

Mathematics: The Language of STEM

Fifth Grade Sale

Arielle Halatek

Grade 5

Indiana Mathematics Content Standards:

5.DS.1: Formulate questions that can be addressed with data and make predictions about the data. Use observations, surveys, and experiments to collect, represent, and interpret the data using tables (including frequency tables), line plots, bar graphs, and line graphs. Recognize the differences in representing categorical and numerical data.

5.AT.5: Solve real-world problems involving addition, subtraction, multiplication, and division with decimals to hundredths, including problems that involve money in decimal notation (e.g. by using equations to represent the problem).

Indiana Mathematics Process Standards:

PS.4: Model with mathematics.

Mathematics Content Goals: Students will understand how to represent data based on authentic experiences in selling goods.

Language Objectives: State and justify which type of item sold is the best for bringing in the biggest profits using data collected from a class sale.

Materials:

- Students will need to bring in the appropriate materials to put up a sale for the fourth grade class to come and participate in.
 - o For the Lemonade Stand, students will need to bring in cups, pitchers, lemons, mix, etc.
 - o For the Cookie Sale, students will need to bring in items such as cookies and napkins.
 - o For the keychain sale, the students will need to gather key rings and various colors of embroidery floss.
- Tables for the sale
- Signage and advertising for each group's product.
- Play money
- Data Sheet
- Materials for students to represent their data visually

THE LESSON

Before: Prior to this lesson, it could be advantageous to read the book, The Lemonade War by Jacqueline Davies. This book will connect well with the students and gear them up for this project, however, it is not mandatory.

- **Activate prior knowledge**
 - o Ask students what they do to earn extra money. What are common things we see our peers doing to turn a profit of some kind?

- Ask them to think about whether these things children can do are services or goods. Explain the difference between these two terms for the students and then allow them to brainstorm the different possible ways a fifth grader could make money.
- After writing these possibilities on the board, ask the students if there are some goods or services that are more profitable than others.
- **Be sure the problem is understood**
 - Say: “Now I want us to actually see how the sales and profits of three different goods sold compare.”
 - Say: “Over the next few days, we will group up and attempt to make and sell goods to our fourth grade class. I want you to group up into 3 equal groups, each having an even mix of boys and girls. One group will be in charge of selling lemonade, another cookies, and the last will be selling keychains.”
 - Say: “On Friday we will have our big sale, so each group will need to discuss what each group member needs to get to contribute. Every person is required to supply an item and carry the workload so that the project is fair and each student is participating. This means that for the lemonade and cookies group, some students will need to gather ingredients from the store while others prepare the finished product. For the key chain group, each student will need to gather key rings and embroidery floss and make an equal amount of keychains per person. Tell the students who go and purchase the materials, it is important to keep the receipts and bring them to school.”
- **Establish clear expectations**
 - Have the students group up and ensure that the groups are evenly mixed. Then tell them to start brainstorming and deciding what roles each person will have in their group. Pass out the checklist and have the students put this in writing so that come Friday, they can be held responsible for their individual role. Go back over each check point and make sure that all of the students understand the steps and criteria involved in this project. Be sure to explain that not only is preparing for the sale important, but that recording the earnings and sales as well as finding a way to best visually represent this data are also detrimental to this lesson. The person in charge of recording the data is free to do so in any way of their choosing, but it is very important that this person is precise and only completes the blue section on the data sheet by themselves. After the sale, the group will come back together and complete the rest of the sheet together. Go over these questions and be sure that the students are understanding what they are asking of the students.

During: On the day of the sale, be sure to have plenty of play money available for the fourth grade students to use to make their purchases. Ten dollars per student should be enough, but alter this amount to your class’s needs. Allow the groups to get together and meet and make a few advertisements for their product to hang up near their sales table. As these students finish their signs, check in to make sure that each group is prepared and ready for the big sale!

- **Let go:** Now that the groups are ready, announce that the fourth graders will be coming in. Greet the fourth graders and remind them to be respectful and honest with our vendors and that they may buy whatever they wish with their play money. Allow the fourth graders to come in and watch as the students begin making their sales.
- **Listen actively:** As you watch the students making their exchanges, be sure to be watching the students who are taking data and see how they do under the pressure of fast sales, and how they stay focused during periods of slow traffic at their table. Ask “How is your strategy going for keeping track of sales?” “Is there a better way of doing it?” “How do you feel about how the sales are going” “Does it make you nervous at all? If so, why?” Dig into their thinking about the sales and why these numbers are important to the group.

- **Provide appropriate support:** Once the fourth graders have finished purchasing, thank them for attending the Fifth Grade Sale. Have the three groups start working collaboratively on the rest of the questions on the Data Sheet. Continue to ask questions and provide guidance (NOT ANSWERS) as the students work through the different steps of this task. It is important to encourage all students in their thinking and effort, and praise them for persevering and working hard to overcome this challenge. Once the students have answered their Data Sheet questions, they are to find a way to graphically represent their costs and earnings. Meet with each group after they have completed a graph of their data and see what connections they have made about these values.
- **Provide worthwhile extensions:** It is important to continue to ask questions of the students throughout this activity, especially as they begin drawing connections about their data. Ask questions like “Looking at your data, are you happy with how the sale went?” “Are there any changes you would make if you were to hold another sale?” “How does this connect to the real world?” “Are there professions where this activity directly relates to a person’s job?”

After: Now that each group has worked with their data and discussed the outcomes of the sale, the groups should share their findings and experiences with the others.

- **Promote a mathematical community of learners:** As each group presents their graph, the audience will listen attentively as the presenters explain their process and findings. The presenting group will explain how their sales went and how the sales costs were compared to their earnings. Audience members should be asking questions about how they would have changed the sale if they were to repeat the experiment and why. The presenters should also share the ways that they think this process connects to the real world and why making a visual representation of their data matters.
- **Listen actively without evaluation:** While the students are presenting, ask clarifying questions when the students become confusing or hard to follow. All students should feel welcome to ask questions in a conducive and respectful manner.
- **Make connections:** After each student has presented, ask the rest of the class if any other students had similar struggles or successes. Were we all successful sales people in the same way? Why did some sales go better than others?
- **Summarize main ideas:** Close the lesson by bringing attention to the hard work and effort that this challenging activity took. Explain how the students varied in their ways of solving the challenge and the strategies they chose to use over others, yet each student found an answer and was able to justify their findings with graphical representations of their data and careful analysis of it to connect this activity to the real world.

ASSESSMENT

Observe: As the students are working away, be taking anecdotal notes of noticeable struggles and success that students had so that you may deliver a note with encouraging feedback to them at the end of the lesson. Ex) “John, remember when you were having problems with how to find the profits your group made? I was so proud of you for working through that and not giving up!” The group data sheet should also be evaluated to look for group understanding. Additionally, use the following questions to help assess their level of perseverance and ability to evaluate the work they did.

Ask:

- What did you find most difficult about this challenge?

- Would you have done anything different if you were asked to try a similar challenge?
- Were there parts of this that excited you and pushed you to keep working hard?
- What are you most proud of after completing this challenge activity?
- After completing this activity, do you see goods and services any differently?

Fifth Grade Checklist

Our product is (Circle one) lemonade/cookies/keychains

- **Split up the jobs:**

Who is gathering materials? What materials/ingredients will these people provide?

Who is preparing the finished product?

Who is responsible for recording the data during the sale?

How much do you think you should charge for your product? Why?

Data Recording Sheet:

How many sales are you able to make given the amount of product that you prepared?

How many sales did your group actually make? (Number of times someone purchased your product.)

How much did your group make in sales? (Amount of money earned.)

Estimate the costs it took to make your product.

Calculate that actual cost using the receipts your group members were asked to save.

How do the costs of the product compare to the earnings you made off of selling it?