# Strategies for Multiplying Multi-digit Numbers

In this lesson, students develop and implement strategies for solving multi-digit multiplication problems. Students will solve the problems in at least two different ways and explain their reasoning. This lesson should be an introductory lesson to multiplication of multi-digit numbers.

###### NC Mathematics Standards:

**Number and Operations in Base Ten**

**NC.4.NBT.5** Multiply a whole number of up to three digits by a one-digit whole number, and multiply up to two two-digit numbers with place value understanding using area models, partial products, and the properties of operations. Use models to make connections and develop the algorithm.

###### Standards for Mathematical Practice:

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.

4. Model with mathematics.

1. Attend to precision.
2. Look for and make use of structure.

###### Student Outcomes:

* I can develop and implement a strategy for solving a multi-digit multiplication problem.
* I can use a variety of strategies to solve multi-digit multiplication problems.
* I can explain my reasoning when developing a multiplication strategy.

###### Materials:

* Outdoor Adventure Store handout (one per student)

###### Launch:

1. Introduce Problem (5 minutes)

Engage students in the task by asking students to discuss activities they like to do outside (hiking, riding a bike, swimming, picking flowers, camping, etc). Distribute the Outdoor Adventure Store handout to students and ask students to read and solve the first problem.

Problem:

*Luis sells 25 hiking packs per day at the Outdoor Adventure Store. How many packs will he sell in 14 days?*

Ask students to solve the problem using multiple methods and representations (numbers, models, grid paper, base ten blocks). They should work individually to solve the problem.

###### Explore:

1. Solving the Problem (10 – 15 minutes)

Allow students time to work individually in order to solve the problem. As students work, observe students to see how they are solving the problem. Encourage students to use multiple strategies and devise their own approaches to solve the problem (pictures, models, manipulatives, grid paper, addition, concepts of multiplication, etc.)

As you circulate, note which strategies the students are using. Take note of common strategies, unique strategies, and strategies that would be important to share with the class. Also look for common misunderstandings and errors that may be important to discuss.

Observe:

* What strategies are students using to solve the problem?
* How are students modeling the problem?
* What misconceptions do students have as they are solving the problem?

Determine which students you will ask to share and carefully select two to three solutions students will present to the class. Look for solutions that will help students develop *effective place-value based strategies* that illustrate the meaning of multiplication. (This is ***not*** a time to study or present the standard algorithm.)

**Discuss:**

3. Discussion of Solutions (10 – 15 minutes)

When most students have finished the first problem, invite selected students to share their strategies.

Sharing Procedure:

* 1. Display the student’s strategy. You may use a document camera or have the student copy their work onto the board.
	2. Ask the student to explain their reasoning for each step.
	3. Ask questions to determine the student’s level of understanding, “Why did you…”
	4. Allow the class to ask the student questions about the strategy.
	5. To ensure others are listening, have each student explain the strategy to a neighbor.
	6. Make any clarifying statements about the strategy.
	7. Invite the next student to share a different strategy.

Once several strategies have been shared using the above process, direct students to select one strategy they heard that they would like to try. Have them attempt the new strategy

**Explore Again:**

Pass out the second handout and ask students to complete problem #2. This task requires the students to solve another multiplication problem using a new approach. Encourage the students to use one of the approaches shared by a classmate. Monitor for strategies you want students exposed to or re-exposed to solidify understanding. Again, ask a few students to share. This sharing session can be much shorter because it is a second-look at the same type of multiplication problem.

**Discuss:**

To close the lesson, ask students to think about their favorite strategy from today. The students could discuss this strategy and why they like it with a partner or they could write their response in a journal.

######  Questions to Pose:

* Why did you…?
* How is Latisha’s strategy similar to Jonah’s? How are they different?
* Where did you run into difficulty in your work? Why was it problematic?
* Why is it important that your strategies are accurate and efficient?
* Which strategy is most efficient? Which strategy is least efficient?

###### Possible Misconceptions/Suggestions:

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| **Possible Misconceptions** | **Suggestions** |
| * Students have difficulty developing their own strategy.
* Students insist on using the standard algorithm which they learned outside of school.
 | * Ask students to think about the strategies they could use for a simple problem such as 3 x 4. Connect these strategies to the problems in today’s lesson.
* Explain that they may be able to use the standard algorithm in the future, but they must first be able to explain why the steps make sense. The purpose of today’s lesson is to explore the meaning of multiplication in multi-digit numbers. Later they may use these strategies to help them understand the standard algorithm, but not today.
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**Special Notes:**

* This in an introductory lesson to multiplying with multi-digit numbers. Students should develop their own strategies. If a student uses the standard algorithm because it was learned at home, suggest that she attempt a different strategy. Note the suggestion listed in the box above.

###### Solutions:

 25 x 14 = 350 21 x 7 = 147

##### Related image **Outdoor Adventure Store**

1. Luis sells 25 hiking packs per day at the Outdoor Adventure Store. How many packs will he sell in 14 days?
2. Solve problem #1 using a different strategy.

 **School Picnic**

1. Central Elementary School orders 21 packs of tablecloths for a school picnic. Each pack contains 7 tablecloths. How many tablecloths will they have for the picnic?
2. Solve problem #3 using a different strategy.