

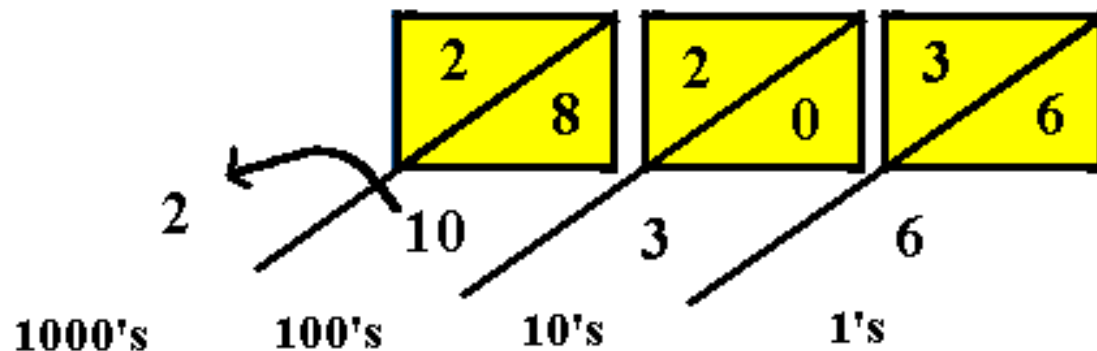
# Napier's Bones

**John Napier was a Scottish baron, inventor, and mathematician who lived during the 16th century (1550-1617). Logarithms ("for the more easie working of questions in arithmetike and geometrie") are his most famous contribution to math. He also invented a calculating device known as "Napier's bones", based on the Gelosia method of multiplication of 12th century India. Each "bone" is a list of the first nine multiples of a number between 1 and 9. There is an index "bone" for reference.**

To multiply  $4 \times 759$  using the bones, line up the bones 7, 5, and 9. Put the index bone next to them. Look at the 4 row only.

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

**Add the numbers in the diamonds. You get 2 in the 1000's place,  $8 + 2 = 10$  in the 100's place (another 1000, in other words),  $0 + 3 = 3$  in the 10's place, and 6 in the 1's place.**



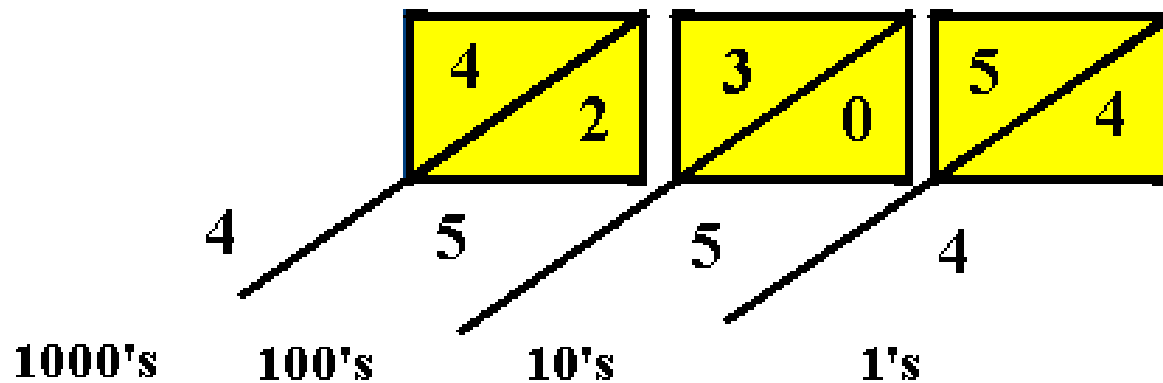
**Answer:  $2000 + 1000 + 30 + 6 = 3036$ .**

**What if you want to multiply a number by a two digit number, such as  $64 \times 759$ ?**

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

**Multiply  $4 \times 759$  as shown above.**

**Multiply  $6 \times 759$ . Use the same bones but look at the 6 row.**



**Multiplying  $64 \times 759$  is the same as multiplying  $60 \times 759 + 4 \times 759$ . Multiply  $4554$  by  $10$  and add it to  $4 \times 759 = 3036$ .**

$$64 \times 759 = 3036 + 45540 = 48576.$$