

## Ideas for using the Pegs and Boards for the first time

It is best to start out by playing with the Pegs and Boards. Let your imagination and creativity flow.

Maths is a very creative subject and much enjoyment can be found through playing with numbers and patterns. Use questions to draw out the maths and promote reasoning. This will maximise opportunities for learning.



The goal of Spot On With Numbers is to aid in the development of number sense. Number sense lays the foundations for success in a child's maths journey. It requires understanding; the ability to subitise (see page 4); visualise; and work flexibly with numbers. This can be achieved by providing children with moveable objects and encouraging them to verbalise a strategy that can later be performed mentally.

There is no right or wrong way to use the Pegs and Boards and numbers do not need to be represented as dice patterns. They can be represented in any way that is meaningful. As long as it makes sense (first to the instructor and most importantly to the child), the Pegs and Boards can be used in any way you choose. Generally it makes more sense to represent one number as one colour, but if you are looking at how numbers are composed or at the patterns within numbers, you may want to use different colours.

Spot On With Numbers' *Number Bond Pack* is the ideal starting point for using the Pegs and Boards. It includes visuals and goes into greater depth in teaching fluency with number facts, making numbers, linking to the fingers and examples of questions to use to develop understanding.

The following pages give some more examples of ideas for using the Pegs and Boards, if you don't have the full pack or would like more ideas and games. However, there are still many more creative ways to use the products and many more applications.....

Spot On With Numbers' Pegs and Boards can be used to help children develop firm mathematical foundations in the early years of their education:

## COUNTING



- Counting pegs already arranged on a board or as they place them onto a peg board from a larger set
- Counting backwards as they remove the pegs and place them back in the box
- Knowing that the last number counted is the total so far
- Beginning to recognise the different patterns the numbers make when counted on the boards and the links between them and different ways the number is represented.

It is very important that when counting, children use concrete or pictorial representation as this helps move away from rote counting; gives numbers meaning; and helps children to make sense of numbers. Number sense requires the child to relate numbers to real quantities and have a sense of what the number actually means. Numbers can be represented in many ways and the Pegs and Boards are a flexible manipulative that allows a child to explore both familiar and unusual patterns of numbers.

### Activity: Linking to numbers of personal significance (which adds meaning for the child)

- Ask the child questions such as 'do you have any brothers/sisters, how many?', 'do you have any pets, how many?', 'how old are you?'
- Ask the child to count out that number on the peg board.
- Ask the child to show you that number with their fingers.



Three representations of 4

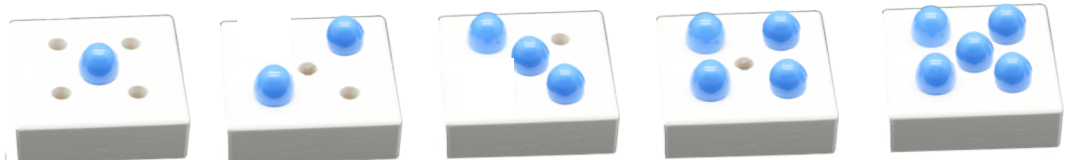
## COMPARISON

- Finding one more or one less than a number by adding or removing pegs.
- Comparing numbers using 'more' or 'fewer' and reasoning
- Noticing connections (linking to their fingers and other representations such as dice or dominoes)
- Exploring similarities and differences.

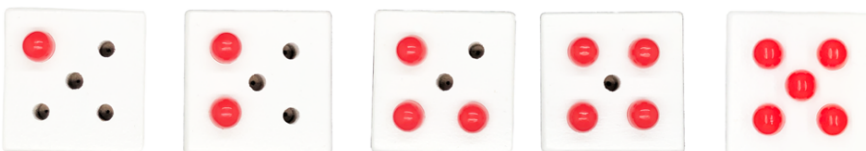
### Activity: Ordering (numbers 1 - 5), which builds on comparison

Ask the child or a group of children to make numbers 1-5 in any way with the Pegs and Boards. Then ask them to order the numbers from smallest to largest:

Here is an example of the numbers 1-5 arranged in the same way as the patterns on a dice:



Please note that the children do not need to create dice patterns. They could choose any way of representing the numbers.



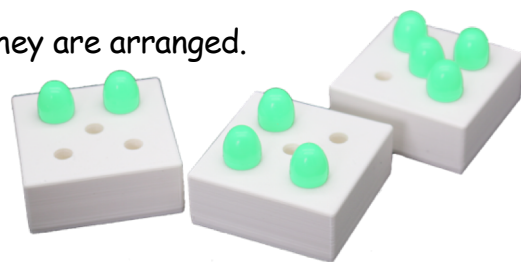
This example starts with 1 on the top left and pegs are added in an anti-clockwise direction, finishing with the five in the centre. This shows the numbers building from one to the next.

## CONSERVATION

Conservation is the ability to realise that if no pegs are removed or added, but the pattern changes, the number will be the same. The Pegs and Boards can be used flexibly, with opportunity to create familiar and unfamiliar patterns, so children can explore multiple representations of one number and develop an appreciation of conservation.

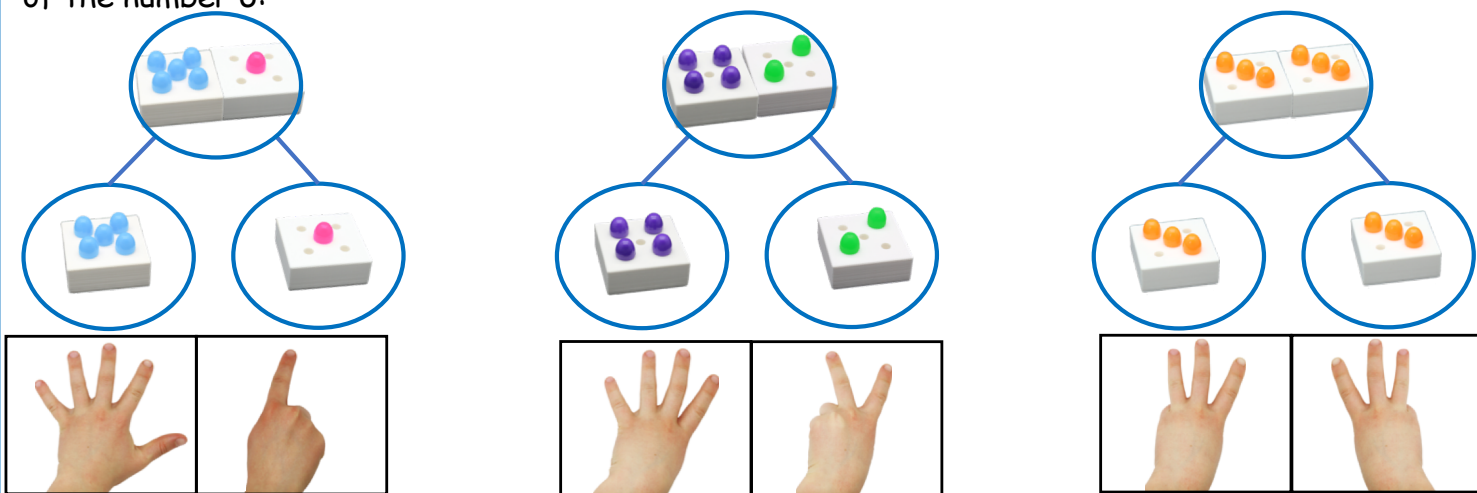
### Activity: An example of exploring conservation

- Use two or three peg boards to create an irregular arrangement of pegs. Ask the child to count them.
- Rearrange the same number of pegs on the peg boards in a different arrangement and ask the child to count them.
- Remove the same pegs from their boards and place them directly on the table in a random arrangement and ask the child to count them.
- Draw out that there are the same number of pegs however they are arranged.
- Begin with arrangements of up to five pegs and slowly increase the number of pegs, and vary the number of boards used.



## COMPOSITION

Using a different number of boards, but the same total number of pegs each time, children can explore patterns and get a sense of how a number is composed. The following shows the composition of the number 6:

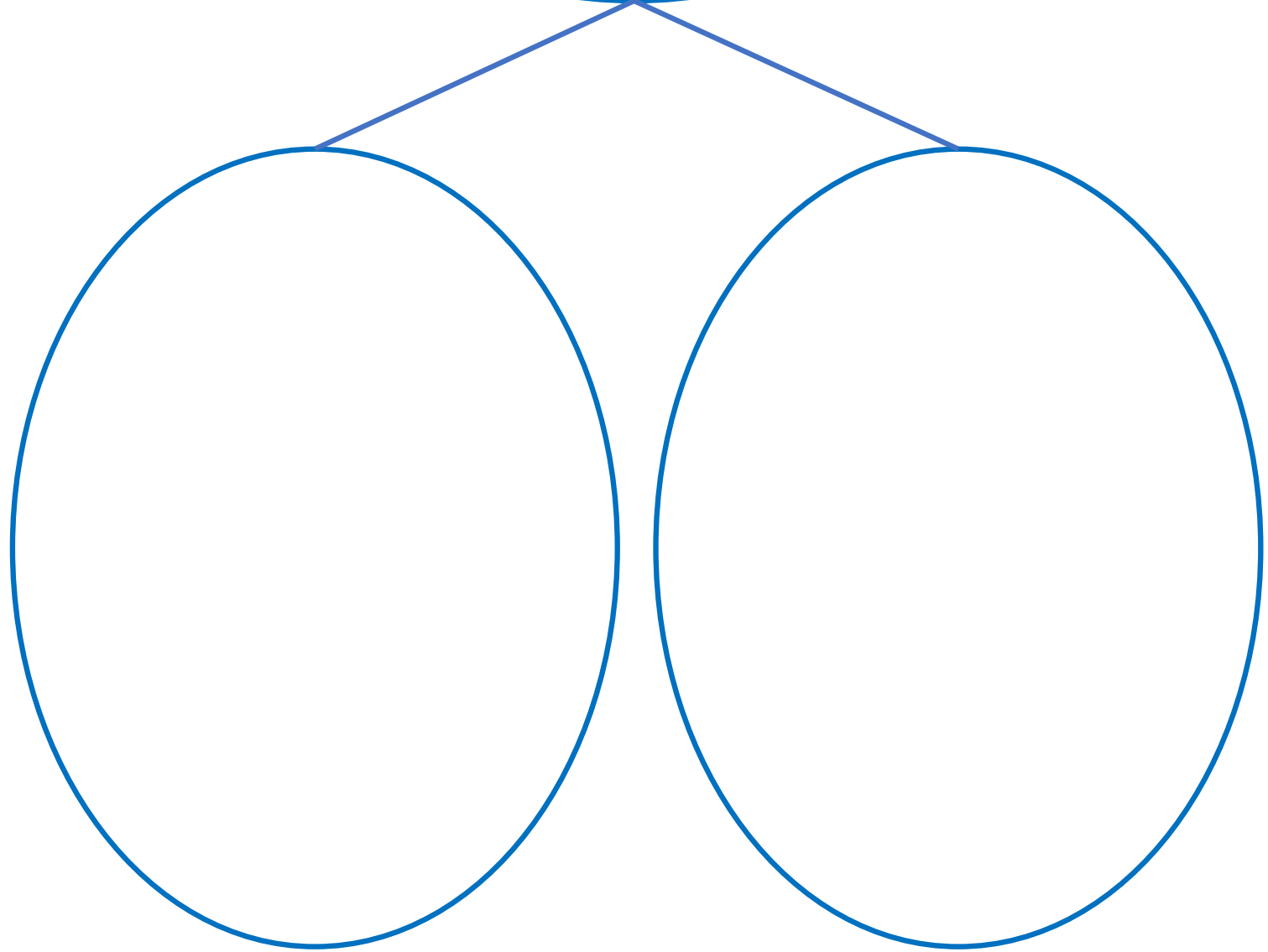
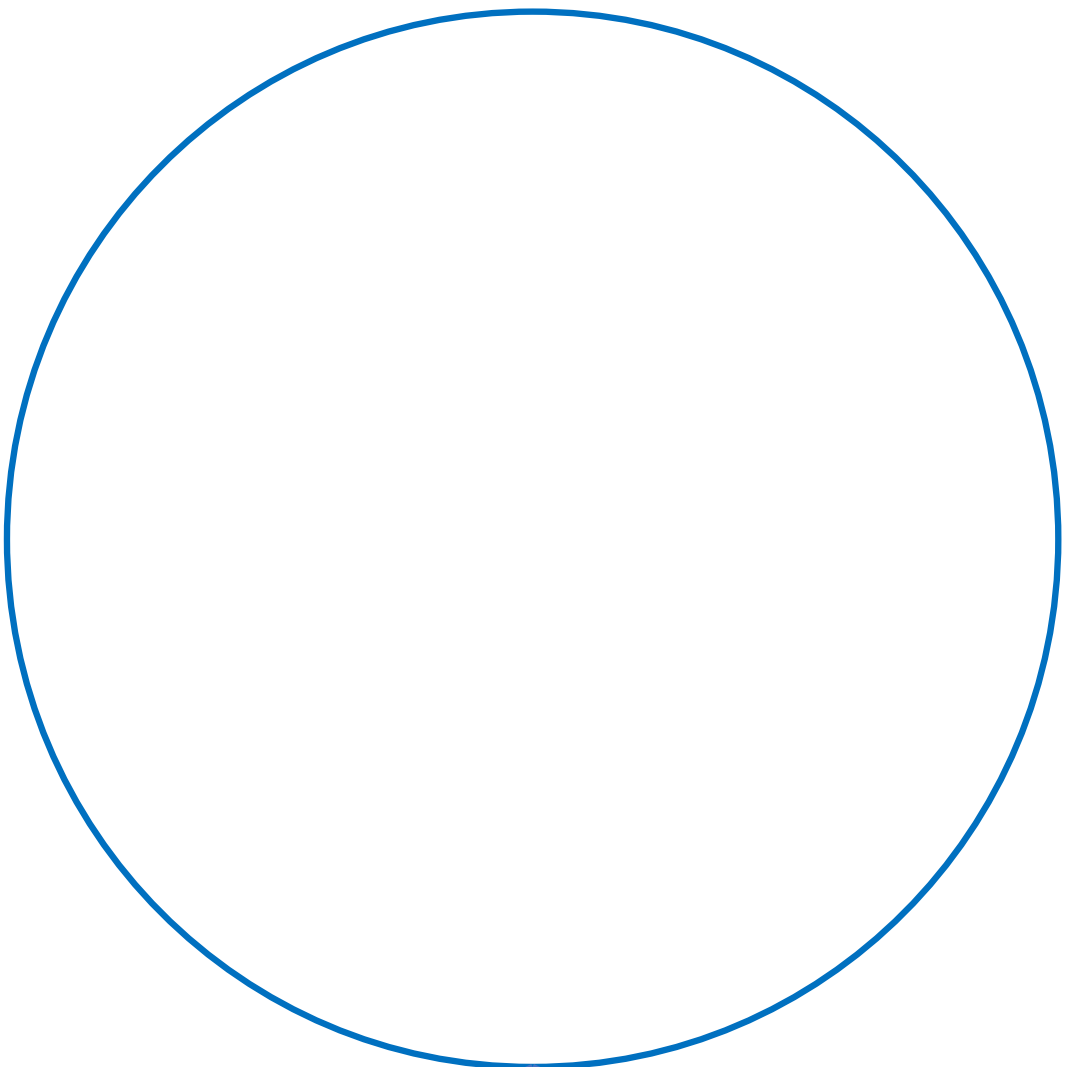


Building (composing) and breaking down (decomposing) numbers is important for developing flexibility in adding and subtracting which the child will need later in their maths journey. If children play with making numbers in this configuration, they will understand that numbers are made of component parts. It also provides a visual to recall number facts and embeds excellent skills for later learning.

**Activity: Bunny ears finger composition** (this can be used to assess whether a child is fluent with number facts to 6 and assess the need for intervention)

- Ask the children to make the number six with their fingers placed on their head
- Ask the children to make six another way. Then another way.
- If any child is struggling with this task, ask them to compose numbers using the Pegs and Boards, linking the composition each time to the fingers.  
The Pegs and Boards link to the fingers as they come in groups of 5. They can be used to help visualise the link between a number and its composition and discourage counting in ones.

Spot On With Numbers' *Number Bond Pack* provides more depth on composition and can be used to provide intervention for children struggling with this task.



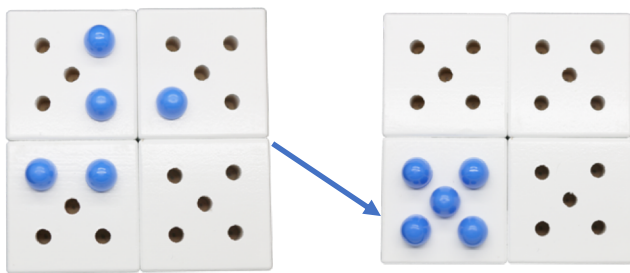
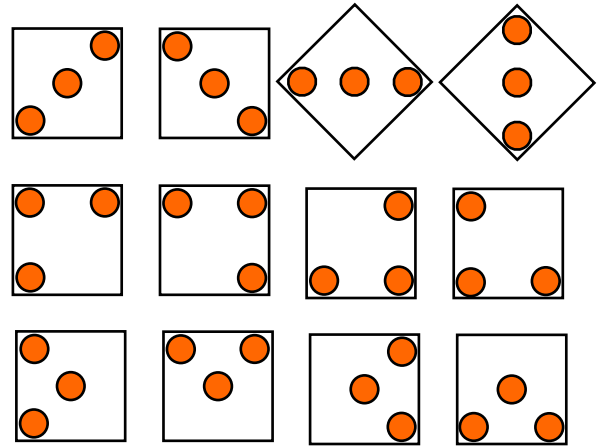
## SUBITISING

Once a strong relationship between the counting word and the pattern has been established, children may be able to 'see' the total number without having to count it. This is known as subitising and is important in developing number sense. The ability to subitise is innate and comes before the ability to count, but the link between the number name and the visual quantity needs to be established first.

The more children see the link between a counting word and the pattern it creates, the more that link will become apparent.

The diagonal encourages us to see (subitise) a set of objects in many more arrangements, similar to those which could occur in a random collection:

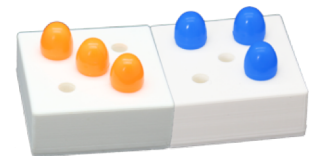
Discuss similarities and differences in the patterns that are created. Move the pegs or rotate the boards so that the child can verbalise the connections and appreciate the similarities between the different configurations.



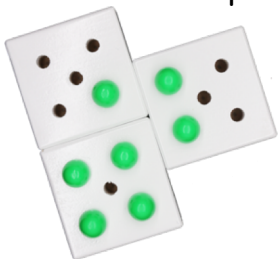
The ability to move the pegs into a familiar pattern strengthens the link between the random arrangement and the number.

The numbers that make up five for example can also be explored by using different colours (eg two green and three orange to show how five is made up).

When a set of objects larger than five is quickly recognised, the person has most likely broken the objects into more than one group and used their number facts to accurately identify the total number of items. This is called conceptual subitising. Again, this subitising can be encouraged with any concrete or pictorial arrangement, but the five dice formation can be used as a support before seeing more difficult arrangements.

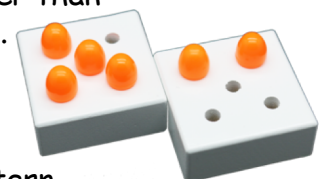


Subitising does not need to be seen as an 'add on' activity, but one that should be encouraged every time the child has chosen to use the Pegs and Boards resource to support them in their activity. Making numbers in different configurations and exploring how numbers are composed aids the development of conceptual subitising.



While using the five dice arrangement for numbers greater than five, the child is also constantly reinforcing number facts.

If more practice is required, the five dice formation can be used to create random arrangements. Again, these can be moved to see the link to a more familiar pattern.



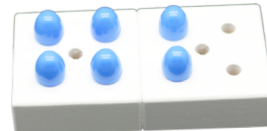
## Making and Visualising Numbers

Ask the child to make different numbers using the Pegs and Boards. Start with smaller numbers and gradually increase the size of the numbers.

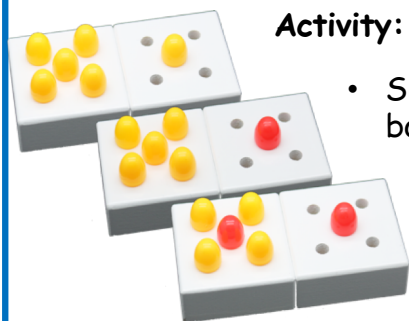
The following activities look at the number 6, but *Spot On With Numbers' Number Bond Pack* provides more depth on making and visualising numbers.

### Activity: Making Numbers

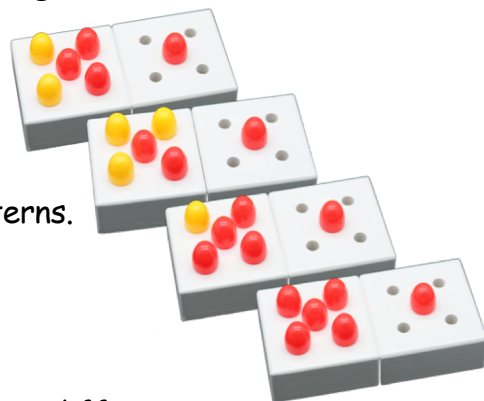
- Hold up six fingers or show a numeral of the number six.
- Ask the child to show you the number six on the Pegs and Boards using one colour in whichever way they choose
- Ask the child to then show you the number 6 in a different way. Continue until they have explored many different ways. They can use more than two boards or find many more ways than these:



### Activity: Number Bonds Patterns



- Similarly ask the child again to show you the number six on the boards in whichever way they choose to using one colour.
- Ask the child to recreate their pattern again, but this time change one peg for a different colour.
- Encourage the child to record each representation in a way that is meaningful to them.
- Continue until the child has explored all possibilities and see if they recognise any patterns.

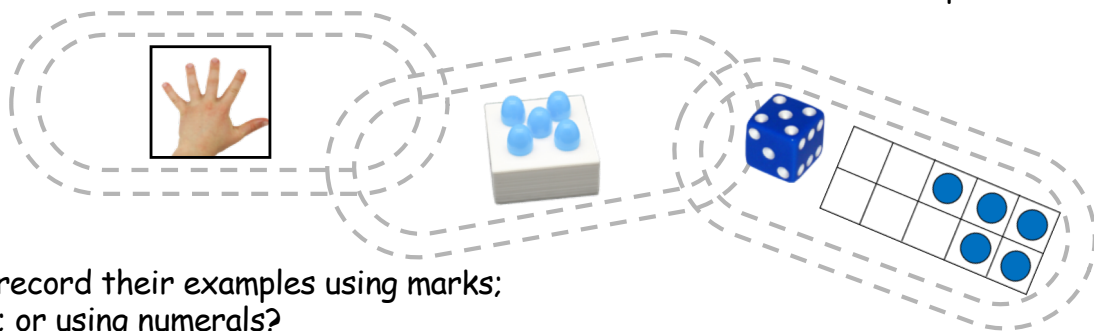


### Questioning:

- Ask the child to **explain** how they made the number six in each example, **describing** what they see in each example.
- Ask the child to **reason** by telling you 'what is the same and what is different' and ask them how they know they are the same number.

### Exploring the links

- Ask the child to link their examples to their fingers, showing the numbers that make six with their fingers (how the number has been composed).
- Has the child created any interesting patterns? Can the child spot and explain the pattern?
- Are there any other resources in their environment that the child can link their examples to?



### Recording

- Is the child able to record their examples using marks; drawing the pattern; or using numerals?

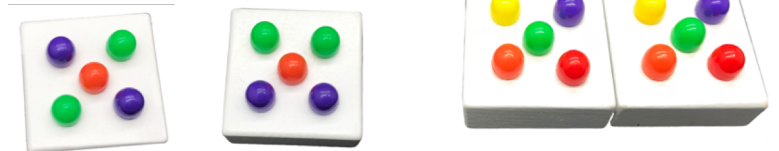
*Spot On With Numbers' Number Bond Pack* provides more depth on making numbers, as well as examples of questions to ask and the types of recording the child may produce.

## Patterns

'There is evidence to show that early patterning skills are important predictors of children's later mathematics achievement' (Rittle-Johnson, Fyfe, Hofer & Farran, 2017) and teachers or 'parents may be able to increase how frequently their children think and talk about advanced early number and patterning concepts by talking with them about such concepts' (Douglas, A., Hwang, J. & Zippert, E. L., January).

Appreciation of patterns forms a vital role in a child's maths journey. Encourage the child to play with the Pegs and Boards and make patterns. Then, ask the child to explain the pattern and talk about what they see.

Children can start exploring patterns with the Pegs and Boards from a young age. It promotes spatial ability by introducing them to rotation and reflection (which is the ability to turn or flip an image).



(these patterns were created by 3 and 4 year olds which shows an awareness of repeating colours)



This three looks like a triangle

These look the same if I turn one

This one looks like the three on a dice

Ask the child to explain 'what is the same? What is different? How can we make them the same?'

Extend creative explorations by asking questions like 'what do you think would happen if...?'



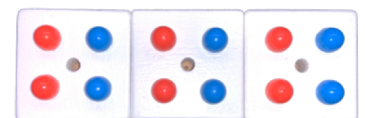
ABC patterns



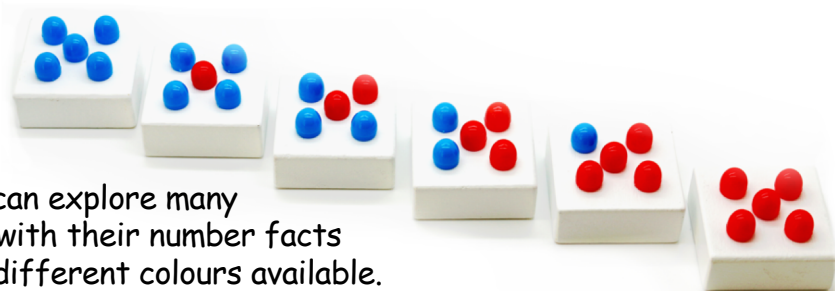
ABB patterns



ABC closed pattern



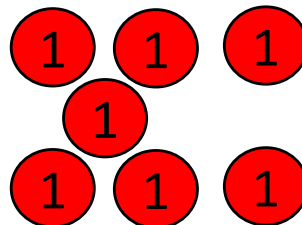
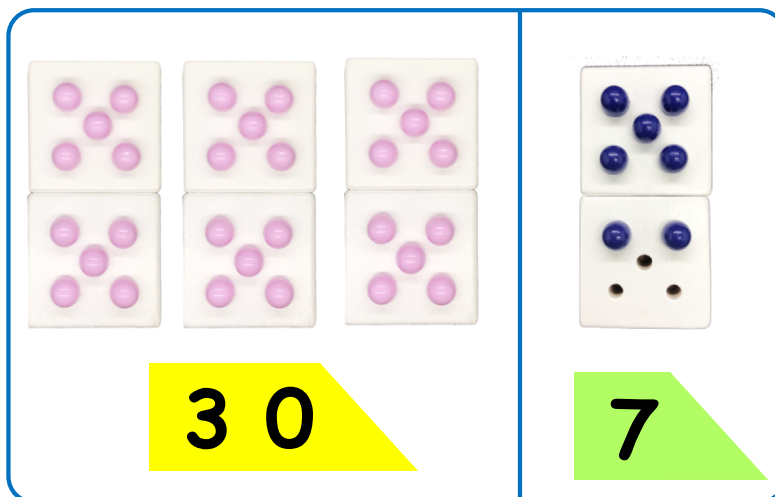
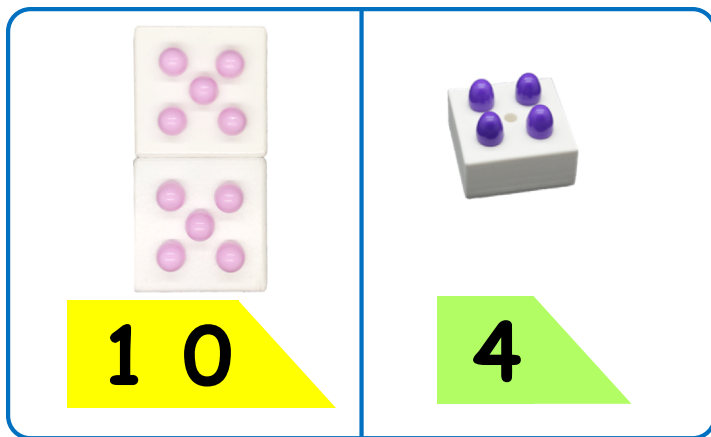
AABB patterns



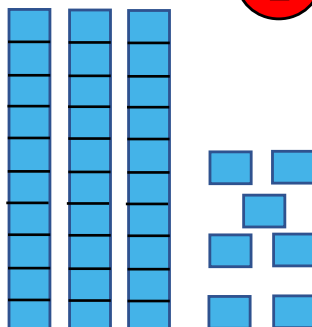
Children can explore many patterns with their number facts with the different colours available.

### PLACE VALUE:

A key learning point for numbers greater than 10 is knowing that the number includes a group (or groups) of 10. Encourage this by pushing together two boards to clearly show 10 and allow plenty of practice making numbers greater than 10:



Encourage children to explore multiple representations of numbers by linking to other resources in the classroom, such as place value counters and 10s blocks:

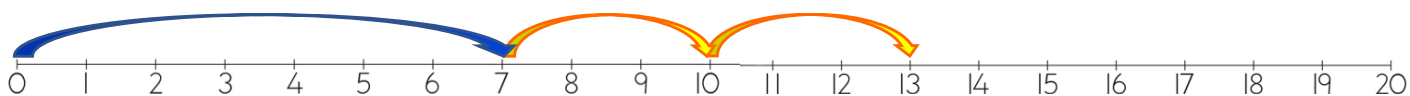
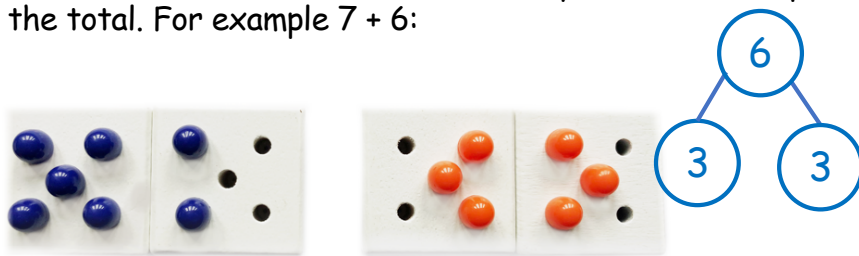


Can the children use the resources to explain how to add or subtract 10?  
For example  $14 + 10$  or  $14 - 10$ .

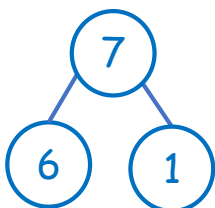
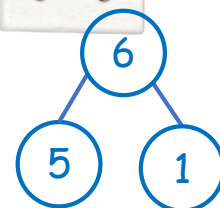
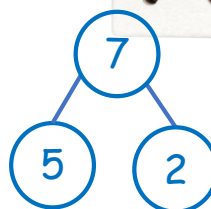
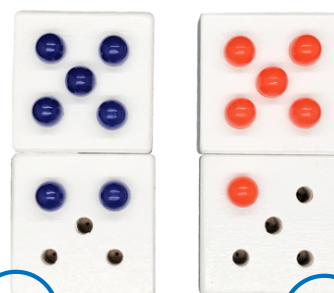


### ADDITION:

The Pegs and Boards can be used to model addition. Make each number with a different colour and explore how the total can be found. The child may need to recompose the pegs and manipulate them to subitise the total. For example  $7 + 6$ :



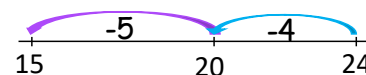
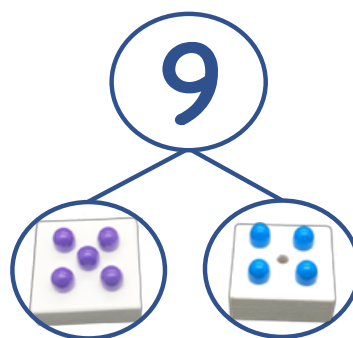
To encourage children to be flexible, ask them for multiple methods for working out the above calculation. For example, a child who sees 7 as  $5 + 2$  and 6 as  $5 + 1$ , may conclude that as  $5 + 5 = 10$ , and  $1 + 2 = 3$ , then the total of  $10 + 3 = 13$ .



Another child may argue that they already know that  $6 + 6 = 12$ , so  $6 + 7$  must be one more than 12. These discussions are beneficial in developing flexibility, fluency, reasoning and seeing connections.

### SUBTRACTION:

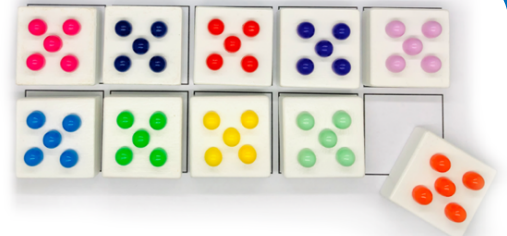
The Pegs and Boards can be similarly used to model subtraction calculations and visualise how the numbers are composed, in the same way that the calculation can be done on tens frames or on a number line (before doing it mentally). For example  $24 - 9$ :



## MULTIPLICATION:



When counting in multiples ask the child to make 10 versions of that number with the Pegs and Boards. If the child has made the number, they will have a better sense of the number and are less likely to rote count, thus ensuring they have a stronger sense of the numbers they are counting in. Encourage the child to arrange the peg boards in a way that they can easily identify the number of groups and the number in each group.



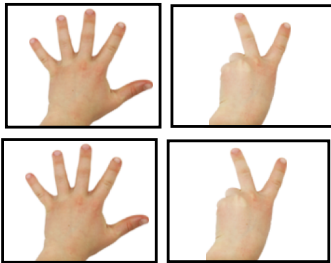
For example, the above shows groups of five laid out in a tens frame.

Here is an example of  $2 \times 7$ :



There are '7 lots of 2'  
'2 multiplied by 7':  $2 \times 7$

Ask the child to move the pegs and share them equally between two sets of boards (exploring commutativity):

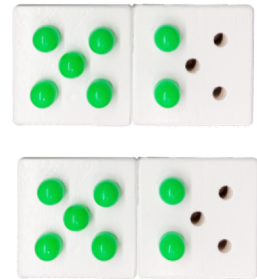


Link to the fingers for a strong visual image for this number fact.

Now there are '2 lots of 7'

'7 multiplied by 2':  $7 \times 2$

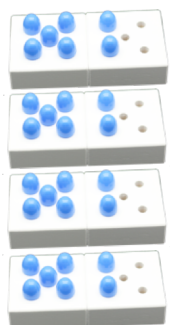
'Double 7'



Does the child notice a quick way to subitise the total number of pegs?

Here is an example of  $7 \times 4$ :

$$7 \times 4$$



$$\begin{array}{l} 5 \times 4 \\ = 20 \end{array} \quad \begin{array}{l} 2 \times 4 \\ = 8 \end{array} \quad = 28$$

Children can visualise multiplication facts and see links between multiplication and division.

Link to halving



Half of 14 = 7

## DIVISION:

Division can be modelled with the Pegs and Boards by making the original number and then either sharing or creating groups of the number being divided. For example  $28 \div 4$ :

$$28 \div 4 = 7$$

