4th Grade Math: Modeling Division with Regrouping

Lesson Objective:

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

- Understand and model division with regrouping (also known as long division).
- Apply division to solve problems involving larger numbers.
- Use visual models to represent division and understand the concept of remainders.

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1. Introduction to Division with Regrouping

Explanation: Division is the process of splitting a number into equal parts. When we divide large numbers, we use a method called **long division**. This involves several steps and sometimes requires **regrouping** (borrowing) when dealing with larger numbers. The goal is to determine how many times one number can fit into another and find any remaining amount.

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2. Steps in Long Division

Step-by-Step Guide to Long Division with Regrouping:

Example 1: Divide **437** by **6**.

1. **Set Up the Problem:** 6437\begin{array}{r|l} 6 & 437 \\ \end{array}6437
2. **Divide:** Determine how many times **6** fits into the first digit of **437** (which is **4**). It fits **0** times, so we move to the next digit.
3. **Regroup:** Consider the first two digits **43**. Divide **43** by **6**. It fits **7** times (since **6 × 7 = 42**). Write **7** above the line. 6437−42\begin{array}{r|l} 6 & 437 \\ - & 42 \\ \end{array}6−43742
4. **Subtract:** Subtract **42** from **43**. The remainder is **1**. Bring down the next digit, **7**, making it **17**. 6437−4217\begin{array}{r|l} 6 & 437 \\ - & 42 \\ \hline & 17 \\ \end{array}6−4374217
5. **Divide Again:** Divide **17** by **6**. It fits **2** times (since **6 × 2 = 12**). Write **2** above the line. 6437−4217−12\begin{array}{r|l} 6 & 437 \\ - & 42 \\ \hline & 17 \\ - & 12 \\ \end{array}6−−437421712
6. **Subtract:** Subtract **12** from **17**. The remainder is **5**. Write the remainder next to the result. 6437−4217−125\begin{array}{r|l} 6 & 437 \\ - & 42 \\ \hline & 17 \\ - & 12 \\ \hline & 5 \\ \end{array}6−−4374217125

Result: The quotient is **72** with a remainder of **5**. So, **437 ÷ 6 = 72 R5**.

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3. Modeling Division with Regrouping

Using Visual Models: Visual models help students understand the process of division by showing how numbers are split into equal parts.

Example 2: Divide **456** by **4** using base-ten blocks.

1. **Represent 456 with Base-Ten Blocks:** Use **4** hundreds blocks, **5** tens blocks, and **6** ones blocks.
2. **Divide Hundreds:** Divide **400** by **4**. Each group gets **100** (since **400 ÷ 4 = 100**). Write **100** above the line.
3. **Divide Tens:** Divide **50** by **4**. Each group gets **12** tens (since **50 ÷ 4 = 12** remainder **2**). Write **12** above the line.
4. **Divide Ones:** Divide **6** by **4**. Each group gets **1** (since **6 ÷ 4 = 1** remainder **2**). Write **1** above the line.
5. **Combine Results:** The quotient is **114** with a remainder of **2**.

Visual Model Example:

$$4456110011211Remainder2\begin{array}{c|c} 4 & 456 \\ \hline 1 & 100 \\ 1 & 12 \\ 1 & 1 \\ \hline \text{Remainder} & 2 \\ \end{array}4111Remainder4561001212$$

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4. Practice Problems (Guided Practice)

Long Division Practice:

1. Divide **625** by **5**:
   - Set up the problem.
   - Perform the division and regroup if necessary.
2. Divide **872** by **8**:
   - Set up the problem.
   - Perform the division and regroup if necessary.

Visual Model Practice:

1. Divide **789** by **3** using base-ten blocks:
   - Represent **789** with blocks.
   - Divide using visual models and find the quotient and remainder.
2. Divide **1,024** by **4** using base-ten blocks:
   - Represent **1,024** with blocks.
   - Divide using visual models and find the quotient and remainder.

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5. Word Problems

Example 1: Sarah has **345** marbles that she wants to divide equally among **5** friends. How many marbles will each friend get, and how many will be left over?

Solution: Use long division to find:

$345 \div 5 = 69$ with a remainder of $0.345 \div 5 = 69 \text{ with a remainder of }$ $0.345 \div 5 = 69$ with a remainder of 0.

Each friend gets **69** marbles.

Example 2: A bakery has **1,536** cookies to pack into boxes. If each box can hold **8** cookies, how many boxes can the bakery fill, and how many cookies will be left?

Solution: Use long division to find:

$1,536 \div 8 = 192$ with a remainder of $0.1,536 \div 8 = 192 \text{ with a remainder of }$ $0.1,536 \div 8 = 192$ with a remainder of 0.

The bakery can fill **192** boxes with no cookies left over.

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6. Independent Practice

Long Division Practice:

1. Divide **849** by **7**.
2. Divide **1,230** by **6**.

Visual Model Practice:

1. Divide **1,165** by **5** using base-ten blocks.
2. Divide **2,045** by **9** using base-ten blocks.

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7. Review and Wrap-Up

- **Recap Key Concepts:** Review the steps of long division, including regrouping, and how to use visual models to aid understanding.
- **Check Understanding:** Make sure students can perform long division independently and understand the concept of remainders.