RAFT IDEAS

Topics: Multiplication, History of Math & Technology

Materials List (per set)
- ✓ 12 tongue depressors
- ✓ 1 copy of the multiplication template
- ✓ White glue, tape, or double-stick adhesive
- ✓ Scissors
- ✓ Matte board, about 18 cm x 28 cm (7" x 11")

This activity can be used to teach:

Common Core Math:
- Factors (Grade 4, Operations & Algebraic Thinking, 4)
- Multiplication of multi-digit numbers (Ops. & Algebraic Thinking, Grade 3, 5&7; Num. & Ops. in Base Ten, Grade 4, 5; Grade 5, 5; Number Sys., Grade 6, 2)
- Problem Solving and Reasoning (Math Practices Grades 3-12)

National Social Studies:
- Knowledge of the past (Theme 2, Time, Continuity, Change)
- Influence of science, technology (Theme 8, Science, Technology, & Society)

raft
resource area for teaching
www.raft.net

Calculating Bones
Napier's Bones, a Calculator from Long Ago
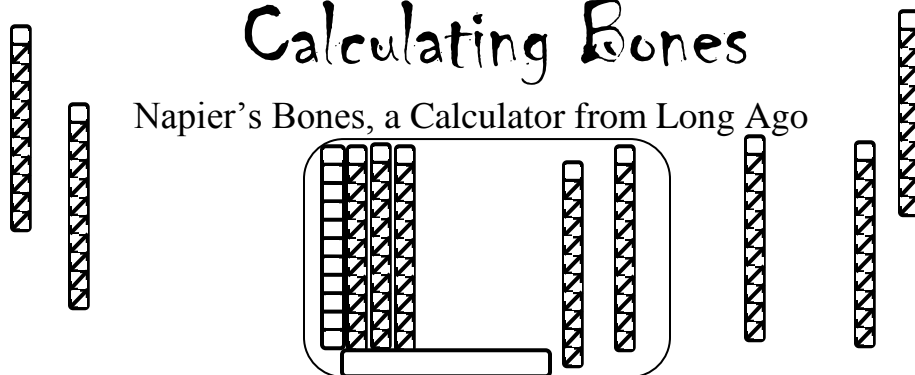
When John Napier, a famous mathematician, invented his "Bones" or "Rods" in the early 17th century, modern calculating was born. With this simplified recreation, students can multiply large numbers quickly, with little effort and no electricity!

Assembly (Instructions for students)
1. Fill-in the 10 blank templates with the multiplication tables for the numbers 0 through 9, using the samples provided as a guide. (See page 2 for templates)
2. Cut out the templates. Secure each paper strip (including the index) to a tongue depressor with white glue, tape, or double-stick adhesive.
3. Secure the "Index" (vertically) to the left side of the matte board. Also, secure the blank tongue depressor (horizontally) to the bottom of the matte board to aid in aligning the "bones".

To Do and Notice (using the "Bones")
1. As an example, try 6 x 645.
2. Collect the three bones to make the 3-digit number ("6", "4", and "5") and place them, in order, next to the index.

You will see something like:

Index	6	4	5
6	3 / 6	2 / 4	3 / 0

1. Follow the "6" row across to see 4 sections: a triangle, 2 parallelograms, and another triangle.
2. Each parallelogram contains 2 numbers that should be added together (and carried, if necessary).
3. Reading across, the product is: 3, 8 (6+2), 7 (4+3), 0 or 3,870.

The Math Behind the Activity
Napier's Bones were invented by a famous Scottish mathematician, John Napier, who contributed significantly to the field of mathematics. He is perhaps best known for inventing logarithms, later used to create another calculating tool: the slide rule. Napier published *Rabdologiae ('numeration by little rods')* in 1617, which explained how to use the Bones or Rods. Committing the multiplication tables to memory is a relatively new expectation of the average student. Today's 3rd graders are actually expected to memorize more than most average businessman of the Renaissance!

Taking it Further
Some Napier's Bones also included a wide rod that included squares and cubes. Challenge students to create a "squares and cubes" bone to complete their sets.

Web Resources (Visit www.raft.net/raft-idea?isid=22 for more resources!)
- Interactive version - http://gwydir.demon.co.uk/jo/numbers/machine/napier.htm

Samples

Fill in these templates with the multiplication tables

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

Index

| **0** |
| **1** |
| **2** |
| **3** |
| **4** |
| **5** |
| **6** |
| **7** |
| **8** |
| **9** |