4th Grade Math: Multiplying by a 2-Digit Number

Lesson Objective:

By the end of this lesson, students will be able to:

- Multiply a multi-digit number by a 2-digit number using place value, area models, and the standard algorithm.
- Solve real-world problems that involve multiplying by a 2-digit number.

1. Introduction to Multiplying by a 2-Digit Number

What Does It Mean to Multiply by a 2-Digit Number?

- Multiplying by a 2-digit number involves repeated addition of the number in two groups: the tens and the ones.

Example: Multiply **34 × 12**. This means adding **34** twelve times, or we can use more efficient methods like place value, area models, or the standard algorithm to solve the problem.

2. Place Value Strategy for Multiplying by a 2-Digit Number

Breaking Numbers by Place Value: When multiplying a 2-digit number by another 2-digit number, break apart both numbers by place value (ones, tens).

Example: Multiply **32 × 14**:

1. Break **32** into **30 + 2**, and **14** into **10 + 4**.
2. Multiply each part:
    - **30 × 10 = 300**
    - **30 × 4 = 120**
    - **2 × 10 = 20**
    - **2 × 4 = 8**
3. Add all the products together:

300 + 120 + 20 + 8 = 448.

Activity:

Multiply the following numbers using place value:

4. **21 × 13**
5. **45 × 16**

3. Using Area Models to Multiply by a 2-Digit Number

What is an Area Model? The area model is a visual method to multiply numbers. The area of the rectangle represents the product, and the sides represent the numbers being multiplied.

Example: Multiply **23 × 15** using an area model:

6. Break **23** into **20 + 3**, and **15** into **10 + 5**.
7. Draw a rectangle, divide it into four smaller rectangles based on the place values.
8. Multiply each pair of numbers:
    - **20 × 10 = 200**
    - **20 × 5 = 100**
    - **3 × 10 = 30**
    - **3 × 5 = 15**
9. Add all the areas (products):

200 + 100 + 30 + 15 = 345.

4. Standard Algorithm for Multiplying by a 2-Digit Number

Steps for the Standard Algorithm: This is the traditional method used to multiply multi-digit numbers by a 2-digit number.

Example: Multiply **46 × 23**:

10. Multiply the ones place (**46 × 3**):
    - **6 × 3 = 18** (write down **8**, carry over **1**)
    - **4 × 3 = 12**, plus **1** makes **13** (write down **3**, carry over **1**)
    - First partial product: **138**
11. Multiply the tens place (**46 × 20**):
    - **6 × 2 = 12** (write down **2**, carry over **1**)

- **4 × 2 = 8**, plus **1** makes **9** (write down **9**)
- Second partial product: **920**

12. Add the partial products:

138 + 920 = 1058.

5. Word Problems with Multiplying by a 2-Digit Number

Example Word Problem 1: A farmer has **25 rows** of apple trees, with **32 trees** in each row. How many apple trees are there in total?

Solution: Multiply **25 × 32** using the area model:

13. Break **25** into **20 + 5**, and **32** into **30 + 2**.
14. Multiply each part:
    - **20 × 30 = 600**
    - **20 × 2 = 40**
    - **5 × 30 = 150**
    - **5 × 2 = 10**
15. Add the products:

600 + 40 + 150 + 10 = 800. There are **800 apple trees**.

Example Word Problem 2: A factory makes **36 toys** each day. How many toys will it make in **25 days**?

Solution: Multiply **36 × 25** using the standard algorithm:

16. Multiply the ones place: **36 × 5 = 180**.
17. Multiply the tens place: **36 × 20 = 720**.
18. Add the partial products:

180 + 720 = 900. The factory will make **900 toys**.

6. Practice Problems (Guided Practice)

Using Place Value:

19. Multiply **24 × 13**.
20. Multiply **37 × 12**.

Using the Area Model:

21. Multiply **42 × 17** using an area model.
22. Multiply **31 × 14** using an area model.

Using the Standard Algorithm:

23. Multiply **56 × 21**.
24. Multiply **63 × 18**.

7. Independent Practice

Place Value Strategy:

25. Multiply **34 × 16**.
26. Multiply **45 × 19**.

Area Model:

27. Multiply **58 × 12** using the area model.
28. Multiply **29 × 15** using the area model.

Standard Algorithm:

29. Multiply **72 × 26**.
30. Multiply **84 × 33**.

8. Challenge Problems

Challenge Problem 1: Multiply **89 × 45** using the standard algorithm.

Challenge Problem 2: A classroom has **28 desks**. Each desk costs **$47**. How much will it cost to buy all the desks?

9. Review and Wrap-Up

- **Recap Key Concepts:**

    - Use place value to break down larger numbers when multiplying.
    - Area models provide a visual method for multiplication.
    - The standard algorithm is an efficient method for multiplying 2-digit numbers.
- **Discuss:** Which method did you find the most helpful for multiplying by a 2-digit number?