Teaching Guidance & Activity Ideas
Bug Hotel 10-Frame

YD1251

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Learning the numbers to 10 is the bedrock of understanding the number system. For children to develop a deep understanding of 10, they need to know a lot about the numbers up to 10. For each number, they need to learn:

How many it is, the number word and the number symbol	For example: The word 'three' and symbol '3' mean this many: ●●●
The properties of the number including whether it is odd or even, and experience of different ways it can be arranged	For example: 3 is odd and can be arranged as an L shape, in a triangle or in a line
How it can be made up of other numbers (composition)	For example: 3 is 1 and 2, and also 1 and 1 and 1
Which numbers are larger and smaller than it	For example: 3 is larger than 1 but smaller than 7
Where it comes in the number sequence	For example: 4 is between 3 and 5
What its relationship is to 0, 5 and 10	For example: 3 is three more than 0 3 is two less (fewer) than 5 3 is seven less than 10

Developing this deep understanding of 10 takes time and lots of hands-on experience. This is where the Bug Hotel 10-Frame comes in. A 10-frame is a simple but powerful tool. It helps children to see the structure of 10 and the numbers to 10, by displaying them arranged in rows.

The Bug Hotel design uses this structure to allow children to put six different types of bug into the hotel compartments using ten wooden cubes. There are a huge number of possible combinations for arranging the bugs in the hotel 10-frame, meaning that children can return to the resource time and time again to deepen their understanding of number.

There are many different ways that children can enjoy using the Bug Hotel 10-Frame with an adult, with other children or on their own. Children can use the hotel standing upright (as five rows of two) or on its side (as two rows of five). Mathematical vocabulary to use with children is shown in bold.



Counting, subitizing and finding "how many"

Children can count cubes as they place them into the Bug Hotel 10-Frame. You can show them how to place one cube as they say each number to help them count accurately. You can also ask them how many of a specific bug they are going to put in, so that they count to check that they have the correct number (and can remove any if they accidentally put in too many).



How many beetles do you want to put in?



What if I move this one to here – how many are there now?



I know there are ten bugs because it is full up.

Children can also subitize the number of cubes (say how many there are without counting). Covering the hotel front with a cloth or using a book to make a barrier means you can hide the number of cubes in the hotel. It is exciting when you reveal the bugs, just for a few seconds, and get children to say how many they saw. Changing the number of bugs each time makes an enjoyable game which helps children learn to subitize.

You can encourage children to say how they see a number, such as seeing 7 as a group of three and a group of four. They may find some numbers easy to subitize when they are arranged in a familiar way within the 10-frame structure. They might say 'five' when cubes are in a line or 'six' for two lines of three, because they have seen them in these arrangements many times before.

I can see 7 as 3 and 4.

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Arranging then rearranging the same number of cubes helps children to see that how many there are stays the same regardless of how the cubes are arranged. Experience of using the Bug Hotel tells children that there are ten when every space is full. With experience, they visualize 10 as two rows of five (5 and 5 or **double** 5).



Different arrangements of five butterflies

Composition of numbers

Using different bugs allows children to see how the number in the hotel can be made up of two, three or more groups. This helps children see how a number can be composed of smaller numbers, For example, 8 can be made up of two numbers: 7 and 1, 6 and 2, 5 and 3, or 4 and 4. 8 can also be made up of three numbers, such as 2 and 2 and 4, or 5 and 1 and 2, or four numbers, such as 1 and 1 and 2 and 4, 5 and 1 and 1 and 1, or 2 and 2 and 2 and 2.



2 and 2 and 2 and 2

While any of the bugs can be used to make groups, the color contrast in the red and yellow ladybugs works well when using two groups to make a number, and some children may find it helpful that they are all the same type of bug.

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By changing one ladybug from yellow to red, the child can see that there is **one more** red and **one less** yellow each time, helping them to notice the **pattern**. Learning the pairs of numbers that make 10 is particularly useful for children as they get older, as it is helpful to quickly know how to make 10 when adding and subtracting large numbers.



10 and 0



9 and 1



8 and 2



7 and 3



6 and 4



5 and 5

Number bonds to 10



It is also possible to think about what makes 10 by leaving some compartments empty, and discussing **how many** bugs there are and how many spaces are left. Children might also talk about **how many** bugs are in the hotel and **how many** are left out.

Children mostly like to fill the hotel, so encouraging them to use different bugs will provide them with lots of combinations of numbers that make 10.



5 and 2 and 3



8 and 1 and 1



4 and 2 and 2 and 2

Are there more beetles or butterflies?

Which bugs are there the same number of?

How many more bees are there than ladybugs?

If I changed one bee to a ladybug, would I have more ladybugs then?

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Number relationships

With different numbers of bugs, children can **compare** to see which there are **more** or **less** of in the hotel. They can **count** the number of butterflies and beetles to find whether there are **more** butterflies or beetles in the hotel, for example.

The two rows of five compartments in the hotel emphasize relationships with 5 and 10. For example, you can see that 6 is **one more** than 5 when five snails fill up one row and then there is **one more** in the other row, because they know that one full row is 5. In the same way, they know that 8 is two less than 10 when 8 is two **less than** a full frame of 10.

Odd and even numbers

Because bugs can be arranged in the 10-frame in pairs (two in each row when it is upright), it is easy to see which numbers are **odd** and which are **even**. If children build from the bottom and fill all the compartments, they will build numbers where there is either an extra bug on its own (**odd**) or not (**even**).



Even



Odd



Linking numerals to the number of bugs

Providing a set of number pebbles or cards means that children can find the **numeral** to match the number of bugs they have (or are going to put) in the hotel. They can also use their fingers to show the number in another way, making the link between the number of bugs, the written number and the number of fingers. If the number pebbles or cards are arranged in order (on the roof, table, floor or a washing line), children can **count** along to find the number they need. This reinforces understanding of where the number is in the **number order**. Adults or children can also use the blackboard roof to show how many bugs are in the hotel or the numbers that make up the total. You can do this by placing number pebbles (or other numerals) on the roof, or by writing numerals, marks or symbols with chalk.

You have seven beetles. Where is the number 7? Can you find it?

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Exploring changing numbers: early addition and subtraction

Addition and subtraction are essentially about how numbers are being changed. Young children often experience these changes as stories. For example,

Five butterflies land in the bug hotel. One sees a beautiful flower and flies away to visit it. How many butterflies are in the hotel now? The four butterflies decide to have a party, and invite two bees and two snails. The butterfly comes back from the flower and asks if there is space for her at the party. The snail says there are two spaces left so the butterfly can come to the party.



Children enjoy narrating their own number stories. You can also use books, songs and rhymes to provide number stories. In the book *Ten Little Ladybugs* and the song *Five Little Ladybugs*, the number of ladybugs decreases by one each time, which the children can act out using the cubes in the hotel. Resources such as Yellow Door's Ladybug Counting Stones can provide additional opportunities for representing the changing number of ladybugs in the hotel. Other examples you could use include the book *Winnie-the-Pooh* and *Ten Busy Bees* (for counting backwards) and the song *Ten Little Butterflies* (for counting forwards).

Opportunities for spatial reasoning and making patterns

The Bug Hotel 10-Frame supports opportunities to develop spatial reasoning as children arrange and rotate bugs in the frame. Children can turn and rotate the cubes to choose which of the six bugs they want to show and which way round they would like the bug to be. Sometimes, children like to put all the bugs the same way round. They can also spot the bug that is a different way round and rotate it to make it the same as the others.

Which butterfly is the wrong way round?

Can you put the last one the same way round as the others?





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Children might also like to make patterns in the frame using the bugs.

These can be **symmetrical** (reflection) or **repeating patterns**.



Symmetrical patterns



Repeating patterns

The bugs are symmetrical!

The pattern goes snail, beetle, snail, beetle…

The Bug Hotel 10-Frame is rich in powerful possibilities for mathematical learning with counting, subitizing, comparison, composition and calculation opportunities, as well as connections to pattern and spatial reasoning. The most important thing is to let children explore, enjoy and play with the resource. Thinking aloud when playing with children is a good way to introduce mathematical ideas and model mathematical thinking without limiting their play and ideas. Approaches such as 'I wonder…' mean you can draw children's attention to how many bugs there are, which bug there are more of or a pattern in their arrangement, without asking a direct question. 'I wonder what will happen if…?' encourages children to predict and visualize changes in numbers and patterns, deepening their understanding and ability to work flexibly in mathematics.

Number books about bugs

Ten Little Ladybugs by Melanie Gerth
Never Touch the Bugs by Rosie Greening
Winnie-the-Pooh and Ten Busy Bees by A.A. Milne
100 Bugs! A Counting Book by Kate Narita
The Icky Bug Counting Book by Jerry Pallotta
One is a Snail, Ten is a Crab by April Pulley Sayre

Number songs about bugs

Five Little Ladybugs
Ten Little Butterflies
The Ants Go Marching

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