MULTIPLICATION WITH A THREE-DIGIT MULTIPLIER

Material

- Large bead frame
- Notation paper
- Lead and red pencils

Presentation

1. Write the equation on the left side of the notation paper.

   4, 367

   x 254

2. Analyze the multiplicand on the right side of the paper. Express the multiplication by units:

   First Analysis:

   7
   60 x 4
   300
   4,000

3. Express the multiplication by tens:

   Second Analysis:

   7
   60 x 50
   300
   4,000

4. Multiply by ten. Write the last zeros in red. Cross out the second analysis.

   70
   600 x 5
   3000
   40,000

5. Express the multiplication by hundreds:

   Third Analysis:

   7
   60
   300
   4,000
   x 200

6. Multiply by one hundred. Write the last two zeros in red. Cross out the Fourth analysis.

   700
   6,000
   30,000
   400,000
   x 2

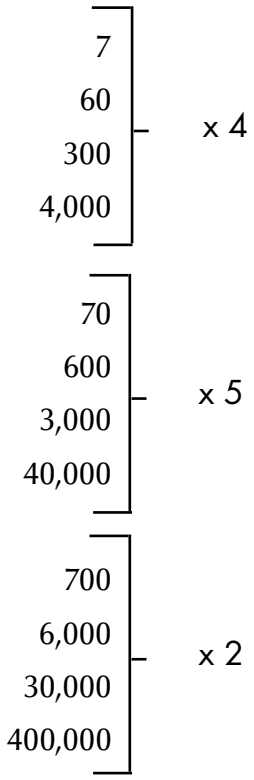
7. Note the zeros in the second analysis. There are zeros in the unit place. Note the zeros in the third analysis. There are zeros in the units and tens places.

   The traditional method of teaching multiplication is illustrated in this example, but in a concrete manner so that 'Move the numbers one space to the left' has a concrete experience by which the abstract algorithm is understood.

   In moving the zero from the multiplier to the multiplicand, the multiplier is divided by ten (or one hundred) and the multiplicand is multiplied by ten (or one hundred).

   In 'Multiplication by Ten' with the bead bars and the golden bead ten bars, the child has been introduced to multiplication by ten and the recurrence of zero. It is applied here.

8. Proceed to do the three multiplications that have been generated on the large bead frame:



9. Record the partial product found on the bead frame after each analysis. Record the partial products under the equations on the left side of the notation paper.
10. Add the partial products to get the product. (Column addition is required. Therefore, a review of the dot board may be required.)

$$
\begin{array}{r}
4,367 \\
\times \quad 254 \\
\hline
17{,}468 \\
218{,}350 \\
+\ 873{,}400 \\
\hline
1{,}109{,}218
\end{array}
$$

Note:

A) The first equations should be carefully prepared so that zero does not appear in the units place in the first partial product. Then, examples of zero occurring in the units of the first partial product are introduced. Finally, examples of zero occurring in various categories of the multiplier are introduced.

B) Initially the child will fill in the row with zeros for the second (and third) partial products. Later the child will see that it is enough to place the zero in the units place for the second partial product and then multiply by hundreds. If there is a zero in the multiplier, one entire partial product is eliminated.

C) The bead frame constitutes the basis for understanding addition, subtraction, and multiplication of two or more digits. It is the basis for later abstract work.

D) While in preschool, repetition took a physical form; repetition takes a mental form for the elementary age child. In the work with multiplication, large problems that may even take several days to complete are preferred over the simple problems.

Aim

This representational material is the foundation for later abstract work in multiplication.

Age

7 to 8 years.

THE BANK GAME - ONE-DIGIT MULTIPLIER

Material

A) Grey cards to represent the multiplier:

1	1	1
2	2	2
3	3	3
4	4	4
5	5	5
6	6	6
7	7	7
8	8	8
9	9	9

		0
	0	0
0	0	0

B) Cards in the hierarchical colors to represent the multiplicand:

1000	100	10	1
2000	200	20	2
3000	300	30	3
4000	400	40	4
5000	500	50	5
6000	600	60	6
7000	700	70	7
8000	800	80	8
9000	900	90	9

C) White cards with numerals printed in the hierarchical colors to represent the product:

100000	10000	1000	100	10	1
200000	20000	2000	200	20	2
300000	30000	3000	300	30	3
400000	40000	4000	400	40	4
500000	50000	5000	500	50	5
600000	60000	6000	600	60	6
700000	70000	7000	700	70	7
800000	80000	8000	800	80	8
900000	90000	9000	900	90	9

Presentation

1. Record an equation with a one-digit multiplier:

$$\begin{array}{r} 3542 \\ \times \quad 7 \\ \hline \end{array}$$

2. Form the multiplicand with the cards:

3	5	4	2

3. Select the numeral for the multiplier and set up the operation:

   3542 x 7 =

4. Using 'expanded notation' analyze the equation:

$$\begin{array}{rl} 2 & \times 7 \\ 40 & \\ 500 & \\ 3000 & \end{array}$$

5. Multiply the units:

   2 x 7 = 14

6. From the product cards make 10 and 4, and place the cards at the bottom of the work area.

7. Move the multiplier down to the tens of the multiplicand:

```
    2
   40    x 7
  500
 3000
```

8. Multiply the tens:

   40 x 7 = 280

9. From the product cards make 200 and 80, and place these cards in order at the bottom of the work area.
10. Move the multiplier down to the hundreds of the multiplicand:

```
    2
   40
  500    x 7
 3000
```

11. Multiply the hundreds:

    500 x 7 = 3500

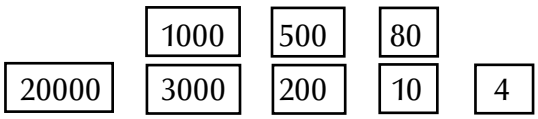
12. From the product cards make 3000 and 500, and place these cards in order at the bottom of the work area.
13. Move the multiplier down to the thousands of the multiplicand:

```
    2
   40
  500
 3000    x 7
```

14. Multiply the thousands:

    3000 x 7 = 21000

15. From the product cards make 20000 and 1000, and place these cards in order, at the bottom of the work area.
16. When the multiplication is complete, add the numerals in categories where there are two or more:



17. Form the product with the product cards:

20000	4000	700	90	4

18. Then superimpose the cards:

2	4	7	9	4

19. Record the product.

Note:

If during the multiplication, a product card is required that is already used, then:

A) Select two product cards that will sum to the card needed. (Example - need 5000, select 2000 and 3000), or

B) Add the product needed and the product already selected. Select the product card that is their sum.
(Example - need 3000, 3000 already selected. Add 3000 + 3000 = 6000. Select the 6000 product card and return the 3000 product card.)