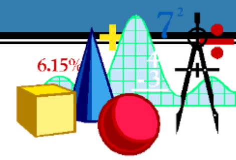
Mathematics, Grade 8
Unit II: Lesson 3 Model / Poster: **Napier's Bones**



The lattice method of multiplication was, at one time, a very popular method of multiplication. Read about this method and work some problems using the lattice method.

Create a poster explaining the lattice method. Construct a set of Napier's Bones and learn how to use them.

Demonstrate for the class how to solve problems quickly using your Napier's Bones.

	3	2	5	6	
1	1/2	0/8	2/0	2/4	4
5	2/1	1/4	3/5	4/2	7
5	2/4	1/6	4/0	4/8	8
	6	3	6	8	

A lattice is first drawn, as shown at the left. The multiplicand 3,256 is placed above and the multiplier 478 to the right of the lattice. Multiplying 4 times 6 equals 24; the tens digit (2) is placed above the diagonal line in the upper right-hand cell, and the units digit (4) is placed below the diagonal line. Next, 7 times 6 equals 42; the tens digit (4) is placed above the diagonal in the next lower cell, and the units digit (2) below the diagonal. This multiplying is continued until all the cells have been filled. The product is then obtained by adding the digits in the diagonals and carrying in the customary manner. Thus, our product is 1,556,368.

The lattice method at one time was the most popular method of multiplication in Europe. This continued until the invention of printing. Since the lattice was difficult to print, it was replaced by our modern method.

The great Scottish mathematician, John Napier, adapted the lattice method of multiplication to an ingenious device known as Napier's bones. These bones had a great popularity and were extensively used for many years.

Napier's bones consisted of several strips of wood, or other material, with square ends. Each of the four faces of a bone contained the successive multiples of one of the ten digits.

A set of Napier's bones can be constructed on heavy cardboard using tongue depressors or Popsicle sticks. These, of course, would have only two faces. For our purpose, only one face of the sticks need to be used. A set of the bones is shown in the diagram to the right.

Napier's bones are actually ten strips, on which the products of the ten digits are written, and an index strip. Each bone is a multiplication table of the first ten numbers by a certain one-digit number. A simple example of how the bones can be used is given in the next few paragraphs.

0/0	0/1	0/2	0/3	0/4	0/5	0/6	0/7	0/8	0/9	1
0/0	0/2	0/4	0/6	0/8	1/0	1/2	1/4	1/6	1/8	2
0/0	0/3	0/6	0/9	1/2	1/5	1/8	2/1	2/4	2/7	3
0/0	0/4	0/8	1/2	1/6	2/0	2/4	2/8	3/2	3/6	4
0/0	0/5	1/0	1/5	2/0	2/5	3/0	3/5	4/0	4/5	5
0/0	0/6	1/2	1/8	2/4	3/0	3/6	4/2	4/8	5/4	6
0/0	0/7	1/4	2/1	2/8	3/5	4/2	4/9	5/6	6/3	7
0/0	0/8	1/6	2/4	3/2	4/0	4/8	5/6	6/4	7/2	8
0/0	0/9	1/8	2/7	3/6	4/5	5/4	6/3	7/2	8/1	9

To use Napier's bones for multiplying 849 by 25, pick out bones 8, 4, and 9. Arrange them as shown in the diagram below.

The index bone is included in the arrangement, at the right.

0/8	0/4	0/9	1
1/6	0/8	1/8	2
2/4	1/2	2/7	3
3/2	1/6	3/6	4
4/0	2/0	4/5	5
4/8	2/4	5/4	6
5/6	2/8	6/3	7
6/4	3/2	7/2	8
7/2	3/6	8/1	9

The product of 5 and 849 is given in the fifth row. The digits between the diagonal lines must be added to find the product. The product is read from left to right as shown in the diagram below.

4	4/0	2/0	4/5	5

5 x 849 = 4,245

The product of 2 and 849 is found in the second row as indicated below.

1	1/6	0/8	1/8	2
	6	9	8	

2 x 849 = 1,698

Since 2 times 849 equals 1,698, then 20 times 849 equals 16,980. The product of 849 and 25 is the sum of the two partial products 4,245 and 16,980, which is equal to 21,225.

A set of the bones can be constructed and illustrated as a very interesting and informative class project.

(From a collection of recreational materials prepared by Mr. Mike Donahoe, Walter Colton Junior High School, Monterey, California, for the California Mathematics Council, Northern Section, May, 1959.)