



# Make Your Own Abacus

Perform calculations like they did hundreds of years ago! Create an abacus, a device invented in China, and learn how to use only beads and string to solve math problems.

## TEKS:

MATH 3.2 A: The student is expected to compose and decompose numbers up to 100,000 as a sum of so many ten thousands, so many thousands, so many hundreds, so many tens, and so many ones using objects, pictorial models, and numbers, including expanded notation as appropriate.

MATH 3.4: The student applies mathematical process standards to develop and use strategies and methods for whole number computations in order to solve problems with efficiency and accuracy.

MATH 3.4 A: The student is expected to solve with fluency one-step and two-step problems involving addition and subtraction within 1,000 using strategies based on place value, properties of operations, and the relationship between addition and subtraction.

## Materials:

- 28 beads
- Marker or pen
- Piece of cardboard
- Rubber band
- Ruler
- Scissors
- Yarn or string (4 12-inch pieces)

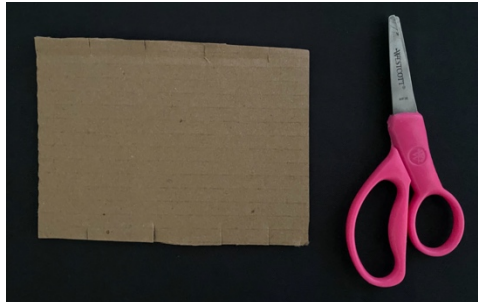
## How To:

1. Cut a piece of cardboard into a 4x6-inch rectangle and place it in front of you, with a 6-inch side of the rectangle at the top.
2. Use scissors to cut four evenly-spaced, ½-inch notches into the top edge of the cardboard rectangle, and four matching notches opposite these on the bottom edge.

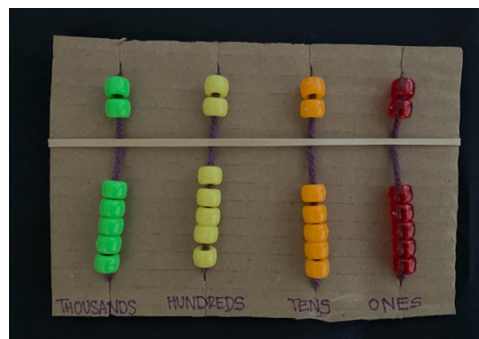
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3. String seven beads onto a 12-inch piece of yarn. Hook this yarn vertically into one "set" of notches, making sure all seven beads are on one side of the cardboard. Knot the yarn on the back of the cardboard rectangle to keep secure.
4. Repeat with the remaining three pieces of yarn until you have used all 28 beads.
5. Place your rubber band horizontally over the entire rectangle, approximately 1.5 inches from the top. Make sure that two beads from each column are above the rubber band and five beads from each column are below the rubber band.
6. Use a marker or pen to label the columns, from right to left, "ones," "tens," "hundreds," and "thousands."
7. Read the STEM Explanation below to learn how to use your abacus to perform mathematical calculations!



### STEM Explanation:

Before written numbers were common, many different cultures had methods of performing calculations, including using pebbles, stone tablets, wooden markers, marbles, or even lines in the sand. When the abacus was invented in China, however, everything changed! Called the *Suan-Pan* in Chinese, this mathematical device was made out of wood with metal or wooden rods (usually 13 of them), and each rod of a Chinese abacus had 2 beads on the top and 5 on the bottom. The arrangement of the beads allowed for quick mathematical computations, and this invention quickly spread throughout the world! Although we now have calculators that can solve complex math problems in seconds, many still use an abacus today, especially to help teach people about place value.

So... how exactly can these beads help us do math?

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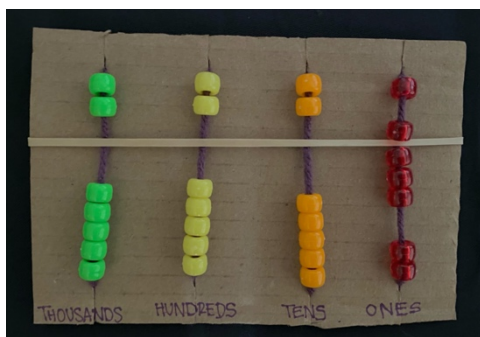
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First, let's learn what the different parts of your abacus represent. The rubber band represents the "center divider" of your abacus. Every string on your abacus has seven beads: two beads above the center divider ("top beads") and five beads below the center divider ("bottom beads"). Each top bead represents a value of "5" and each bottom bead represents a value "1."

Each string on your abacus represents a different place value, making each top and bottom bead represent a different multiple of "5" and "1." The string on the very right represents the "ones" (digits from 0-9; bottom beads: 1, top beads: 5). The string next to it represents the "tens," (digits from 10-99; bottom beads: 10, top beads: 50), the next string the "hundreds," (digits from 100-999; bottom beads: 100, top beads: 500), and the final string on the left represents the "thousands," (digits from 1000-9,999; bottom beads: 1,000, top beads: 5,000). Beads pushed toward the center divider are considered to be "activated," meaning that they have a value.

Now that you have that background information, let's count something! Use your abacus to count to 8.

1. Place your abacus on a flat surface in front of you and make sure that all of the beads on your abacus are pushed away from the center divider.
2. Begin counting by pushing the five bottom beads in the right "ones" column up toward the center divider. This represents the number 5.
3. Once you push all five beads up, the entire bottom section is full! However, we still have three beads to go before we get to 8.
4. Move one of the top beads in the right "ones" column down toward the center divider to replace the five beads in the bottom section and push all five bottom beads back down. This still represents the number 5.
5. Next, move three bottom beads up toward the center divider. One top bead (5) and three bottom beads (3) represents the number 8!



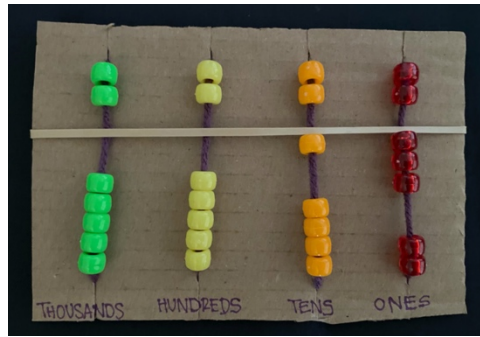
Now say that we want to do the calculation of  $8+5$ .

1. The first step would be to record the first number on your abacus: 8. Check!
2. Next, add the value of 5 using beads. Move the final two bottom beads up to the center to create a value of 10.
3. You still need to add three more beads, so push all of the beads in the right column away from the center divider and replace that value of 10 with a bead from the next column: push one bottom bead from the tens column up to the center divider to represent 10.
4. Next, push three bottom beads from the ones column up to the center divider to represent 3, and you're done! Count the total value displayed on your abacus to get the result of  $8+5$ ... it should be 13!

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That was a long way to do a simple math problem that would have probably only taken seconds in your head. With enough practice, however, you can use your abacus to quickly add very large numbers!

Need some help or want some more practice? Check out these videos:

- To see an animated explanation of how to use a Chinese abacus:  
[https://www.youtube.com/watch?v=a0w8XTR0R7g&ab\\_channel=Howcast](https://www.youtube.com/watch?v=a0w8XTR0R7g&ab_channel=Howcast)
- To watch someone count to 500 on a Chinese abacus:  
[https://www.youtube.com/watch?v=FTVXUG\\_PngE&ab\\_channel=PelleLindbl%C3%A5](https://www.youtube.com/watch?v=FTVXUG_PngE&ab_channel=PelleLindbl%C3%A5)

### Career Connection:

*Mathematicians* do research to develop and understand mathematical principles. They analyze data and use mathematical techniques to help solve problems in the world. They often work with teams of scientists and engineers. To be a mathematician, you need to get at least a master's degree in mathematics.

### Resources:

- <http://www.chinahighlights.com/travelguide/culture/the-chinese-abacus.htm>
- [https://www.youtube.com/watch?v=FTVXUG\\_PngE&ab\\_channel=PelleLindbl%C3%A5](https://www.youtube.com/watch?v=FTVXUG_PngE&ab_channel=PelleLindbl%C3%A5)
- <http://letsdosomethingcrafty.com/cheap-quick-easy-make-upcycled-diy-abacus/>

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