <p>4.OA 3. Solve multistep word problems posed with whole numbers and having whole number answers using the four operations, including problems in which remainders must be interpreted...Assess the reasonableness of answers using mental computation and estimation strategies including rounding.</p>	<p>5.OA Write and interpret numerical expressions.</p> <p>5.OA 1. Use parentheses, brackets, or braces in numerical expressions, and evaluate expressions with these symbols.</p> <p>5.NBT Perform operations with multi-digit whole numbers and with decimals to hundredths.</p> <p>5.NBT 6. Find whole-number quotients of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays and/or area models.</p>
<p>MP: 1 Make sense of problem and persevere in solving them.</p> <p>MP: 3 Construct viable arguments and critique the reasoning of others.</p> <p>MP: 4 Model with Mathematics</p>	<p>MP: 1 Make sense of problem and persevere in solving them.</p> <p>MP: 3 Construct viable arguments and critique the reasoning of others.</p> <p>MP: 4 Model with Mathematics</p>	<p>MP: 1 Make sense of problem and persevere in solving them.</p> <p>MP: 3 Construct viable arguments and critique the reasoning of others.</p> <p>MP: 4 Model with Mathematics</p>

CONNECTIONS (Consider while planning):

• Previous Math Knowledge:

- Four operations (addition, subtraction, multiplication and division) using numbers between 0-1000.
- Fair shares (division); equal groups (multiplication);
- Partitioning
- Equivalent fractions
- Representing math ideas with pictures, symbols, and words.

• Cultural/Community/Family Connections:

- Sharing
- Fairness/unfairness
- Experiences with honoring grandparents/elders in the community (birthdays, anniversaries)
- Sharing costs to buy something
- Pooling money (putting money together to buy something)
- Saving/earning money

Language Considerations: specialized terms: *Abuelo, Nana, Tata (cultural names for grandparent), fair share*

TASK LAUNCH AND VARIATIONS

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

In this task, students are given task about four grandchildren combining their money to purchase a gift (a photo printer) for their abuelo/tata/grandpa. The grandchildren in the story are different ages and have different amounts of money they earn or already have. One of the grandchildren suggests that they should split the cost among them and each pay the same amount. Another grandchild says that would not be fair and says they should pay different amounts. The students must come up with a recommendation to the grandchildren about how to share the costs to buy the present. The plan must be fair. Report out plan with a group poster and whole class discussion.

Launch: Fair Share Discussion

Building background knowledge and connecting to funds of knowledge. Show scenario slide: FAIR SHARING:

What does it mean to share something fairly? Can you think of a situation in which you had to share something fairly with your friends or family? What made the situation fair? How did you know it was fair? What would be a situation in which it was unfair?

Give students time to talk with their table mates about what a fair share is.

Task Variations

Version A: Abuelo's Birthday (easier number choices)

It is Sr. Aguirre's 70th Birthday.

Four of his grandchildren want to buy him a gift.

They found a Photo Printer on sale for \$120.00.

They want to buy him the printer so he can print photos of family members.

- Alex, a 9th grader, earns \$15 each week from babysitting jobs.
- Sam, a 6th grader, earns \$10 each week taking care of his neighbor's pets.
- Elena, a 4th grader, earns \$5 each week doing jobs for an aunt.
- Jaden, a 1st grader, has no weekly job but has saved \$8 in her piggy bank.

One of the grandchildren says that they should split the cost of the printer among them and each pay the same amount.

Another grandchild says that it is not fair and they should each pay different amounts.

What do you think? What is *fair* in this situation?

TASK:

- Help the children make a plan to share costs in a fair way to buy the gift.

- Use mathematics to justify your conclusions.
- Your plan should work in other situations where family members want to share costs fairly.

Version B: Abuelo’s Birthday (harder number choices, range)

It was Sr. Aguirre’s 70th Birthday.

Four of his grandchildren want to buy him a gift.

They found a Photo Printer on sale for \$119.99.

They want to buy him the printer so he can print photos of family members.

- Alex, a 9th grader, earns between \$15 and \$20 each week from babysitting jobs.
- Sam, a 6th grader, earns \$10 each week taking care of a neighbor’s pets.
- Elena, a 4th grader, earns about \$5 each week doing odd jobs for an aunt.
- Jaden, a 1st grader, has no weekly job but has saved \$8 in her piggy bank.

One of the siblings says that they should split the cost of the printer among them and each pay the same amount.

Another sibling says that it is not fair and they should each pay different amounts.

What do you think? What is *fair* in this situation?

TASK:

- Help the children make a plan to share costs in a fair way to buy the gift.
- Use mathematics to justify your conclusions.
- Your plan should work in other situations where family members want to share costs fairly.

ANTICIPATED STUDENT ASSUMPTIONS:

In this task, students will have to make many decisions based on assumptions. For example, they will need to make assumptions/decisions about:

Who will pay for the gift: Will all the grandchildren pay for the gift? Will some of the grandchildren pay for the gift? What about the youngest child?

How much will each grandchild contribute: The children make different amounts for different types of work. One child only has a fixed amount (piggy bank). Some students might assume a grandchild has savings to draw upon.

How long it will take to get enough money to buy the gift: The question does not ask about time to get enough money, but students may assume that they have to start saving and take time into consideration when they decide how much each child should pay. They may ask how much time they have to save the money.

How their plan is fair: In our plan, each grandchild pays This plan is fair because...

ANTICIPATED STUDENT STRATEGIES:

Strategies for Task A and B

Equal Pay Model

- divide \$120 by 4. Each grandchild pays \$30. Then figure out how long it would take earn \$30. This often pushes a conversation about Jaden's contribution of \$8.00.
- divide \$120 by 3. (three siblings have a job and will split cost evenly \$40). Jaden will make up the difference or pay the "tax".

Proportional Model:

- The amount each grandchild pays is proportional to their earning power. Alex would pay the most because of being the oldest sibling and makes 2 or 3 times as much as the other grandchildren. Sam would pay more than Elena. Jaden might contribute some amount but not all of her \$8.00.

Strategies for B:

Make numbers friendly: Students might round up \$199.99 to \$120 to make it a friendlier number to work with.

Address the range: Some students might select an endpoint of the range (\$15 or \$20) to make numbers easier to work with. Some may attempt to take an "average" or the midpoint (\$18) in between as an assumption for their model.

Conceptual confusions/misconceptions

- What to do with Jaden's contribution (youngest grandchild). Static amount \$8.00
- Divide the printer price by 4 and think they are done with the problem.
- Add the time (weeks) it would take each sibling to come up with each share, rather than consider that the children would be earning the amount concurrently. (Note the problem does not ask for time to save the money but students may assume that is part of the problem.)

MATERIALS

- Abuelo's Birthday_Student Task
- Abuelo's Birthday_Lesson Slides