Getting to grips with beadstrings

Many people have grabbed a beadstring with great enthusiasm, used it well for a few weeks and then wondered what else to do with it. The aim of this leaflet is to reignite your initial enthusiasm for beadstrings and open your eyes to the range of ways in which they can be used as an effective model and image for mathematics.

Beadstrings come in different lengths (10, 20 or 100). It is important pupils are clear about the distribution of beads on these different strings e.g. on a 10 bead beadstring there are 5 red and 5 white beads whereas on a 100 bead beadstring there are alternate groups of 10 red and 10 white beads.

Some classes have large demonstration size beadstrings or beadbars. Others have small pupil size beadstrings. Some classes have both of these and others have none of the above resources.

Maintaining pupil interaction is vital when using any resource. With beadstrings this can be boosted via pupil jottings and mark making to support the representations shown on the beadstring by a teacher or fellow pupil.

Beadstrings can be very useful in independent or adult led group work as a kinaesthetic resource to encourage systematic problem solving and exploration of number.

We have grouped these ideas into the strands from the renewed mathematics framework. These ideas are starting points and can be modified by altering the size of the numbers used.

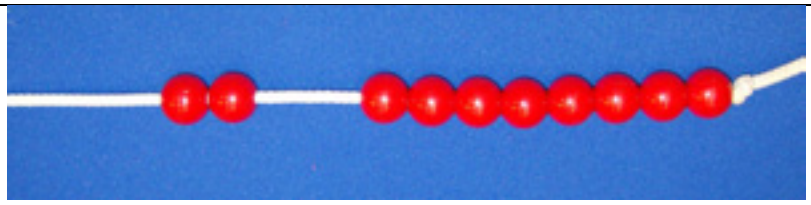
These ideas are a starting point which can be adapted, adopted and added to depending upon the needs of your pupils. If you have any more ideas that work well then please let us know so we can add them to this list.

Cornwall Primary Mathematics Team

Using and applying mathematics

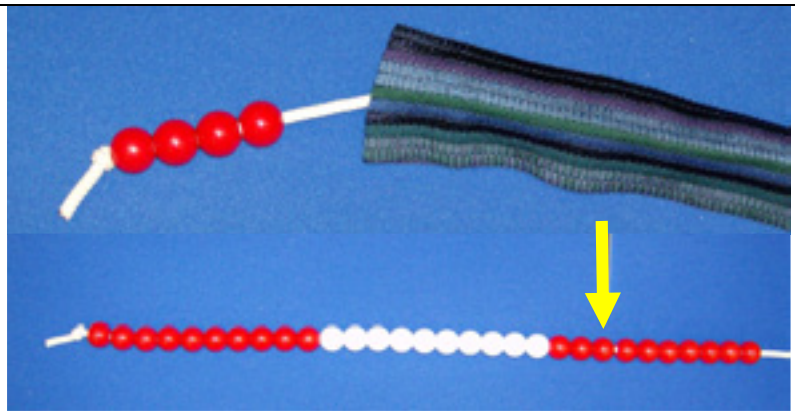
Number recognition

Move the beads to represent a chosen number, or show the beadstring and ask what number it represents. The example here shows 2. A dice or pair of dice can be thrown to generate a number to represent with the beads.



Visualisation and internalisation of the beadstring resource

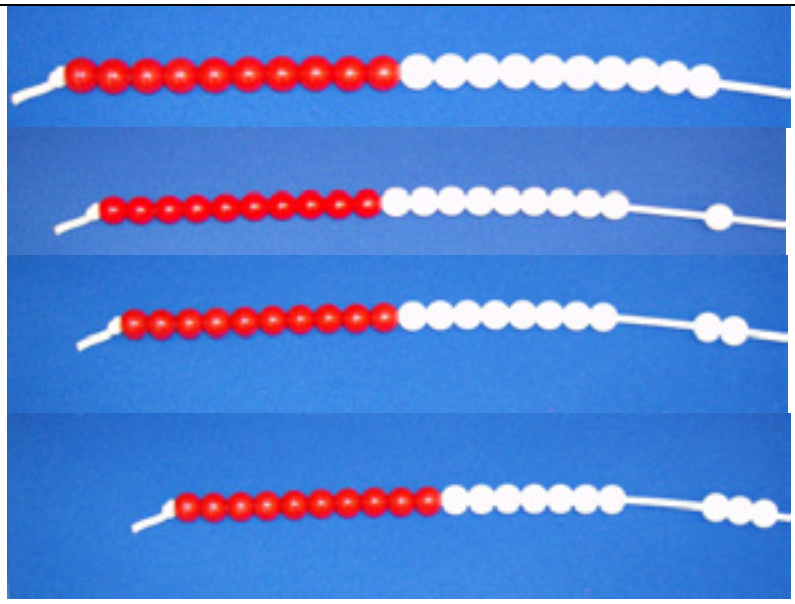
Show the children the beadstring so they know the 10 red beads are at the zero end. Hide or cover the beadstring and ask them to decide what number is represented by the 3rd bead in the second red group of 10. Once pupils have decided upon an answer look at the beadstring to check.



The answer is….

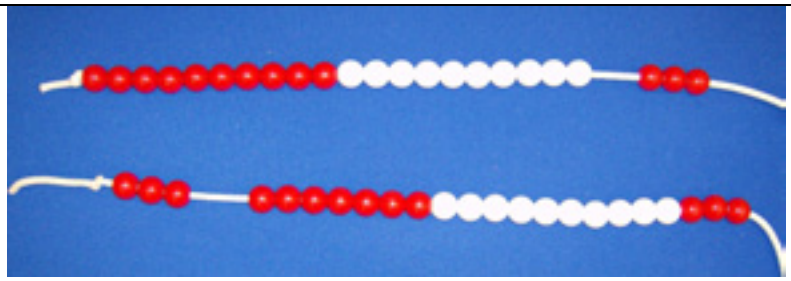
Use the beadstring to represent a given total. Explore possible calculations which could generate this answer. These could be all additions, all subtractions, some of each type of calculation, use just 2 numbers, use three numbers and two operations etc.

The image here shows the answer is 20.



What's the same, what's different

Look at two beadstrings and consider what is the same and what is different about the two strings. In this example we can see 20 + 3 on one string and 3 + 20 on the other. They both show 23, one shows 23 as 10 + 10 + 3 and the other shows 23 as 3 + 7 + 10 + 3

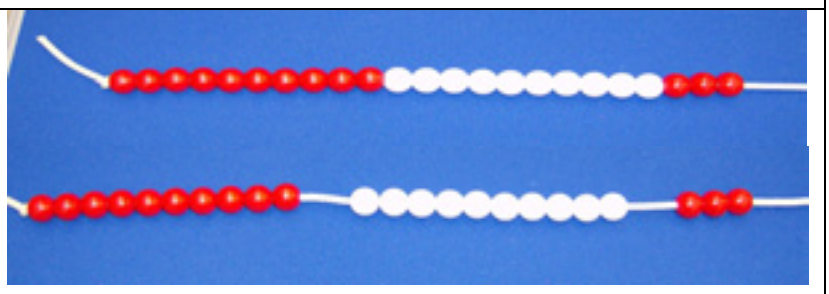


Counting and understanding number

Place value

Because of the marking in groups of 10 on the 100 beadstring it can be used to explore place value and partitioning into tens and ones for any number up to 100.

This image shows 23 = 10+10+3

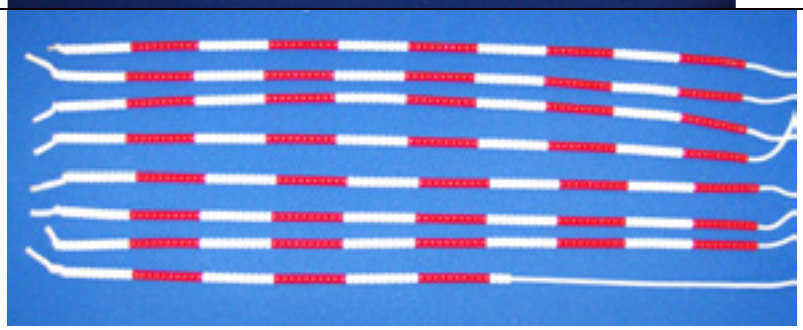


Estimation skills

Hide part of the beadstring in a bag. Show the remainder jumbled up on the floor. Ask children to estimate how many beads they can see. Straighten out the string and count together to check.

Big number counting

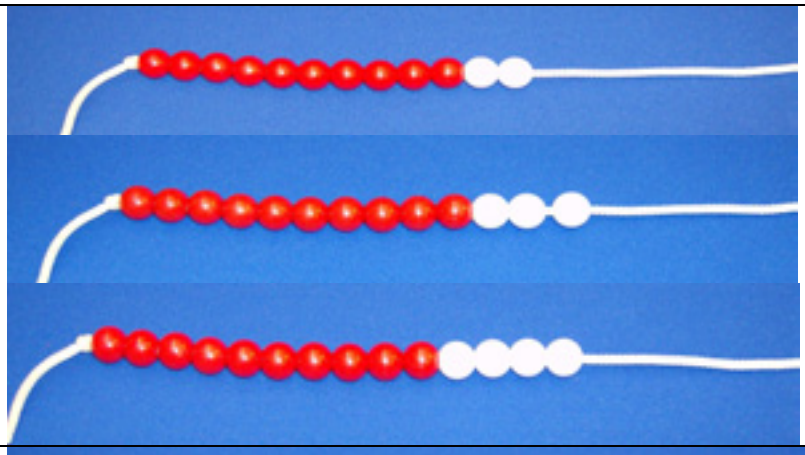
Help children to see the value and size of large numbers using several beadstrings. e.g. 763 could be shown with 7 hundred beadstrings and 63 on a final string. This could also be shown as 7 hundred bead strings, 6 ten beadstrings and 3 individual beads.



1 more or 1 less

These images show 12 + 1 = 13 and 13 + 1 = 14.

Moving the beads enables pupils to see and feel the effect of adding or making more or of subtracting or making less.



Counting on / back in 10s from 0 or a multiple of 10.

This image shows 10 + 10 + 10. Move another 10 across as you say the new total of 40. It is important to link the action of moving beads and saying the values shown.

Counting and understanding number

Ordering numbers

Using the two ends of the beadstring, or two or more beadstrings, you can make different values, and explore the concept of 'more than' and 'less than' orally or as part of a number sentence. This image shows 12 < 19 or 19 > 12.

Explore which other values could replace 12 in this number sentence and keep the statements true.

Which values are more than 12 but less than 19?

How would this be recorded as a number sentence?

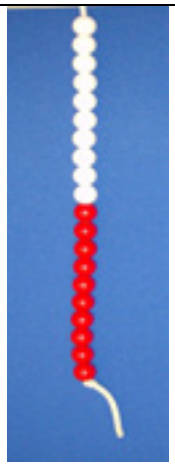
How many more than 12 is 19? What other pairs of numbers have this same difference? Can you use an ordered list to find some?

Counting vertically

Turning the beadstring and using it vertically enables pupils' counting skills and identification of values to be developed.

These are the skills needed when reading scales on a measuring jug or values on a thermometer.

Showing pupils the same resource used in a different orientation can help them to understand counting vertically is just the same as counting horizontally.

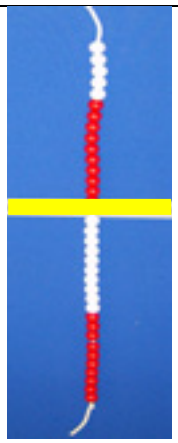


Negative numbers on a thermometer

Use a marker such as a line, table edge or whiteboard edge to indicate zero. You could use a peg or clip to mark zero.

Beads below the line indicate negative values, those above are positive values.

You can then identify values and work out increases, decreases and differences in temperatures.



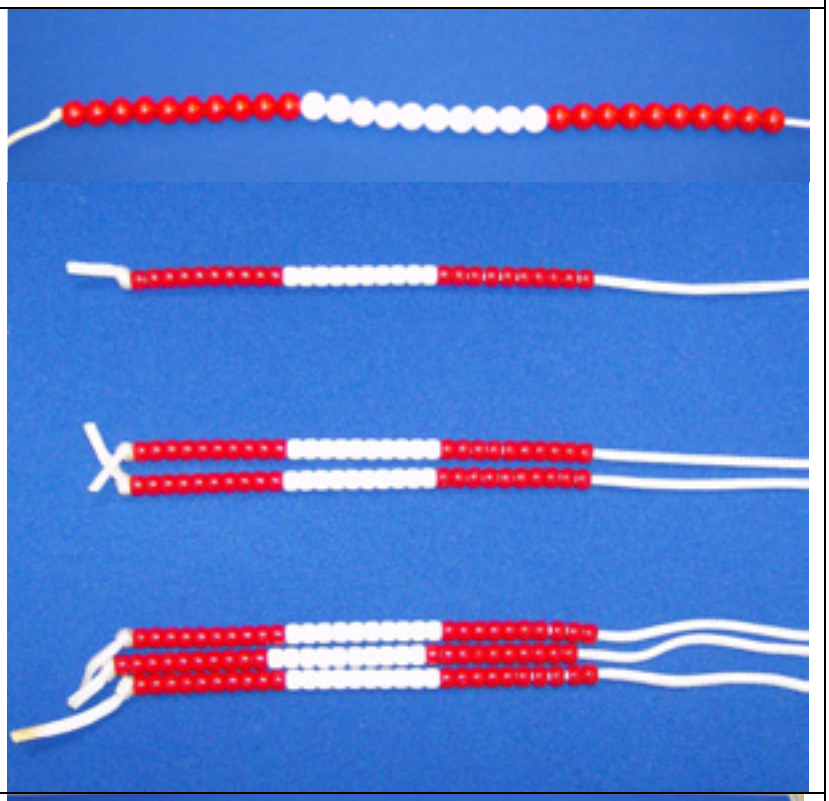
Proportion

Use the beadstring to explore the concept of part red or white out of the number of beads selected. In this example 30 beads are shown. The proportion of white beads is 1/3 or 1 in every 3.

Counting and understanding number

Ratio

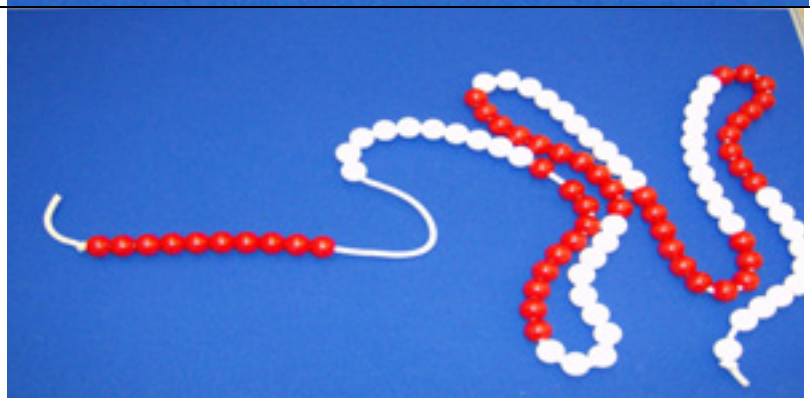
Use part of the beadstring and explore the concept of ratio. E.g. 10 reds, 10 whites, 10 reds- the ratio of red to white is 2:1 or 2 red for every 1 white. What other quantities of red and white beads have the same ratio as this? (further beadstrings would be needed to explore this practically)



Percentages

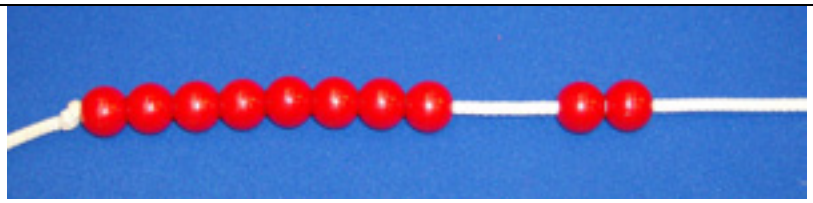
Because there are 100 beads on a long beadstring it can be used to explore the concept of percentages. In this example 10 beads out of 100 are laid out straight. This is 10% of the beads on the string.

Consider what it would look like if we laid out 25% of the string



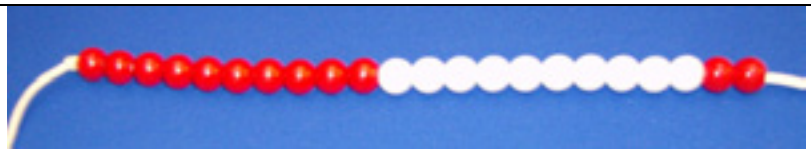
Equivalence of fractions and decimals

Here the image links 8/10 and 0.8 using just 10 beads to support the idea. Using all 100 beads would allow you to link fractions, decimals and percentages to show 10% = 0.1 = 10%



Bigger and smaller than

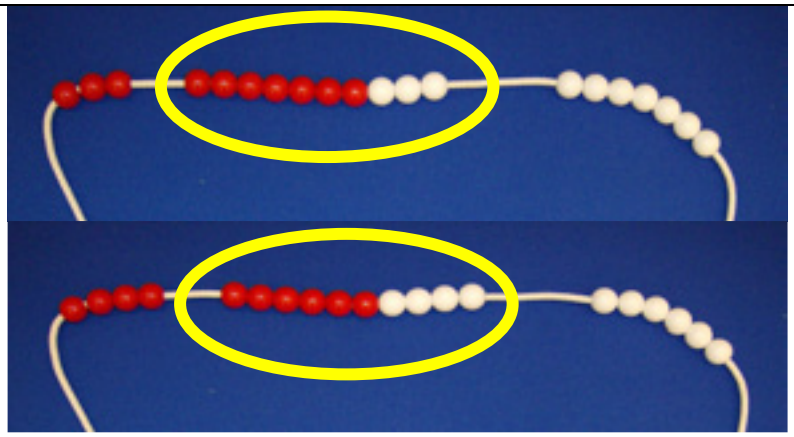
Use one beadstring to represent a value. Ask children what value is shown. This example shows 22. Ask children to show a number bigger or smaller than the one shown on your string. You could ask them to show 1 more, 10 more, 1 less, 10 less etc.



Knowing and using number facts

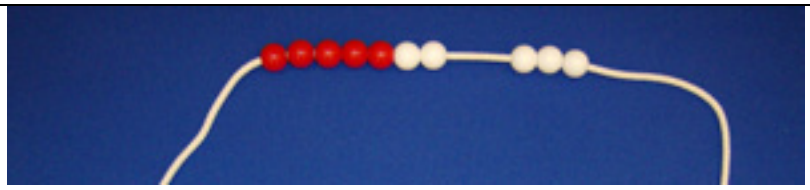
Number facts for numbers up to 10.

Use the middle of the string to show ways of making any number up to 10 using a mixture of red and white beads. This image shows 7 red and 3 white beads to represent 7 + 3 = 10. Moving one red away and adding one white to this pattern would then show 6 + 4 = 10. Children could then explore all the ways of making 10 or any number up to 10 in this way. This would link to pegs on a coat hanger, spots on a ladybird and also Number Facts ITP.



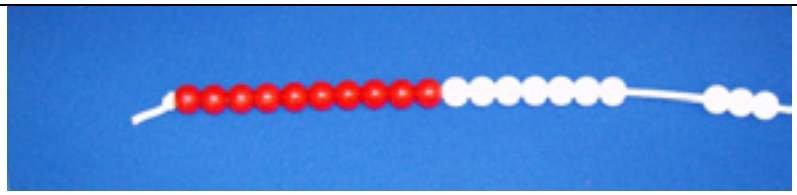
Partitioning 5 and a bit

Use 5 red and 5 white beads from the middle of the string. Separating off red or white beads enables you to show number facts for 10. The image here shows 7 + 3 = 10, and also shows that 7 is made up of 5 + 2.



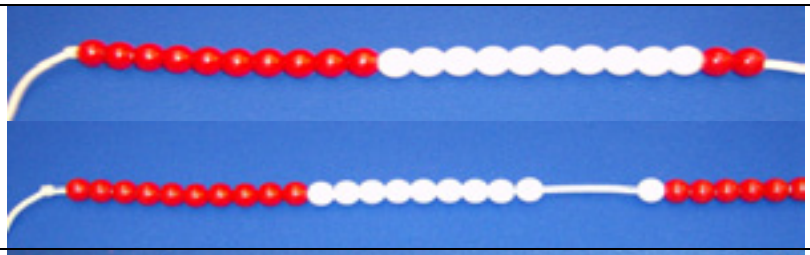
Complements to 100 (or any number up to 100).

This image shows 17 + 3 = 20. By moving these beads around other complements to 20 can be shown



Rounding to the nearest 10

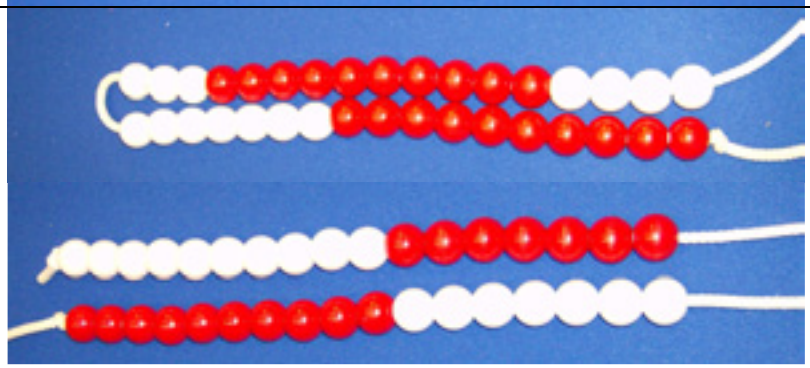
Because of the marking in groups of 10 on the 100 beadstring you can see 22 would round to down 20 and 19 would round up to 20.



Halving

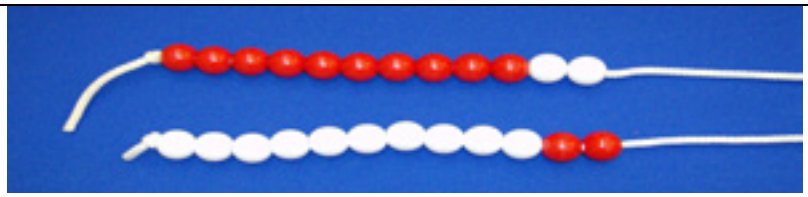
Fold the bead string in half and move the beads so the number of beads are divided equally between the two parts. This image shows half of 34 is 17.

The two ends of the string can also be used to find half by counting up to the number (i.e. 34) and moving beads up towards the ends as you do so (2,4,6,8..) The final image for half of 34 would look like this, with 17 beads on each end.



Doubles.

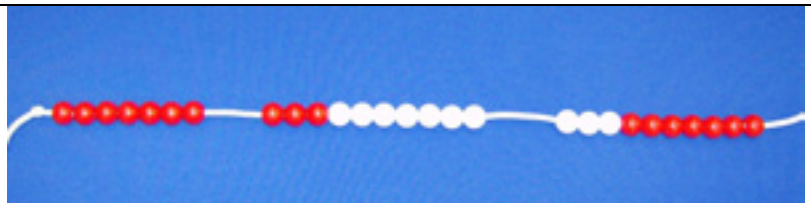
Hold the two ends together with the same number showing. This image shows double 12.



Calculating

Counting on / back in 10s from any number

This image shows 7 + 10 = 17 and 17 + 10 = 27. Showing this on the beadstring allows pupils to see the need to use number facts to 10. For this example 7 + 10 = 7 + 3 + 7 = 17.

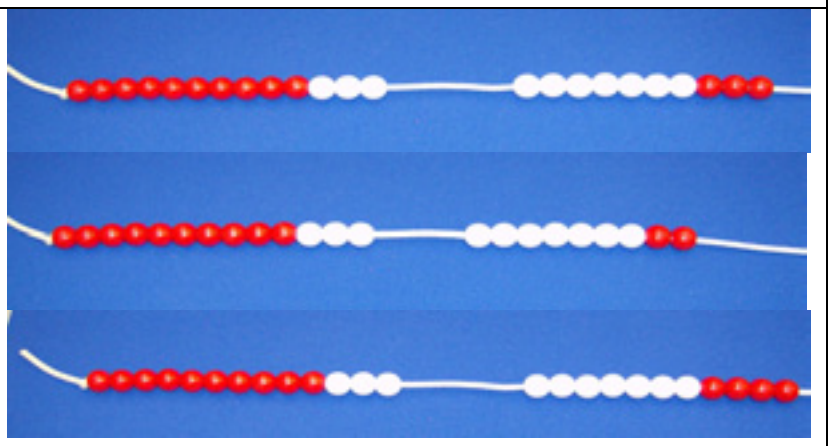


Add / subtract 9 or 11 by adding / subtracting 10 and adjusting

To find 13 + 9 start with 13 and add 10. This image shows 13 + 10 = 23.

Since 9 is one less than 10 to find 13 + 9 remove 1 bead. This leaves a total of 22 instead of 23

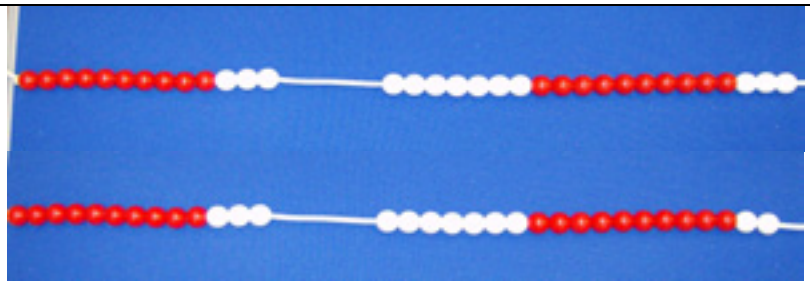
To find 13 + 11 start with 13 and add 10, as shown in the top image. Because 11 is one more than 10 to find 13 + 11 add 1 bead. This gives a total of 24 instead of 23.



Add / subtract any number ending in 9 or 1 by adding a multiple of 10 and adjusting

This image shows 13 + 20 = 33

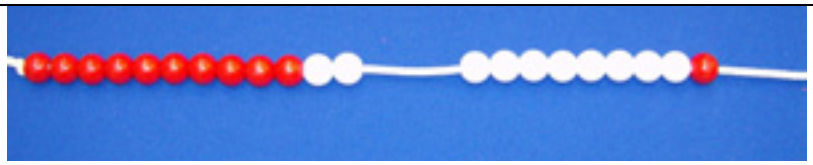
Because 19 is one less than 20 to find 13 + 19 remove 1 bead. This leaves a total of 32 instead of 33



Addition

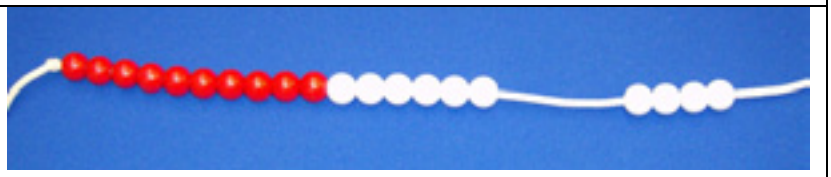
This image shows 12 + 9 = 21.

First find the starting number and add on the next number. The answer is shown when both sets of beads are put together.



Subtraction – take away.

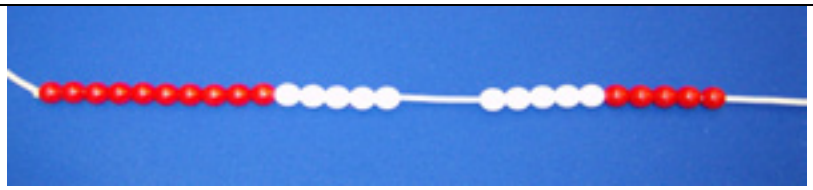
This image shows 20 beads take away 4 leaves 16 beads at the end of the beadstring. Moving the beads away helps pupils understand this image of subtraction. This would be recorded as 20 – 4 = 16



Calculating

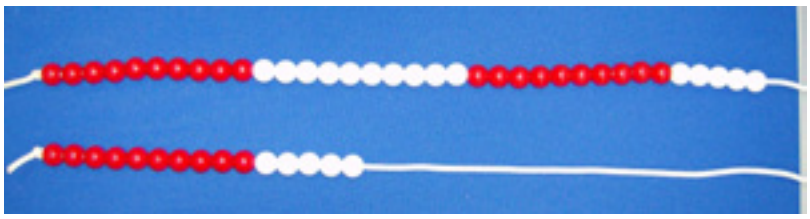
Subtraction – find a difference.

This image shows the difference between 25 and 15 is 10. This would be recorded as 25 – 15 = 10.



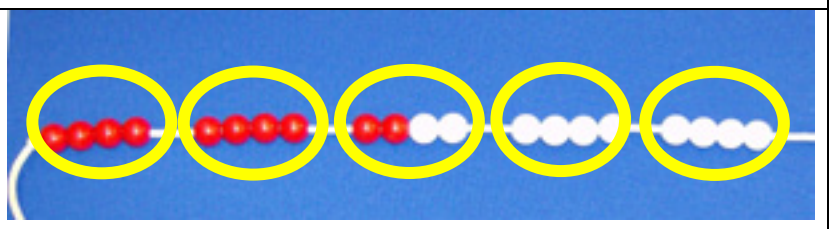
Using the beadstring in this way helps pupils understand the concept of mathematical differences.

This can be also represented using two beadstrings as shown here. Find 25 on one string and 15 on the other. The difference between these two amounts can then be seen. This is the same image as shown on the ITP difference.



Repeated addition or multiplication facts

Repeatedly adding on 4 can be modelled as shown here. Count aloud as you move the beads in this way.

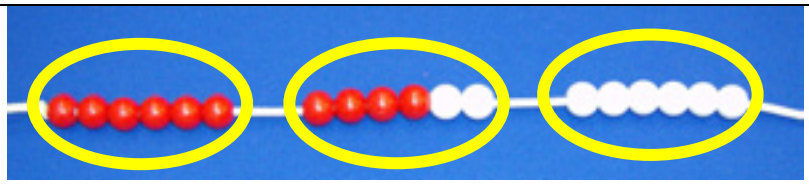


On the beadstring it will be clear to see 4 x 5 = 20. Ask pupils to consider other multiplication facts for which the answers are a multiple of 10

Grouping (repeated subtraction)

Start with the total and make equal groups of the amount shown in the calculation. The number of groups is the answer to the calculation.

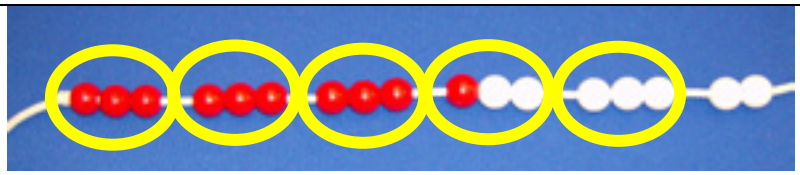
This image shows 18 ÷ 6.



Division with remainders.

This image shows 17 ÷3 = 5 r 2

Find the amount and then make groups of equal amounts. The remainder is left at one end. Pupils can then see how many more would be needed to make another whole group and not leave a remainder and why when dividing by 3 you can only have remainders of 1 or 2.



Fractions of amounts

Any amount up to 100 can be used.

e.g. $\frac{1}{4}$ of 20 = 5 or $\frac{3}{4}$ or 20 = 15. For this example $\frac{1}{4}$ can be found by halving and halving again. This works well on a beadstring.