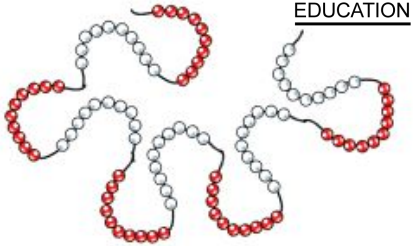
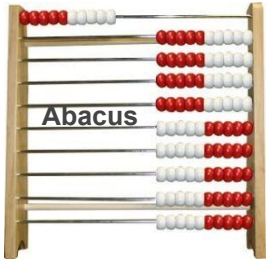
Manipulatives of the Month

Beadstrings

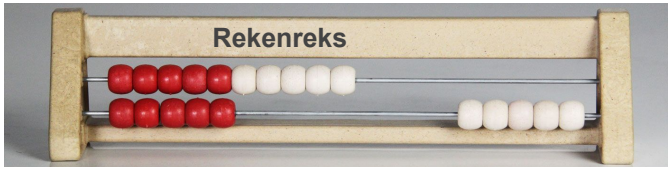
Beadstrings

Beadstrings are versatile, compact, and easily accessible learning tools. They help students develop counting skills by allowing them to add or remove beads along the string as needed. They also serve as an effective visual aid for teachers, providing a clear focal point for group instruction. Beadstrings to 10 group the beads in fives. beadstrings to 20 work in a similar way and beadstrings to 100 are grouped in tens.



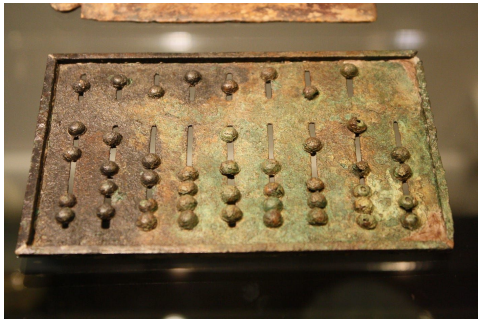


Similar manipulatives include Rekenreks and the Slavonic Abacus.
Rekenreks include two rows of beads.
The Slavonic **Abacus** (sometimes referred to as a Bead Frame) includes ten rows of ten beads



History:

Beadstrings have a long history as counting and learning tools, tracing back to early civilizations. They are closely related to the abacus, which dates back over 4,000 years and was used in ancient Mesopotamia, China, and Rome for calculations.

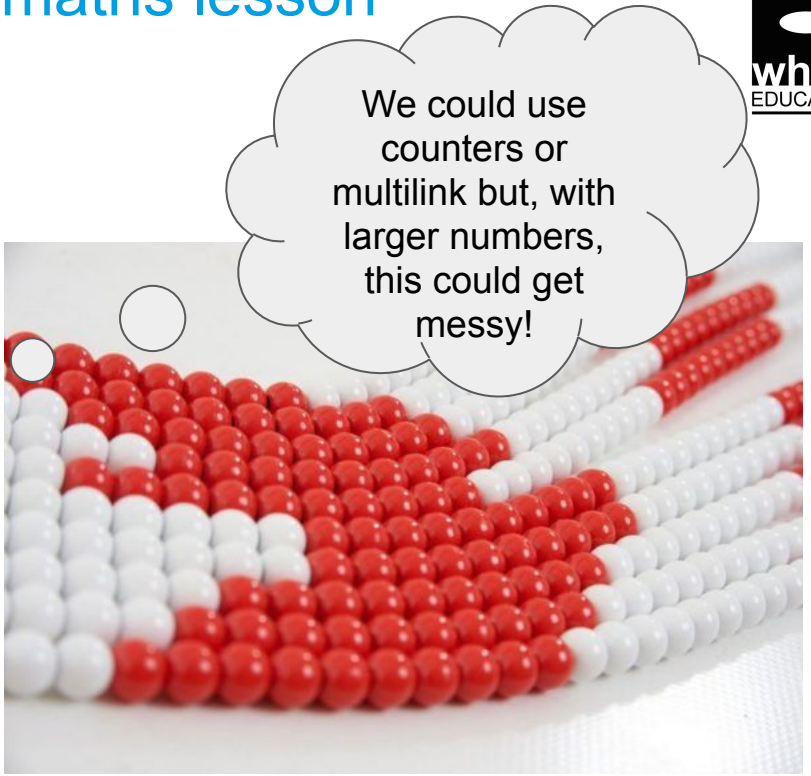


10 ways to use beadstrings in the maths lesson

This month we explore **10 different ways to use beadstrings** in the maths lesson.

They are often used to teach:

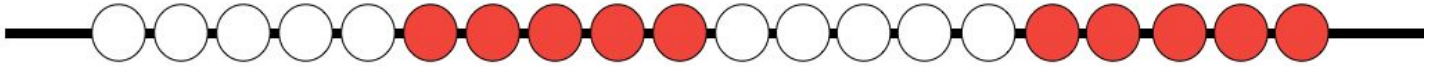
- ***Counting & Number Recognition*** – Helps students count beads to understand numbers.
- ***Addition & Subtraction*** – Supports visualising number operations by moving beads.
- ***Multiplication & Grouping*** – Teaches skip counting and grouping in sets.
- ***Division & Fractions*** – Demonstrates splitting numbers into equal parts.
- ***Place Value & Patterns*** – Uses colours and sections to show place value and sequences.



Where every bead counts, making maths a vibrant adventure!

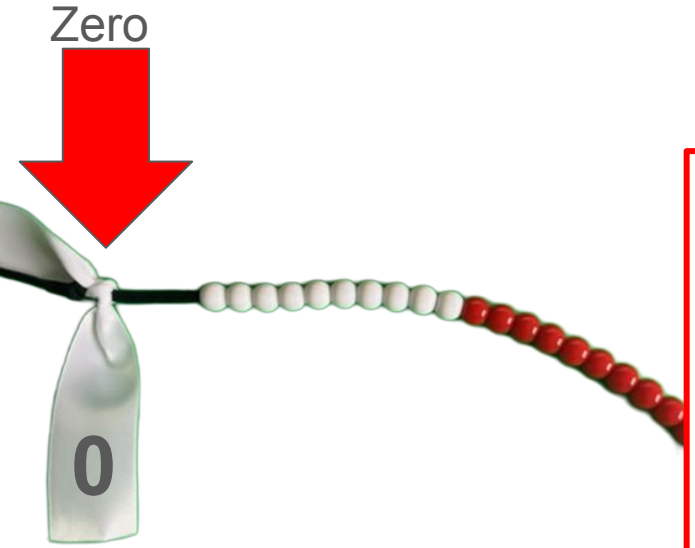
Beadstrings

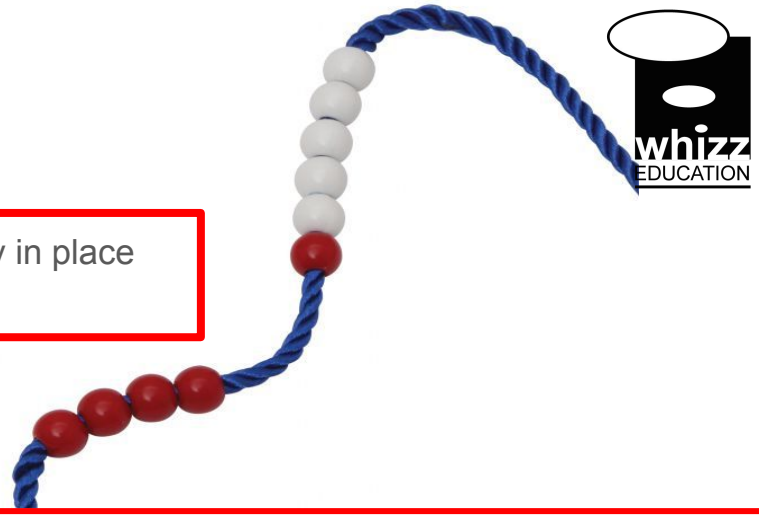
- Beadstrings to **10** are very effective at helping students to investigate number bonds up to 10.
- Beadstrings to **20** enable students to apply their knowledge of number bonds to 10 and see the links to number bonds to 20.
- Beadstrings to **100** can support students in number bonds to 100 as well as helping when adding by making ten. Beadstrings can show a link to adding to the next 10 on number lines which supports a mental method of addition.
- Beadstrings to **120** can support fraction concepts.



Top Tips - Beadstrings

The quality of the string is important. Some beads will stay in place when moved, this makes doing the maths much easier.





Depending on which end of the beadstring you start with, the first group of beads of five or ten might be white, or it might be red. This is a potential problem for struggling students, as the beadstring the teacher is modelling with can look very different from the beadstring they are holding.

Tie a piece of ribbon to the end you want them to hold in their left hand and explicitly showing them which end to call zero to help them match the teacher's modelling.

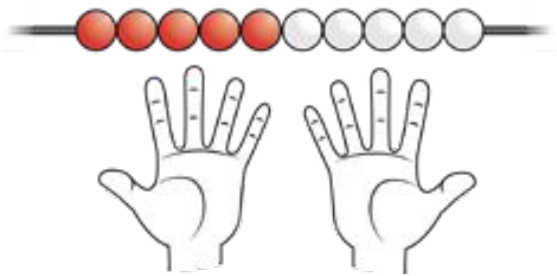
Activities

One of the ideas that will be reinforced throughout the activities is that beads should be moved in clusters whenever it is possible for students to do so. In an effort to promote subitisation, encourage students through your own modeling to slide beads to the left (and at times to the right) in groups rather than counting individual beads, one at a time.

1. Five Pattern, Ten Pattern
   - *Ordering & recognising number patterns*
2. How can I make a 100 Beadstring?
   - *Collaboration, pattern making*
3. Counting
   - *Number properties*
4. Comparing and Ordering
   - *Measurement and spatial awareness*
5. What's missing?
   - *Addition & subtraction, inverse relationships*
6. Tug of War
   - *Fluency*
7. Addition/Subtraction
   - *Calculating, seeing patterns, applying strategies*
8. Fractions, Percentages & Decimals
   - *Develop fluency with fractional numbers*
9. The 120 Beadstring
   - *Fractions*
10. Renaming the Value
    - *Investigation*

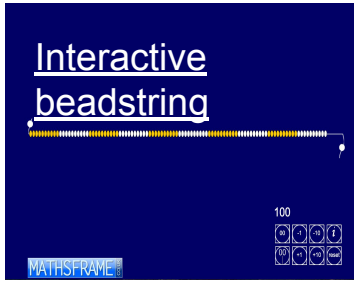
1. Five Pattern, Ten Pattern

An important link can be made between the five-five pattern and the number of digits on each hand.



5 of each beadstring

10 of each beadstring



The structure of the beadstring highlights groups of 5 or 10. This offers visual pictures for learners that one number may be a combination of two or more other numbers. Students quickly learn to *"see"* in groups of 5 and 10. For example, seeing the number 7 as two distinct parts: one group of 5, and two more.

Allow them time to explore and 'play' with the bead string, then lead them into guided discovery.

- *Why are the beads different colours?*
- *Is there a pattern to the colour of the beads?*
- *How many beads are there on the beadstring?*
- *What calculations can you do?*
- *How might this help with addition and subtraction?*
- *When else might the beadstring help?*

2. How can I make a 100 beadstring?

Collaboration, pattern making

Making your own is surely the way to go.
Students will love making them too!

Here's how…

- String or a shoelace
- 50 white beads
- 50 coloured beads (choose a single colour rather than multi colours)

Method

- Tie a knot at the end of your string, big enough so that the beads won't fall off
- Ask your students to thread on the beads: 10 white, followed by 10 red for example
- Repeat this until all of the beads have been used up
- Leave some extra space for the beads to be moved along the string when students are using it to count
- Then tie a knot at the other end

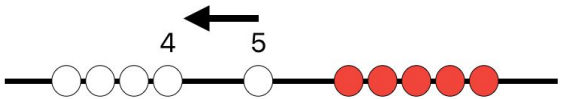
Try making a giant beadstring!

3. Counting

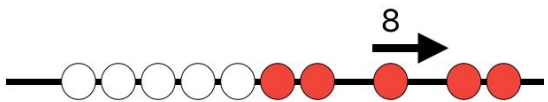
Beadstrings are an excellent way to seeing patterns and subitising - *You can use beadstrings of different configurations to do these activities.*

1. **Count forward in ones**, 1, 2 ,3… etc - move the beads to the left

2. **Count forwards from any point** e.g. from 4, hold 4 in my head(and hold the 4th bead) 5, 6, 7… etc



3. **Count backwards** - move the beads to the right



4. **Show in one movement** -
… 10,… 20,… 100,…0,… 90 *and so on*

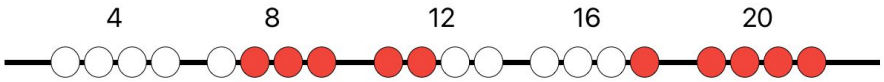
5. **Show me two ways to find** (select numbers that are near to decade numbers)

6. **Show me three ways to find 50.**
Strategy 1: Count up in tens.
Strategy 2: Count back in tens.
Strategy 3: Fold the bead string in half.

Once students are confident with identifying 50, this can increase efficiency further.

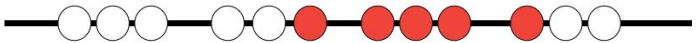
3. Counting continued…

7. **Skip count** e.g., group the beads in fours 4, 8, 12, 20…



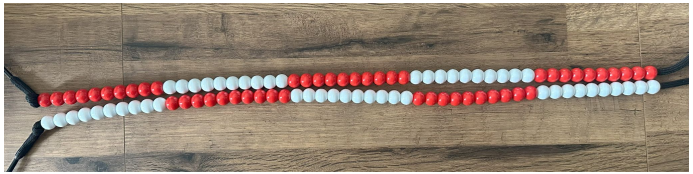
8. **Fact families -** exploring the grouping structure of division and the link to multiplication.

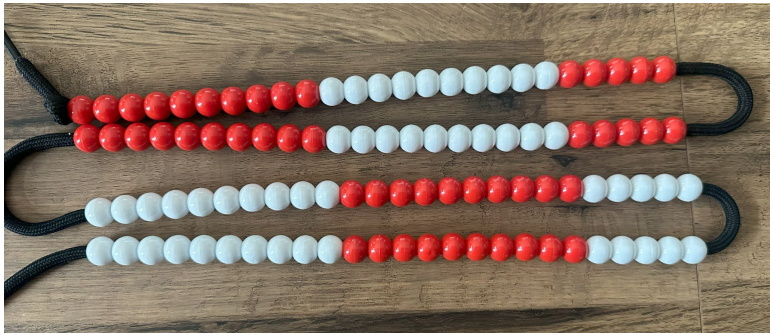
If dividing 12 by 3, we can ‘pull’ out groups of 3 beads to found out how many groups we can make.



4 equal groups of 3
4 x 3 = 12
The product is 12
12 ÷ 4 = groups of 3
12 ÷ 3 = 4 equal groups

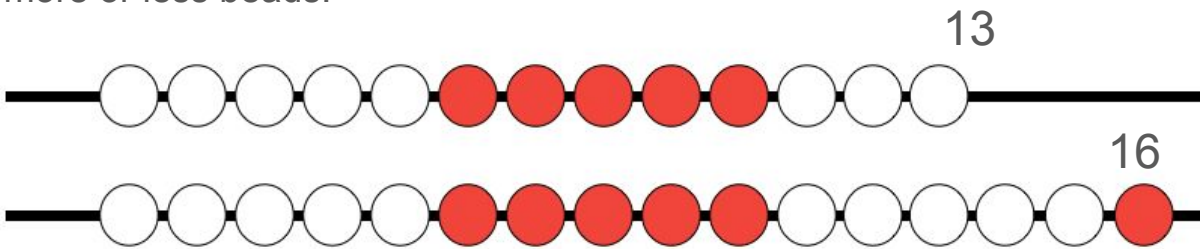
9. **Equal groups/ arrays -** how could we label these groups below? What other equal groups can you make?





4. Comparing and Ordering

The length of two beadstrings can be compared showing which one contains more or less beads.

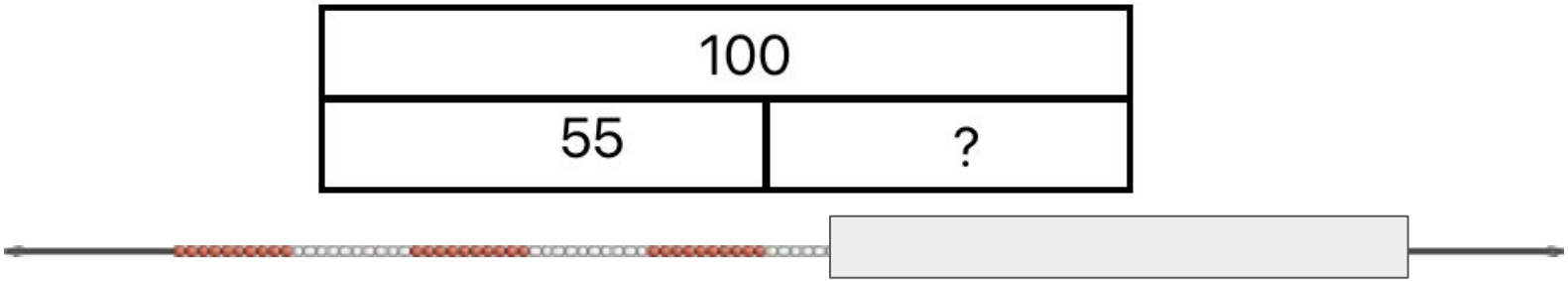


Game:
In pairs, have a beadstring each (10, 20 or 100) - decide whether you are playing ‘more than’ or ‘less than’. Both make a number, whoever fits the rules e.g. if playing ‘more than’ then whoever made the biggest number wins if they can say how many more beads their number was compared to their partner.

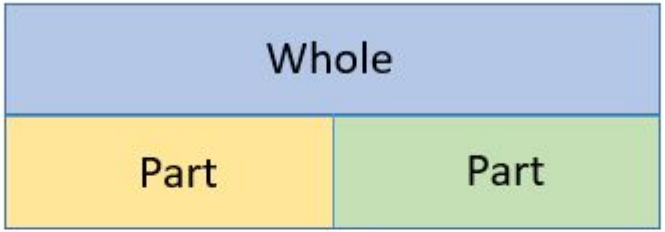
Using two beadstrings is a good tool to demonstrate a **Rounding and Compensating Strategy** e.g. the solution for 48 + 36 can be found by solving 50 + 34. By placing two beadstrings one above the other, students can add 2 beads to the top string while taking 2 beads off of the bottom string and thus showing that the beads present are the same – they are just redistributed to another string.

5. What's missing?

Addition & subtraction, Inverse relationships



Find the missing part/unknown. The beadstring can be split into two parts with one part covered. This extends the thinking to finding unknown numbers, given a whole and one part.
Change the unknown number and get the students to write their own problems.



How can you use a beadstring to help?

Discuss possible strategies to work out the unknown numbers - explore the inverse!

Part unknown ? + 63 = 100
Part unknown 35 + ? = 100

6. Tug of War

Fluency & commutativity

You will need: 20 beadstring and dice

1. Each player takes 10 beads to their end of the beadstring.
2. Players take it in turn to roll the dice and take that many beads from the opposing player.
3. Each player says how many beads they have after each roll of the dice (*See Below)*… and how they know?
4. Keep playing until one player has all the beads.

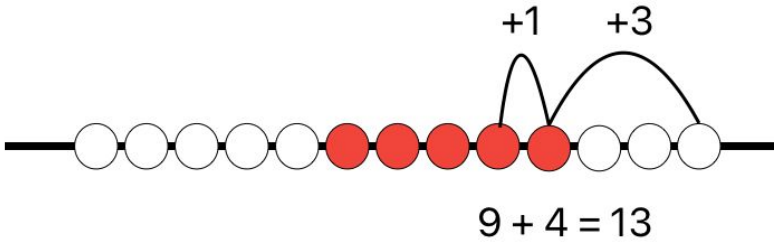
The language is using the *part-part-whole model*.
It highlights the commutativity e.g. 13 + 7 =20; 7 + 13 = 20
The coloured beads can also help recognise patterns e.g. 5 + 5 + 3 =13 and 5 + 2 = 7

“I have 13 beads, you have 7 beads. There are 20 beads altogether.”

7. Addition/Subtraction

Calculating, seeing patterns, applying strategies

Using beadstrings for addition and subtraction can support bridging 10 and commutativity.



Two Digit Addition / Subtraction progression

- Begin with a decade number and adding a single digit e.g. 40 + 3, 60+7
- Then, a two digit number and naming the amount to the next decade e.g. 36 – How many to 40, 41, 50?
- Move on to a two digit number and adding an amount that is within the decade e.g. 42 + 6, 56 + 3, 7 + 31
- Bridging a decade number next, a two digit number and adding through the decade e.g. 37 + 6 , 45 + 8. Concentrate on the colours pushed over to get to the next decade.
- Finally, pose 2 digit and 2 digit addition problems. This activity is designed to use “partitioning strategies” up the beadstring e.g. 38 + 17 = 38 + 10 → 48 + 2 →50 + 5 → 55.

Students can record their strategies by using an empty number line.

8. Fractions, Percentages and Decimals

Develop fluency with fractional numbers

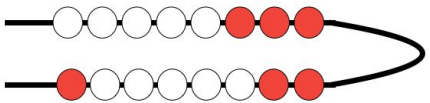
For these activities you can use three beadstrings (20, 100 and 120 beads).

How many beads in the whole?
If 18 is half…?
If 18 is quarter..?

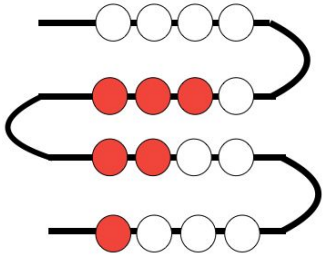
Find other fractions of amounts
E.g. ⅛ of hundred beadstring
¼ of hundred beadstring

Fractions as a quantity
A beadstring may be used to support students calculating a fraction of a quantity. Finding fractions such as a half or a fourth (quarter) may be worked out by folding a string in half, or half and half again, in the case of calculating a fourth.

16 ÷ 2 = 8

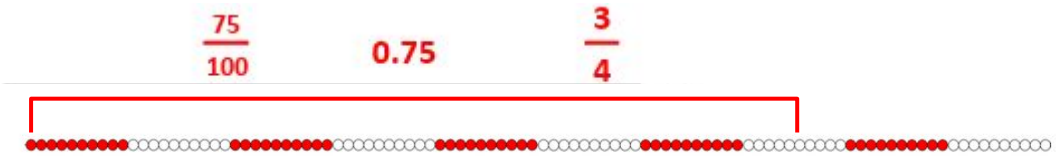


16 ÷ 4 = 4



Percentage: the 100 beadstring
The 100 beadstring is ideal for performing percentage calculations. Students can work out tenths and hundredths of the hundred beadstring. Later, they can calculate halves, fourths, fifths of the 100 beadstring.

Linking Fractions, Decimals And Percentage
Working out 75%, 75/100 and 0.75 of three different 100 beadstrings and laying them in three rows will highlight the links between them.

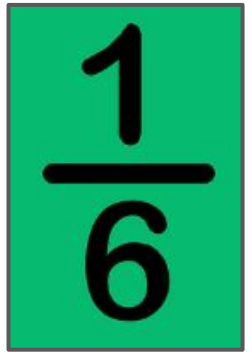


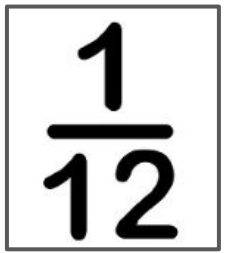
9. The 120 Beadstring

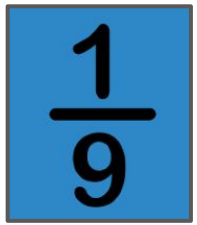
Add twenty beads onto the 100 beadstring to form a 120 beadstring.

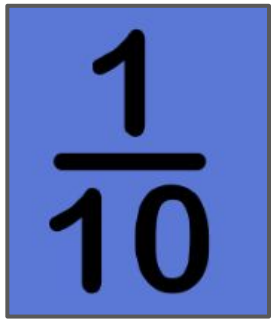
The 120 beadstring provides many more opportunities to calculate fractions.

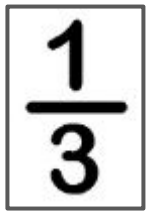
What fractions can be calculated?
Show me.

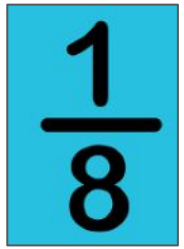










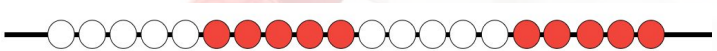


10. Renaming the value

Investigation

By **renaming the beads' values**, the beadstring can represent whatever you want.

If all beads on a twenty beadstring represents a total of two then what value would a single bead represent?



If twenty beads represents 2, then each bead is valued at 0.1.

Imagine the twenty beads represent four, what value would a single bead represent?

If fifty beads represents ten... Then what does one bead represent?

What other values could the beads on a beadstring represent? Prove it!

10. Renaming the value continued…

Rename the beadstring 0 to 1.

- What is the value of each group of colour now? (one tenth, 0.1)
- What is the value of each bead now? (one hundredth, 0.01)
- Count up and down the beadstring in hundredths.

Can you do this?	And this?
0.2, 0.3, 0.9	0.47, 0.23, 0.97, 0.62

Rename the beadstring 0 to 100%.

- What is the value of each group of colour now? (ten percent, 10%)
- What is the value of each bead now? (one percent, 1%)
- Count up and down the beadstring in percentages.

Show in one movement	Show in as few steps as possible
20%, 30%, 90%	63%, 28%, 95%, 82%

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