U-fill™

REUSE ▸ REFILL ▸ RETHINK

You reuse in the classroom or ***we reuse*** in production

Call us to arrange collection of your emtpy refill canisters and we will reuse them in production. Before you do, first make sure that you cannot find a new purpose for them in the classroom. Our Ten- frame U-fill bases have been specially designed to help transport the canisters safely without getting damaged, but also as a by-product for mathematics.

Ten-Frames for Maths - Keep one box of empty refills (50 refill canisters + 5 Ten-frame bases). Fill 20 canisters with one coloured material, and fill 20 canisters with a different coloured material. In the following examples, we have used red and yellow coloured sand.

'Ten' is of course the building block of our Base 10 numeration system. Ten-frames are two-by-five rectangular frames into which dual colour counters are placed to illustrate numbers less than or equal to ten or, if using more than one ten-frame, numbers more than ten. (NC Yr1 POS Number – number and place value; identify and represent numbers using objects and use the language of: equal to, more than, less than (fewer), most, least). The use of Ten-frames was developed by researchers such as Van de Mane (1988) and Bobis (1988). Various arrangements of counters on the Ten-frames can be used to prompt different mental mages of numbers and different mental strategies for manipulating these numbers, all in association with the numbers' relationship to ten. Plenty of activities with Ten-frames will enable children to automatically think of numbers less than ten in terms of their relationship to ten and to build a sound knowledge of the basic addition/ subtraction facts for ten which are an integral part of mental calculation.

The U-fill Ten-frames are a useful device to support students' development of number relationships for numbers beyond 10. It can be used for developing mental strategies, such as the 1 more, 1 less, (NC Yr1 POS Number – number and place value; given a number identify one more and one less). Partitioning strategies and can encourage students to use known number facts. Comparisons of two numbers, including more, less, how many less can also be illustrated by use of more than one Ten-frame.

Place value

Ten-frames can provide a first step into understanding two-digit numbers simply by the introduction of a second frame.

Placing the second frame to the right of the first frame, and later introducing numeral cards, will further assist the development of place-value understanding. (NC Yr2 POS Number – number and place value; recognise the place value of each digit in a two-digit number (tens, ones); identify, represent and estimate numbers using different representations).

Can be shown horizontally or vertically

The students need to see this at a glance as thirteen [10 + 3] without having to count up to thirteen. Using several Ten-frames together can assist children with counting to larger numbers by encouraging them to count in tens and then ones. (NC Yr1 POS Number – number and place value; count numbers to 100).

The format of Ten-frames provides a structure that supports counting in multiples of twos, fives and/or tens (NC Yr1 POS Number – number and place value; count in multiples of twos, fives and tens)

U-fill Ten-Frames for Maths written by Laura Greenshields, Achieving for Children

Number bonds to 10 and beyond

The Ten-frames can support students with learning their number bonds to make 10:

1 + 9 = 10, 2 + 8 = 10, 3 + 7 = 10, etc. Use of the colour filled canisters helps them to visualise the number pairs that add to make ten.

The use of the Ten-frames to work on number bonds can support the concept of inverse by simply supplying a visual to support a range of questioning. For example, what do you add to 9 to make 10? If I have 10 and take 1 away, what will I be left with?

You can also work on number bonds of any number up to 10 on a single Ten-frame. To work in number bonds beyond 10 you can link two or more Ten-frames together.

(NC Yr1 POS Number – addition and subtraction; represent and use number bonds and related subtraction facts within 20).

Addition with Ten-frames

(NC Yr1 POS Number – addition; add one-digit and two-digit numbers to 20, including zero; solve one-step problems that involve addition, using concrete objects, and missing number problems such as 7 = ? ÷ 5.)

Begin by posing an addition problem where one of the numbers is just under 10.

- John has 9 canisters and Mari has 6 canisters.
- How many canisters do they have altogether?

Ask the students to use the Ten-frames and canisters to model this question.

Have the students now think about ways that they could make this problem easy to solve.

They could, without counting on, show in this way.

By moving one of the canisters as shown above, ten and five is now shown. (This method does require some knowledge of partitioning single digit numbers (see next section).

It is important for students to see that the answer to 9 + 6 is the same as the answer to 10 + 5. By having both the starting Ten-frame with 9 + 6 laid out next to the second Ten-frame of 10 + 5 you can begin to develop students understanding of the = symbol meaning the ‘same as’.

(NC Yr2 POS Number – addition; solve problems with addition: using concrete objects, including those involving numbers and quantities-add numbers using concrete objects including: a two-digit number and ones, a two-digit number and tens, two two-digit numbers, adding three one-digit numbers).

Partitioning and using known number facts

Task:
This task involves showing a number in each of the two adjacent Ten-frames. The students’ task is to figure out how many there are. (Alternatively, the task can be to figure out how many are missing or how many more (or fewer) there are in one frame than the other). Posing the task using canisters or two different colours, one colour for each Ten-frame, facilitates the students’ explanations as well as the posing tasks. For example, if the following display shows red canisters in one frame and yellow canisters in the second frame, a student might explain that they partitioned the 6 red canisters into 5 + 1 and moved the one red canister to the frame with the yellow cannisters to make five and five. Because five and five is ten, there are ten canisters in all.

Another student might explain that they used their known number facts and moved the four yellow canisters beside the red canisters to fill up the first Tens-frame. So there are ten in all.

By capitalising on solutions such as these, the teacher can draw out students' explanations and use these for discussion points.

(A step on from students physically moving the canisters would be for them to visualise moving the canisters. This will only come after they have become familiar with using the practical equipment and being able to manipulate it).

Both of the above methods help to develop the students' understanding of number conservation that the total remains unchanged when canisters are moved from one frame to the other.

Subtraction with Ten-frames

(NC Yr1 POS Number – Subtraction; subtract one-digit and two-digit numbers to 20, including zero; solve one-step problems that involve subtraction, using concrete objects, and missing number problems such as 7 = ? – 9).

Subtraction problems can also be illustrated using Ten-frames.

- Luigi has 14 canisters and gives away 5 of them.
- How many canisters does Luigi now have?

Have the students model 14 on two Ten-frames.

Two equally good methods can be used to arrive at the answer.

Method 1
Remove the 4 to leave the ten, and then remove a further 1 from the lower right hand position to leave 9. (This method will require some prior learning on number bonds up to 10 e.g. 5 = 4 + 1 for students to partition single digit numbers in order to use this method).

Method 2
Remove the 5 from the first Ten-frame to leave 5 and now add the 4 from the second Ten-frame to the first to show 9.

Encourage the students to use both approaches. Which of the approaches do you prefer? And why?

Games:

Clashing and cancelling

In this game if a red canister and a yellow canister collide, they cancel each other out.

So if we put a red canister with a yellow canister we get a zero.

In the following, what number would we have after the red canisters and yellow canisters have cancelled one another out?

Number sense

We shall use a red canister for an even number when it appears on the dice and this will be shown in the first Ten-frame, and a yellow canister for an odd number when it appears on the dice and this will be shown on the second Ten-frame.

Throw the dice four times.

Ten-frame to record the even numbers [red]

Ten-frame to record the odd numbers [yellow]

Questions:

1 Will you ever get an odd number of red canisters? Why or why not?

2 Will you ever get an odd number of yellow canisters? Why or why not?

3 If you add the total number of red canisters to the total number of yellow canisters, will you ever get an odd number of canisters? Why or why not?

Multiplication and division with Ten-frames

Odd and Even:
Ten-frames lend themselves to the recognition of odd and even numbers through the concept of pairing – the canisters must be placed in pairs (one on the top row and one on the bottom row), rather than across one row first to support the visual concept of odd and even. (NC Yr2 POS Number – multiplication and division; recognising odd and even numbers).

This must be an even number because each canister has a partner.

This must be an odd number because the last canister in the top row does not have a partner.

X and ÷:
The format of the Ten-frame is a 2 by 5 array. This will support students with multiplication and division of the two and five times table-up to 2 x 5 on one Ten-frame and up to 2 x 10 by placing a second Ten-frame to the side of the first and so on.
The canisters must be placed in pairs (rather than across one row first) to support the array model.
(NC Yr1 POS Number – multiplication and division; solve one-step problems involving multiplication and division, by calculation the answer using concrete objects and arrays)

This array shows that 2 x 5 = 10, 5 x 2 = 10, 10 ÷ 5 = 2 and 10 ÷ 2 = 5.

By adding a Ten-frame below the first Ten-frame you will have a 4 by 5 array, by adding another below you will have a 6 by 5 array and so on. Remember that by adding a Ten-frame to the side you are increasing the array from x5 to x10 and so on. (NC Yr4 POS Number – multiplication and division: recall multiplication and division facts for multiplication tables up to 12 x 12).

Fractions with Ten-frames

Ten-frames can be used to support recognising and finding half an amount of objects. Using two different colour canisters supports students understanding with this concept. The canisters should be one colour in the top row and a different colour in the bottom row. More than one Ten-frame can be used side by side if you want to find half of an amount larger than 10. (NC Yr1 POS Number – fractions; recognise, find and name a half as one of two equal parts of a quantity).

This Ten-frame shows that half of 8 = 4.

When using Ten-frames with older children you are able to use it to represent ten tenths (one whole). (NC Yr3 POS Number – fractions; count up and down in tenths; recognise that tenths arise from dividing an object into 10 equal parts and in dividing one-digit numbers or quantities by 10).

Each of the canisters in this Ten-frame represents one tenth.

By aligning ten Ten-frames together (two across and five down) you are able to use it to represent one hundred hundredths (one whole).
(NC Yr4 POS Number - fractions (including decimals) count up and down in hundredths: recognise that hundredths arise when dividing an object by one hundred and dividing tenths by ten.)

References

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