100 Bead String

Bead strings provide a structured linear representation of numbers in the range 1 to 100, color coded with tens alternating between red and white. The string encourages students to anchor to and use tens as benchmarks (friendly numbers), as they model quantities, count, compare, add and subtract. The bead string provides foundational experiences to prepare students to understand number lines. As students gain experience with this concrete material, they can begin to transition to showing their thinking on a bead string recording page and eventually a number line.

Bead strings can be purchased or easily made with pony beads and string or cord. (3mm macrame cord works well.) Having students build their own bead string is a great experience to familiarize them with the structure.

What is a Bead String?

A standard bead string is made of 100 beads, alternating groups of ten red and ten white, but there are variations. Students might begin with a bead string that has only 20 or 50 beads, alternating colors by ten, to build awareness of the ten structure within a smaller range of two-digit numbers.

Bead strings can also be structured in different ways, including color coding in sets of five to bring out the five structure within the tens. Students might work with an "hour" bead string that alternates colors every five beads, with 60 total beads to represent the minutes in an hour. No matter the color or structure of the bead string, the goal is to encourage students to use the base-ten structure to allow them to efficiently work with two-digit numbers.

Representing Numbers

Orient the bead string horizontally starting with red on the left. If using colors different from red and white, orient so that the darker color is to the left. A quantity is represented by pushing beads to the far left of the bead string. For example, the image below represents 23.

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Getting started:

Have students explore the bead string. Ask questions such as:

- What do you see?
- How many beads? How are they organized?
- How many beads in this group of red?
- How many red beads in all? How many white?

"How many?" Tasks:

- Move over any number of beads and display.
- Ask How many beads? How do you know?
- Look for evidence of using groups of 10. If needed, ask How many groups of 10?

"Get..." Tasks

- Ask students to build a number with one push.
- Start with multiples of 10.
- Move to numbers that are slightly more or slightly less than a multiple of 10.
- Be aware if the child is using the nearest multiple of 10, such as finding 49 by finding 50 and counting back 1.
- Move to any number in the range 1 to 100.
- Variation: show a numeral instead of verbally giving the number.

Compare two numbers

Ask students to use two bead strings compare numbers. Students would build each number on one of the bead strings, then position bead strings next to each other.

Change tasks

Ask students to build a number, then ask how they would change it to have a different number. Start with small changes, especially changes that focus on a nearby multiple of 10 or using the groups of 10. For example:

- Change from a multiple of 10 (e.g. Make 50. How would you change it to make 54? Or Make 30. How would you change it to make it 27?)
- Change to a multiple of 10 (e.g. Make 37. How would you change it to make 40? OR Make 37. What will happen if you push over the remaining 3 red beads?)
- Change over a multiple of 10 (e.g. Make 25. How would you change it to make 32?)
- Work with multiples of 10 (e.g. Make 60. How would you change it to make 80?)

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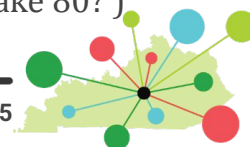
Two-digit numbers plus or minus one-digit numbers

Bead strings provide support for students to develop efficient strategies to work with adding or subtracting a one-digit number from a two-digit number. The bead string helps students think in chunks by anchoring to multiples of ten and using fluency within 10. As they build efficient strategies with the concrete representation, they are laying the foundation for mental strategies.

To build this thinking, students might move through a progression of building and solving different types of problems on the bead string. To build fluency, it is important that students use the structures to solve these types of problems using chunks, rather than counting by ones.

- Add to a multiple of 10: **20+4**
  - Two groups of ten and 4 more results in 24, connecting to early experiences building with the bead string
- Add or subtract within a decade family: **32+6, 38-6**
  - Use 2+6 or 8-6, but working in the 30s
- Add or subtract to reach a multiple of ten: **38+__ =40 , 34-?= 30**
  - What is the nearby multiple of ten? How far away is it?
- Subtract from a multiple of ten: **30-4**
  - Break apart the last 10: 10-4=6 and it will now be in the 20s
- Cross a multiple of ten: **38+5, 32-6**
  - Combine previous understandings, anchoring to ten and working in chunks
  - 38 is two away from 40, so break apart the 5 into 2 and 3, two more makes 40, and 3 more is 43 (see Figure 1 below to see how this might look on the bead string or recorded on an empty number line)
  - 32-6 remove 2 to reach 30, remove 4 more from 30 leaves 26 (See Figure 2 for how this might be recorded on the recording sheet.)

Figure 1

Figure 2