# NAPIER
## 16TH CENTURY "MATHEMAGICIAN"

**Biographical Information:**

John Napier (NAY-peer) was a Scottish mathematician who lived from 1550 to 1617. His family tree included many influential nobles and statesmen. His mother's brother, Adam Bothwell, assisted at the marriage of the Earl of Bothwell to Queen Mary, and also anointed and crowned the infant King James VI.

As a young boy, Napier was educated at home. When he was 13, his mother died and he was sent to study at the University of St. Andrews. He lived most of his life on the imposing family estate of Merchiston Castle, near Edinburgh, Scotland. Napier held no professional post, but was always busy with scientific and mathematical pursuits, developing a reputation as an intense and energetic amateur.

**Contributions:**

Napier was the inventor of logarithms, which made numerical calculations faster and more accurate. He also developed another method for simplifying calculation, known as Napier's Rods, usually made of bones or ivory. He was the first mathematician to standardize the use of the decimal point. Napier also invested his time in agricultural experimentation, military science, and religious and political causes.

**Quotation by Napier:**

"There is nothing so troublesome to mathematical practice than multiplications, divisions, square and cubical extractions of great numbers...I began therefore to consider how I might remove those hindrances."

**Anecdotes:**

*Marvelous Merchiston*

At home on his estate, Napier was always busy working on a new invention or writing about a new idea. He developed the use of salt as fertilizer.

He invented a hydraulic screw and a revolving axle which could remove water from flooded coal pits, and he experimented with what he called "chess arithmetic," where digits moved like rooks and bishops on a board. Because of his almost limitless ingenuity, Napier's friends and neighbors nicknamed him "Marvelous Merchiston."

*The Drunk Pigeons*

Napier was tired of his neighbor's pigeons, who were always pecking the seeds and grain out of his fields. He had warned the neighbor that he was going to do something drastic, but it had not done any good. One day, in exasperation, he sent a message threatening to catch and keep the birds the next time they flew over his fields.

"Mr. Napier," laughed the neighbor, "if you can catch them, you can have them!"

The next morning, Napier's servants arrived at work to find their master busily picking up pigeons and tossing them into a sack. They had never seen anything like it, but they weren't surprised.

Napier had a reputation for finding practical solutions to everyday problems, even though his ideas were often unorthodox. His neighbors found out later that Napier had soaked some peas in brandy, and scattered them in the yard to attract the pigeons. After they had had their fill of the peas, he was able to pick them up by hand and toss them into the sack. The pigeons were drunk!

*The Clairvoyant Rooster*

Napier was suspicious of his new workers; one of them must be dishonest. Tools and supplies were mysteriously but steadily disappearing. On questioning, each worker denied responsibility. Finally, Napier thought of a plan to catch the thief.

Early one morning he gathered the workers outside a dark storage room. He told them his special truth-telling rooster was perched inside. Each worker was instructed to go in, pet the rooster on the back, and then come back out. The rooster would be able to tell who was responsible for the missing items. One by one the workers filed into the shed to pet the rooster. Then Napier asked them all to turn their hands palms up. All but one had greasy black palms. Napier had cleverly coated his common black rooster with lamp black. The innocent workers petted the rooster without fear, but the guilty one took no chances and kept his hands in his pockets. His clean hands gave him away!
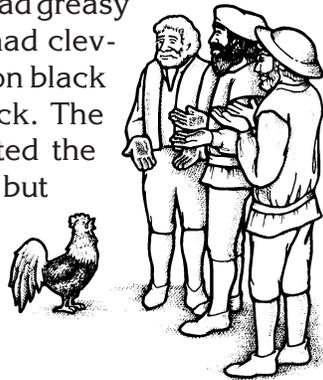
*Futuristic Weapons*

Napier spent years planning and drawing a series of military machines. One of these was a fantastic sailing device which could travel under water. Another was a moving vehicle which could shoot in all directions as it moved. He imagined a piece of artillery which could kill all cattle within a mile's radius. These projections became so horrifying to Napier that he rejected them all and insisted that prototypes never be developed. Today, it is remarkable to see how Napier's ideas, sketched out in the 16th century, are paralleled in the submarine, the tank, and the machine gun.

*Logarithms and Slide Rules*

One of Napier's greatest interests was astronomy, and he groaned when he thought of the almost endless calculations required of astronomers. After twenty years of study and experimentation, Napier introduced the use of logarithms—an incredible breakthrough in simplifying computation. This discovery was met with almost universal acclaim and acceptance, not just by astronomers, but by all persons who had been burdened by cumbersome arithmetic. Logarithms, the principle on which slide rules were based, essentially reduced multiplication and division to addition and subtraction.
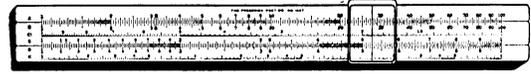
*Stick with Napier*

In 1971, Nicaragua paid homage to the world's "ten most important mathematical formulas" by issuing a set of commemorative stamps. Napier's formula for logarithms is on one of these stamps.

*Napier's Bones*

Napier's rods or bones, as they were sometimes called, were an additional help to persons who depended on calculation. A set of rods consisted of ten rectangular strips of ivory, wood, or metal, small enough to carry in the pocket much as people now carry pocket calculators. Each rod was marked with numbers. By placing selected rods side by side, one could multiply quickly and accurately.
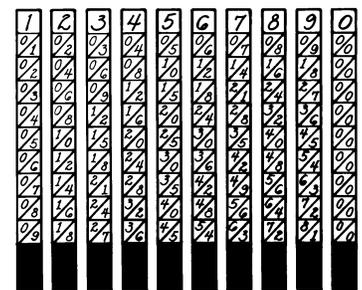
*Get to the Point*

Napier was the first mathematician to consistently use the decimal point to separate the whole number part from the fractional part of a number. His usage quickly became standard in Great Britain, but many European countries continue to this day to use the decimal *comma* instead.

# LATTICE MULTIPLICATION

A method of multiplication, used by the early Hindus, is called lattice multiplication. A lattice diagram is drawn and additions are performed diagonally. Study the examples below to uncover the method.
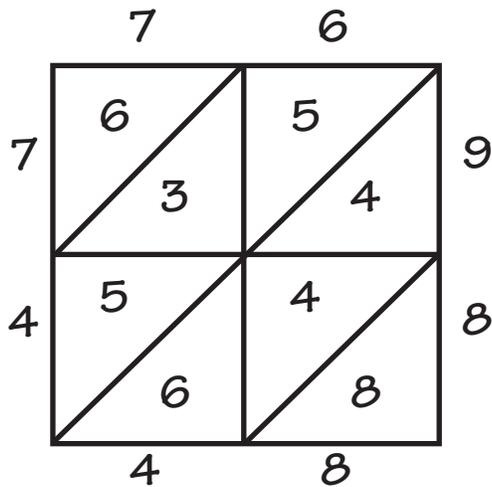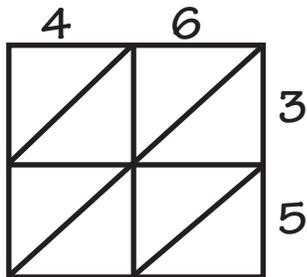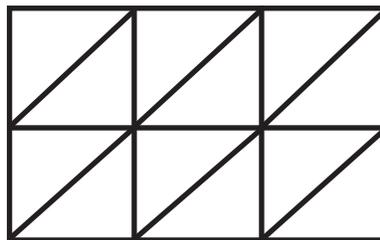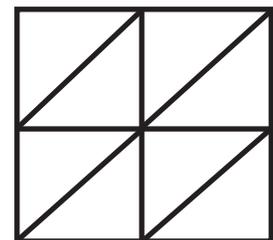
$76 \times 98 = 7448$
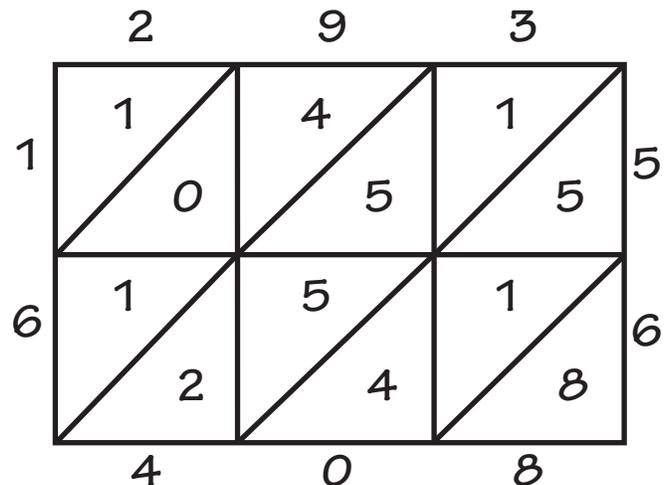
$293 \times 56 = 16408$

Use lattice multiplication to solve these problems.

$46 \times 35 =$ _____

$259 \times 37 =$ _____

$53 \times 24 =$ _____
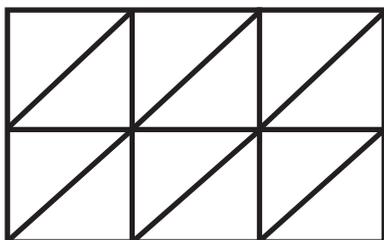
$457 \times 38 =$ _____
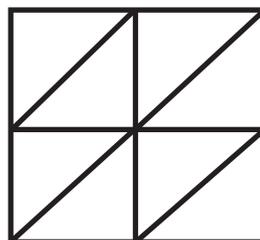
$63 \times 75 =$ _____
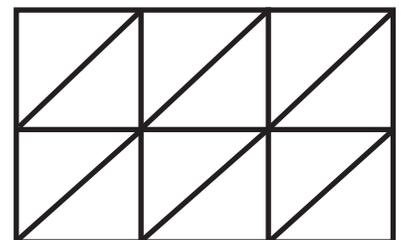
$836 \times 28 =$ _____

# NAPIER'S RODS

| Index | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-------|---|---|---|---|---|---|---|---|---|

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | (Index) |
|---|---|---|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 1 |
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| 08 | 16 | 24 | 32 | 40 | 48 | 56 | 64 | 72 | 8 |
| 09 | 18 | 27 | 36 | 45 | 54 | 63 | 72 | 81 | 9 |
| 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 00 | 0 |