Sequence for Teaching Multi-Digit Multiplication

• 2-digit times 1-digit without regrouping
• 2-digit times 1-digit with regrouping and having a product less than 100.
• 2-digit times 1-digit with regrouping and having a product greater than 100.
• 2-digit times 2-digit with regrouping.
• 3-digit times 1-digit with regrouping.
• 3-digit times 2-digit with regrouping.
• 3-digit times 3-digit with regrouping.
• Multi-digit times multi-digit with regrouping.
Multiplication Word Problems

• Students in Ms. Smith’s 3rd grade classroom had a food drive. If each of the 28 students brought 5 cans of food, how many cans did they collect in all?
• The Peterson family is taking a trip. They plan to drive 250 miles each day. If they are on their trip for 12 days, how many miles will they drive?
Multiplication Algorithms

- Multiply the bottom ones time the top ones
  \((5 \times 2)\)
- Record the 0 in the ones place
- Regroup 1 to tens place
- Multiply bottom ones times top tens place
  \((4 \times 5)\)
- Add regrouped 1 to 20
- Record 21 in the tens place
- Read problem - \(42 \times 5 = 210\)
Multiplication Algorithms

• 32 x 56
  – Multiply the bottom ones time the top ones (6 x 2)
  – Record the 2 in the ones place
  – Regroup 1 to tens place
  – Multiply bottom ones times top tens place (6 x 3)
  – Add regrouped 1 to 18
  – Record 19 in the tens place
  – Place 0 in the ones column underneath the 2
  – Multiply bottom tens times top ones (5 x 2)
  – Record the 0 in the tens place.
  – Regroup the 1
  – Multiply the bottom tens times the top tens (5 x 3)
  – Add regrouped 1 to 15
  – Record 16 in the tens place
  – Add 192 + 1600
  – Read problem: 32 x 56 = 1,792
Multiplication Algorithms

• The algorithms will be the same for the larger numbers, just more steps.
• It is important for students to understand and show competence in the 2-digit times 1-digit and 2-digit times 2-digit sequences prior to moving on to larger numbers.
• Students will need to be taught what to do with the zeros in the tens, hundreds, etc. places. The term often used is place holder. Some teach to write 0, others will teach students to place an x in the spot.
CRA Method

• Concrete (25 x 3)
  – Show 3 groups of 25 (proportional objects)
  – Combine the ones
  – Exchange 10 ones for 1 ten - 5 ones left
  – Combine tens
  – Count 10, 20, 30, 40, 50, 60, 70, 71, 72, 73, 74, 75
  – Write answer 25 x 3 = 75

• Representational
  – Show 3 groups of 25
  – Circle one group of 10 ones
  – Draw 1 tens
  – Count 10, 20, 30, 40, 50, 60, 70, 71, 72, 73, 74, 75
  – Write answer 25 x 3 = 75
CRA Method

• Abstract
  – Provide students with the problem - no objects or pictures.
  – Student computes the problem.

• The CRA Method is not suggested for problems that have a product larger than 1,000.
Teaching Multiplication

• Estimation
  
  \[ 47 \times 3 = 50 \times 3 = 150 \]
  
  \[ 278 \times 4 = 300 \times 4 = 1,200 \]

• Multiples of Tens and Hundreds
  
  – Students should be exposed to multiplication problems that have multiples of 10 and 100 so they can see the patterns
  
  • \( 10 \times 4, \ 10 \times 8, \ 10 \times 12, \ 10 \times 1 \)
  
  • \( 100 \times 5, \ 100 \times 9, \ 100 \times 10 \)
Teaching Multiplication

• Partial Products - showing students how the multiplication problem can be broken down. (See handouts for examples of showing this).

\[
\begin{align*}
13 & \times 12 \\
26 & \quad = \quad 2 \times 13 \\
+ 130 & \quad = \quad 10 \times 13 \\
156 &
\end{align*}
\]
Teaching Multiplication

Partial Products

423
x 146

\[
\begin{align*}
2,538 & \quad = \quad 6 \times 423 \\
16,920 & \quad = \quad 40 \times 423 \\
42,300 & \quad = \quad 100 \times 423 \\
\hline
61,758
\end{align*}
\]
Teaching Multiplication

• 0 as a place holder

\[
\begin{array}{c}
596 \\
\times 254 \\
\hline
\_\_\_\_, \_\_\_\_\_\_ \\
\_\_\_\_, \_\_\_\_\_\_ 0 \\
\_\_\_\_, \_\_\_\_\_\_ 0 \\
\_\_\_, \_\_\_\_\_\_ 0 0 \\
\end{array}
\]
Sequence for Teaching Multi-Digit Division

- 2-digit divided by 1-digit with a remainder.
- 3-digit divided by 1-digit with a remainder.
- Multi-digit divided by 1-digit with a remainder.
- 3-digit divided by 2-digit without remainder.
- 3-digit divided by 2-digit with remainder.
- Multi-digit divided by multi-digit with remainder.
Division Word Problems

- Tammie has 24 cookies. She is going to share them evenly with her sister. How many cookies will each person get?
- Brian has 457 marbles. He has 5 friends playing at his house. If he shares his marbles with his friends, how many marbles will each person have?
Understanding Division

• $534 \div 17$
  – $534 = \text{total number to be divided}$
  – $17 = \text{number of groups}$

• Students now have to start from the right, not the left. It is important to make sure students understand this, as they have been working right to left in all other concepts.
Division Algorithms

• $48 \div 4$
  – Starting in the tens place, divide the divisor into 4 ($4 \div 4$)
  – Record 1 in the tens place
  – Divide the divisor into the ones place ($8 \div 4$)
  – Record 2 in the ones place
  – Read problem: $48 \div 4 = 12$
Division Algorithms

- **79 ÷ 3**
  - Starting in the tens place, divide the divisor into 7 (7 ÷ 3)
  - Record the 2 in the tens place.
  - Subtract 7 - 6 = 1
  - Bring down the ones place to make 19
  - Divide the divisor into 19 (19 ÷ 3)
  - Write 6 in the ones place
  - Subtract 19 - 18
  - Write remainder of 1 next to ones place
  - Read problem 79 ÷ 3 = 26 R2

- There are several algorithms to follow. Teachers must ensure students have practice with numbers that have zeros in them.
CRA Method

• Concrete $72 \div 5$
  – Show 7 tens and 2 ones
  – Divide the 7 tens into 5 groups (1 in each group)
  – Regroup the 2 tens into 20 ones
  – Divide the 22 ones into 5 groups (4 in each group)
  – Notice 2 ones left over as a remainder
  – Write answer: $72 \div 5 = 14 \text{ R}2$
CRA

• Representational
  – Show picture of 7 tens and 2 ones
  – Divide the 7 tens into 5 groups (1 in each group)
  – Regroup (by drawing) the 2 tens into 20 ones
  – Divide the 22 ones into 5 groups (4 in each group)
  – Notice 2 ones left over as a remainder
  – Write answer: $72 \div 5 = 14 \text{ R}2$

• Abstract
  – Provide students with the problem with no concrete objects or pictures
Mnemonic for Teaching Steps of Long Division

- **Dad** Divide
- **Mom** Multiply
- **Sister** Subtract
- **Brother** Bring Down
- **Cousin** Check Work
Face to Remember Steps in Long Division

[Diagram of a face with division symbols and a multiplication symbol]
Teaching Division

• Estimation

- $48 \div 5 = 9.6$  
- $77 \div 21 = 3.66$  
- $1,795 \div 321 = 5.6$

- $50 \div 5 = 10$  
- $80 \div 20 = 4$  
- $1,800 \div 300 = 6$
References


