

Multiplication Lesson Summary

Juice Boxes

Overview

This investigation is given to students **before** the introduction of the standard multiplication algorithm. Students have had experiences in multiplying one-digit numbers and in multiplying by multiples of 10. They have used the array model to represent various multiplication contexts which contained arrays (1st stage of modelling, e.g., rows of apples). In this investigation they are asked to multiply two-digit numbers. Modelling them on an array is difficult because of the size of the numbers. Students are encouraged to use their own strategies to find an answer. This investigation will facilitate the development of strategies such as skip counting, repeated addition, doubling, and using the distributive property. The teacher connects some of these strategies to the model of the open array, thereby introducing the students to the second stage of modelling.

Learning Objectives

This investigation will help students to:

- model multiplication situations using an open array
- consider multiplication as a whole consisting of a number of groups containing the same number of items
- develop multiplication strategies such as repeated addition, doubling, and using the distributive property

Learning Expectations

Students will:

- multiply two-digit whole numbers by two-digit whole numbers using estimation, student-generated algorithms, and standard algorithms

Materials

- chart paper, markers

Getting Started

- Present the following situation to the class:

Our school is going to be having a track and field day in the spring, with events for all students. I am on the planning committee to help organize the event and I need your help to solve a question that has come up.

I know that the students are going to be hot and thirsty because of all the exercise they will be getting so I thought it would be important to have some cold drinks available.

This past weekend I was visiting with my uncle. He works at a factory that makes juice boxes and I was telling him about our upcoming track and field day. He said that he would like to donate 12 cases of juice boxes for our school. He told me that there were 42 juice boxes in each case. I want to find out if there are enough juice boxes for everyone who will be at our track and field day. I'm estimating that there will be about 500 people altogether.

- Ask the students to make a prediction before the investigation:
 - What do you predict? Do you think there will be enough juice boxes for 500 people? If you think that there will be enough, show a thumbs-up sign. If you disagree – if you think that there won't be enough juice boxes – show a thumbs-down sign.
- Remind students of the problem and have them share some initial ideas with an elbow partner:
 - How could you solve the problem to find out exactly how many juice boxes our school will get?
- Ask the following questions to help students understand the problem:
 - What do we need to find out?
 - What information is important to know?
 - What tools can we use to help solve the problem?
- Clarify the task and expectations for students' work:
 - Instruct students to work in pairs or small groups.
 - Tell students they can use manipulatives and paper and markers for their solution.
 - Explain that all groups must choose a strategy that makes sense to them, because they will be sharing their solutions on the chart paper provided so everyone can see the strategy they used to solve the problem.

Working on It

Once students have started working, take on the role of facilitator and circulate among the groups to:

- Observe how well students are able to represent the situation and their strategies
- Probe and guide students' thinking by asking questions such as:
 - How can you show your thinking on your chart paper?
 - Where are the cases of juice boxes represented in your solution?
 - Is there another way you can answer this question?

Note: Some students may try to use the standard multiplication algorithm if they know it. Remind these students that they will need to explain their strategy and the numbers that represent the cases and juice boxes when they use this algorithm. Alternatively, suggest that they try to solve the problem using a different strategy and then connect the algorithm with the new strategy.

- Select a number of groups (3 or 4) to present their solutions during the Reflecting and Connecting portion of the lesson. Selections should reflect a variety of strategies with varying efficiency and should encourage building connections.

Reflecting and Connecting

Gather the whole class together, then:

- Invite groups up to the front to present and discuss the strategies they used to solve the problem.
- Discuss and compare the various strategies that students used to arrive at the same answer. Emphasize that different methods are possible, but that some may be faster than others.
- Construct an open array to illustrate a student strategy that uses the distributive property. For example:

	42
10	420
2	84

Summarize the strategies that were used to find the answer, including the distributive property (students don't need to know the name) and the new model of the open array.