

LEARNING THE "FAMILY" FORMULA USING BIG FRIEND AND LITTLE FRIEND IN MENTAL ARITHMETIC

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Abstract: *The greatest schools in the world have embraced mental arithmetic as a popular academic topic. In addition to being taught in North America and Europe, it is a required subject in many Asian nations. In Russia, schools for this field of study are also starting to exist. This science has a lengthy and fascinating history of development.*

Key words: *abacus, big, friend, family, simple, calculations, unit, numbers.*

As we continue the mental arithmetic lessons, it is natural for every bachelor to form an idea about the sequence of topics. Because, in the mental arithmetic lessons, the topics should be structured in such a way that a specialist studying this field or a practicing student should learn arithmetic operations in a simple and consistent way. To carry out the topics in this order, first get acquainted with the abacus, count on the abacus, study room units, simple calculations in unit numbers, counting in tens, counting in hundreds, then cognitively more complex topics, i.e. little friend, big. We got acquainted with the actions of friends. Now it's time to create "family" formulas based on a small and big friend. During the study of the topic, we will consider arithmetic operations in this direction one by one.

When performing the operation $7+7=$ on the abacus, we first enter the number 7 in the units room. Then you need to enter the number 7 again in the units room. However, it can be seen that there is a lack of free stones in the unit room. Therefore, to add 7, we use the big friend formula: $+7=+10-3$. You need +10 (add 10) to the tens room of the abacus, and -3 (subtract 3) from the units room. However, 3 cannot be subtracted from the units room. Because we can see that there are only 2 values for subtraction at the bottom of the units room. So for -3 (subtract 3) we have to use the little friend formula: $-3=-5+2$. To subtract 3, subtract 5 and add 2. We can see that the result is 14. So, in performing this operation, we created a family formula by combining the big friend and small friend formulas. If we express these formulas;

$+7=+10-3$ big friend formula

$-3=-5+2$ little friend formula.

If we generalize these formulas, the following formula is derived;

$+7=+10-5+2$ family formula

As you can see from the formula, instead of -3 (subtract 3), the expression $-5+2$ is given.

Let's consider another action. For example,

17

6

2

-8

The following sequence can be used to perform this action:

Step 1: we insert the number 17 into the abacus with the help of free stones.

Step 2: After that, you need to add the number 6 to the units room. However, since there are not enough free stones to add 6 in the units room, we have to borrow from the tens room of the abacus. This formula can be used for this. $+6=+10-4$. So to add 6, we first add +10 (add 10).

Step 3: You need -4 (subtract 4) from the units room. But there are no free stones left in the unit room to subtract 4. Therefore, we subtract 5 and add 1. We use this formula $-4=-5+1$.

Step 4: We can see that the value 23 is generated on the abacus. After that, we add 5 and subtract 3 based on the formula $+2=+5-3$ for +2 (add 2). The value 25 is generated on the abacus.

Step 5: To subtract 8 from 25, we perform the operation using the formula $-8 = -10 + 2$. That is, we add -10 (subtract 10) from the tens room, +2 (add 2) to the units room. Then we can see that the result is 17. (Figure 70)

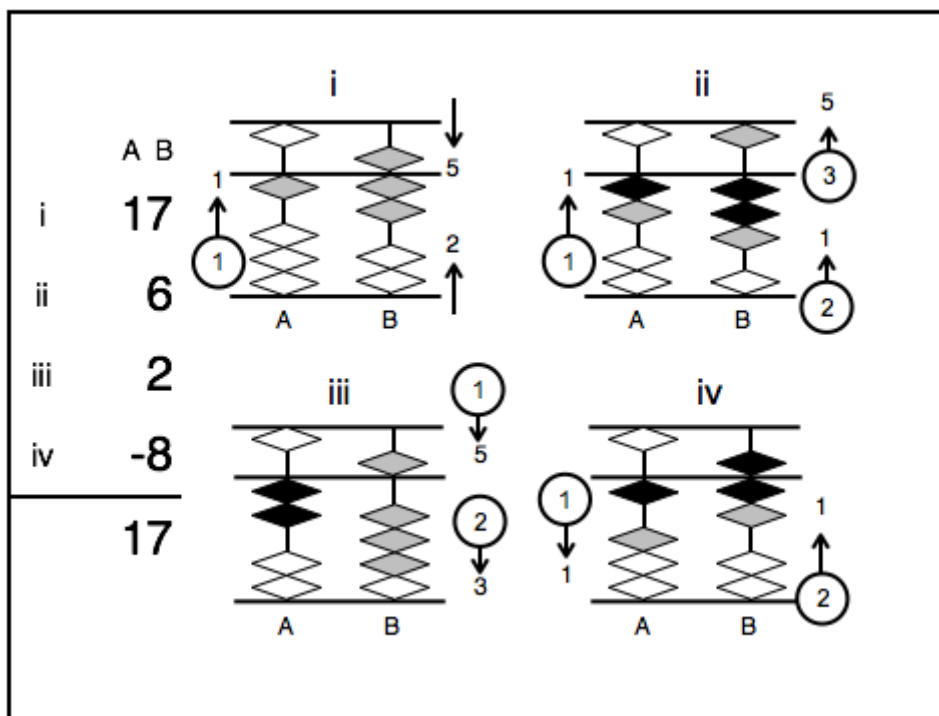


Figure 70: Representation of the operation $17+6+2-8=17$ in sequence on the abacus

Let's look at some more examples:

- 5
- 9
- 8
- 3

Step 1: we enter 5 in the units room of the abacus.

Step 2: For +9 (add 9), +10 (add 10) from the tens room and -1 (subtract 1) from the units room based on the formula $+9=+10-1$. We add 10 to the tens room.

Step 3: For -1 (subtract 1) from the room of units, subtract 1 using the formula $-1=-5+4$ because the lower stones are missing free stones. Then we can see that the value 14 is formed on the abacus.

Step 4: Add 8 to the resulting value using the formula $+8=+10-2$ to add +8 (add 8). Then we can see that the result is 22.

Step 5: To +3 (add 3) to 22, we perform the operation using the formula $+3=+5-2$. Then 25 will be produced. (Fig. 71)

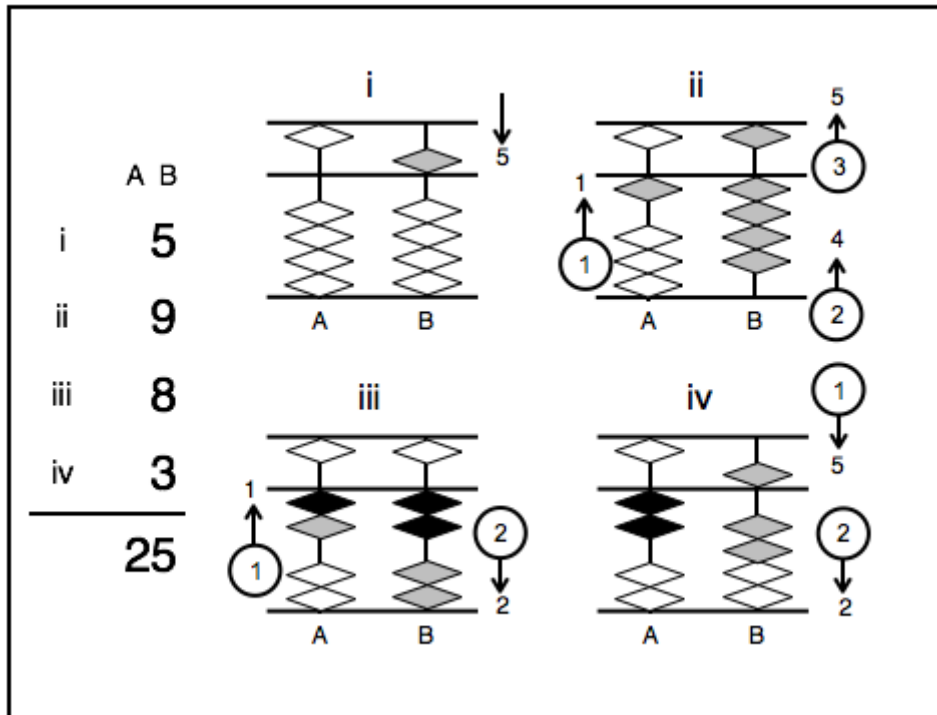


Figure 71: Representation of the operation $5+9+8+3=25$ on the abacus.

15
-7
-2
8

The following sequences can be used to perform this action:

Step 1: we enter the number 15 into the abacus.

Step 2: For -7 (subtract 7), we perform the operation based on the formula $-7=-10+3$. Then the value 8 is formed on the abacus.

Step 3: -2 (minus 2) is subtracted from 8. Then the value 6 is generated.

Step 4: To add 8 to 6, we use the formula $+8=+10-2$. Then +10 (add 10).

Step 5: For -2 (subtract 2), we use the formula $-2=-5+3$, since there are no free stones left. Then the value 14 is formed on the abacus.

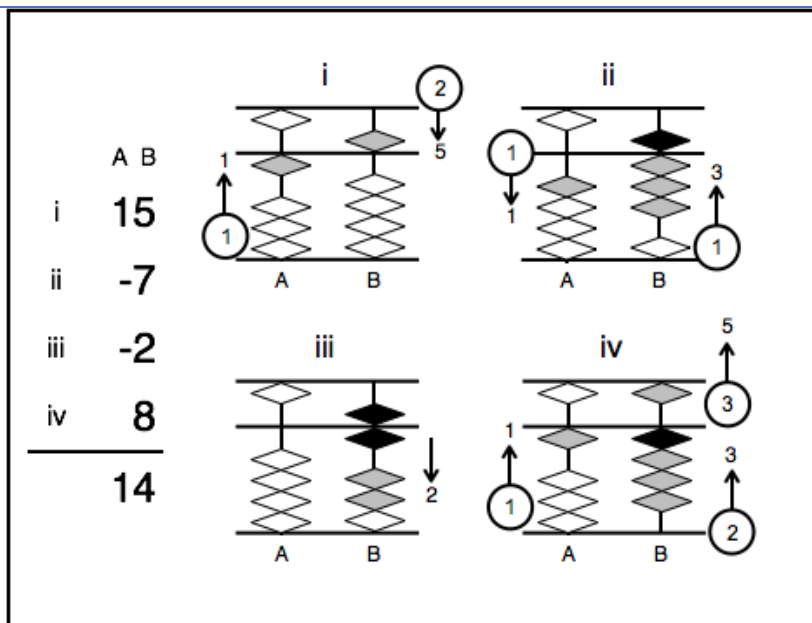


Figure 72: Representation of the operation $15-7-2+8=14$ on the abacus

Family formulas formed based on the combination of small and large friend formulas can be summarized as follows:

positive,

$$(5,6,7,8) + 6 = +10 - 5 + 1$$

$$(5,6,7) + 7 = +10 - 5 + 2$$

$$(5,6) + 8 = +10 - 5 + 3$$

$$(5) + 9 = +10 - 5 + 4$$

negative,

$$(14,13,12,11) - 6 = -10 + 5 - 1$$

$$(14,13,12) - 7 = -10 + 5 - 2$$

$$(14,13) - 8 = -10 + 5 - 3$$

$$(14) - 9 = -10 + 5 - 4$$

So, adding and subtracting in the abacus is done by creating several complex formulas.

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