



Early Maths v1.0

Maths Software for the Early Years (Foundation Stage)

“What humans do with the language of mathematics is to describe patterns... To grow mathematically children must be exposed to a rich variety of patterns appropriate to their own lives through which they can see variety, regularity, and interconnections.”

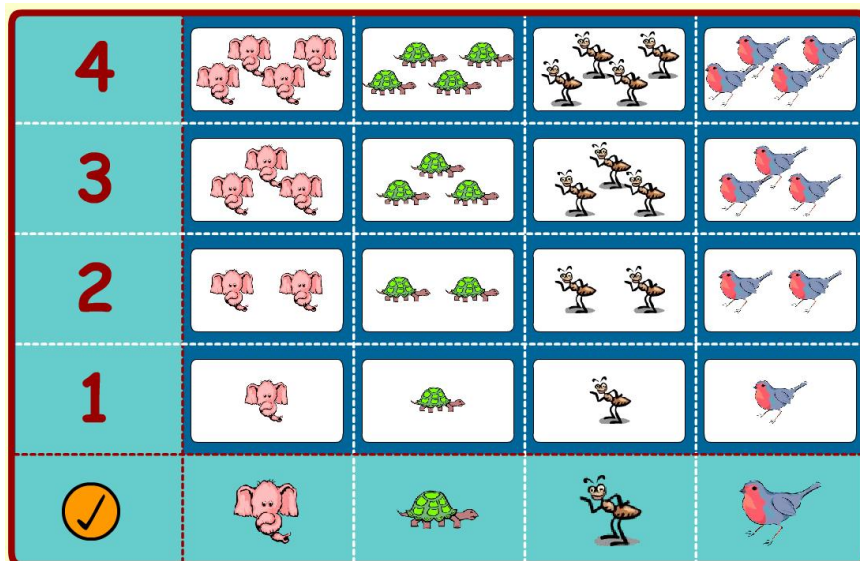
- Lynn Steen, from *On the Shoulders of Giants: New Approaches to Numeracy*

This user guide has been
compiled by Ian Sugarman

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CARD SORTER



When all cards are correctly placed, children will have demonstrated that they are able to **sort according to two criteria** – in this case, number and shape.

This activity is well known for its **self-correcting** property – i.e. if a card is wrongly placed, when the card that should be placed there comes up, there is a good chance that the issue will be confronted. But if it isn't, when all 16 cards have been placed, and the tick is clicked, any incorrectly placed cards will be

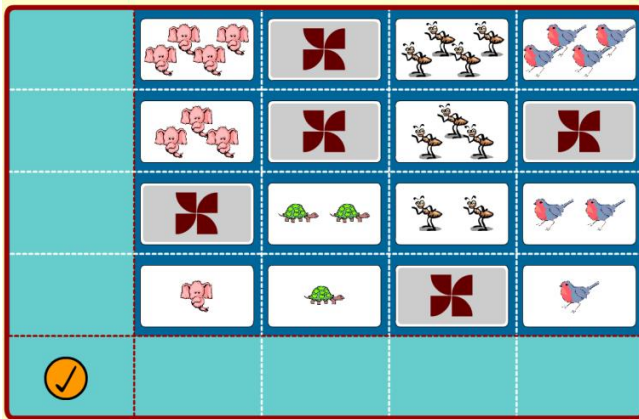


highlighted, and await correction.

Once a game is over, it is a good idea to focus upon the generalised principles of the layout by setting a **higher level problem**.

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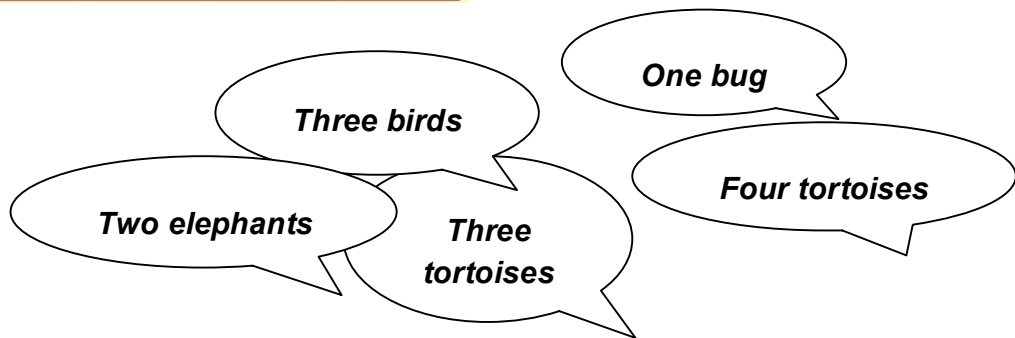
Clicking on the Margin cards that identify the nature of the lines, will make them disappear e.g.



Here, the cards have all been correctly sorted and the margin cards have been removed.

5 cards have randomly been turned over.

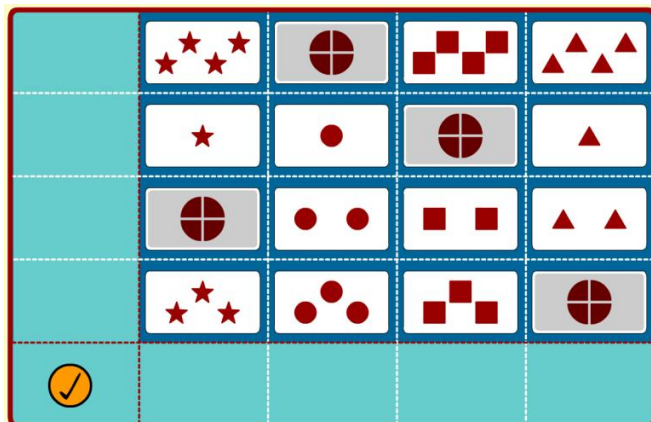
Can they identify what each mystery card is?



An even greater challenge is presented when you select the mixed number option.

They must look along and down each line and ask themselves the question

“What is the same about the other ones? They are all one, and they are all squares”



A Guide to Vocabulary



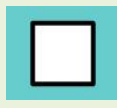
circle



ellipse or
oval



(equilateral)
triangle



square



rhombus or
diamond



pentagon
(regular)



pentagon
(irregular)



hexagon
(regular)



4-pointed
star



5-pointed
star



6-pointed
star

MATCH THE PATTERN: STICKS

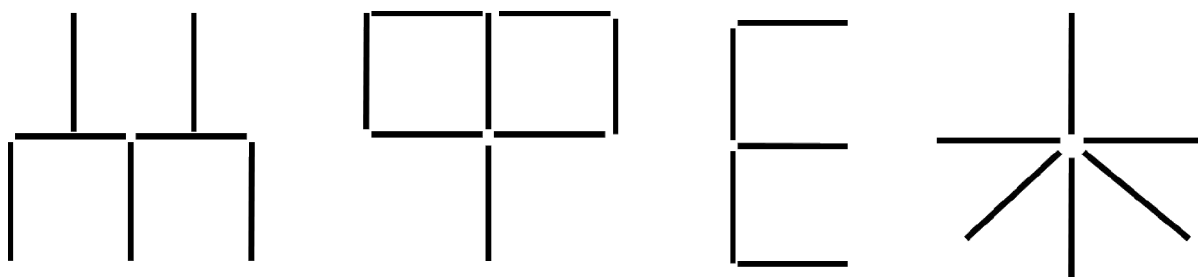
These activities are designed to allow children to forge links between the world of Shape and the world of Number.

They will see images of shapes and patterns that they are required to copy.

The basic resources that are needed are:

- **Sticks**, either headless matchsticks or plastic
- **Counters**
- **Squares**, Small plastic/card ones or cubes

Each set of images is sorted into two levels of difficulty.



These are examples of patterns from the **first level** of stick images.

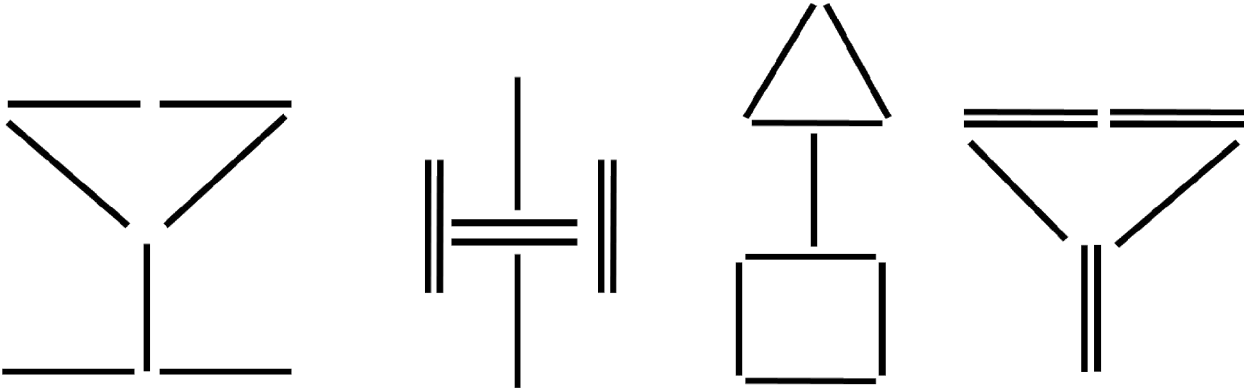
Classwork – teacher led

A suggested progression in using these patterns is:

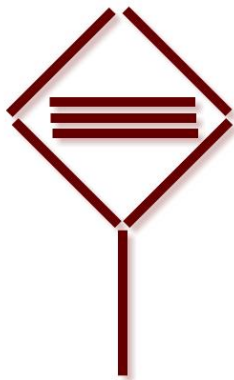
1. Show a pattern and ask pupils to use little sticks to **copy it**. Let them see what others have done and discuss any differences.
2. Show a pattern for a couple of seconds and then **hide it**. Can they copy it from memory? – collaborating in pairs is good for discussion.
3. Re-show the image so they can check if they are right.
4. Drag an image to the side of the screen and ask a pupil to come up and copy the image **using the virtual sticks** in the bin.
5. Show a pattern and see who's first to say **how many sticks** there are. Vary who you ask, *e.g. sometimes a group, sometimes just a pair of pupils*
6. Show a pattern for a couple of seconds and ask them to **draw it**.

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Second level images are a little more complex and careful note needs to be taken of numbers. Here are a few examples:



Some pupils could be asked to not only say how they know how many sticks there are, e.g.



There's a square – that's 4.

And 3 in the middle with 1 on the bottom – that's another 4..... 4 and 4 is 8.

but also write down their mental calculation alongside their drawing,

e.g. **$4 + 3 + 1 = 4 + 4 = 8$**

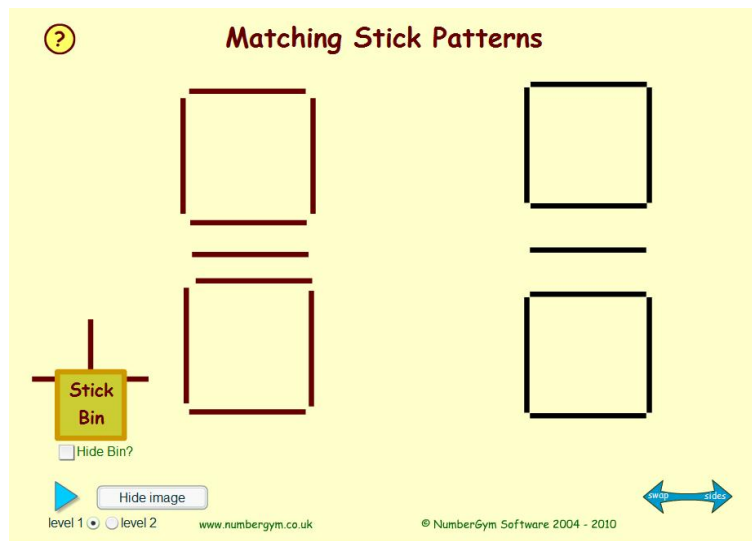
This will not be appropriate for most children – verbalising their calculation will be a sufficient challenge.

Pupils working independently

Pupils can practise copying the patterns and exercise their memory by using the virtual sticks from the bin.

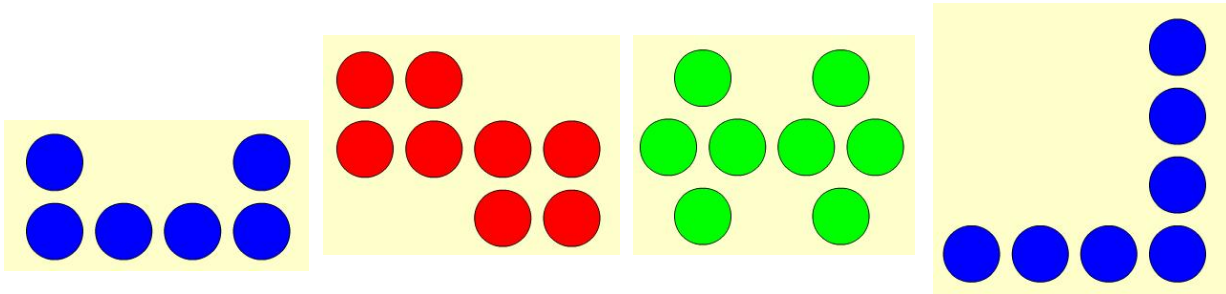
Working in pairs – one selects an image and shows it for a couple of seconds, then moves it to the side of the screen and hides it.....

Can the partner remember how it looks and copy it?

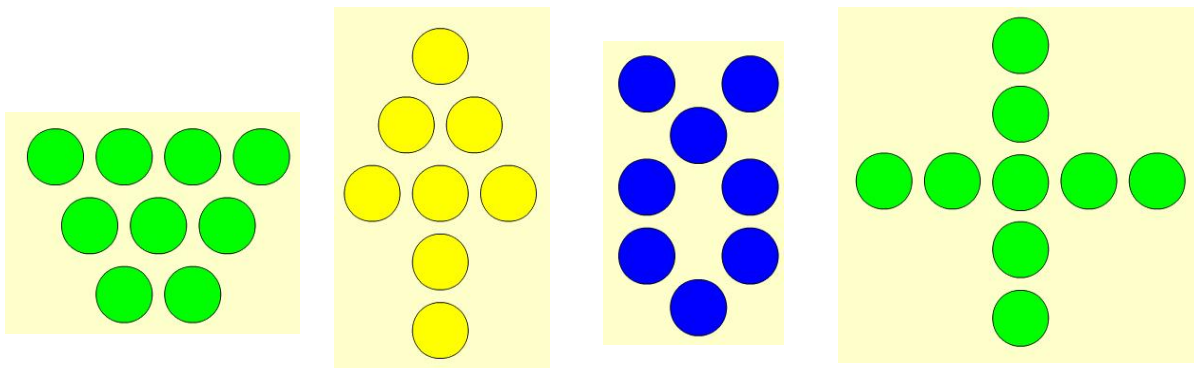


MATCH THE PATTERN: CIRCLE IMAGES

We recommend following the basic progression that we outlined on Page 5 for using the stick images.



These are some examples of images from Level 1.



These are from Level 2.

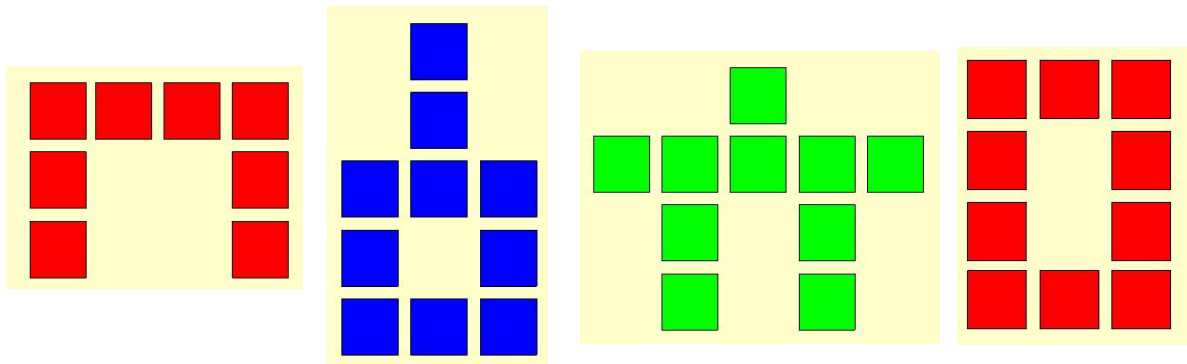
A large rounded rectangle with a black border. At the top center is a yellow box containing 10 blue circles arranged in two rows of five. Below the box are two speech bubbles. The left bubble contains the text: "I saw 2 squares. There was a circle in between them." The right bubble contains the text: "I saw a 5 in the middle. And two on each side of it."

*I saw 2 squares.
There was a circle in
between them.*

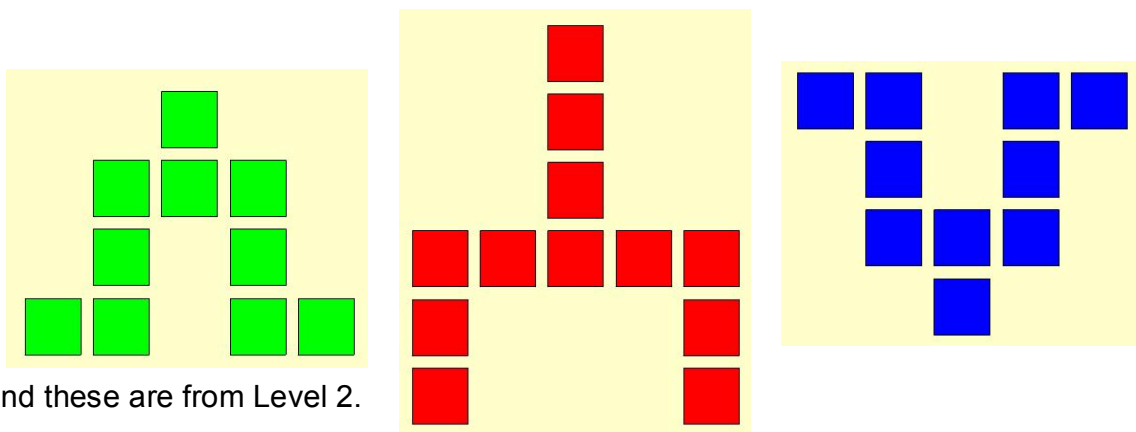
*I saw a 5 in the middle.
And two on each side
of it.*

MATCH THE PATTERN: SQUARE IMAGES

We recommend following the basic progression that we outlined on Page 5 for using the stick images.

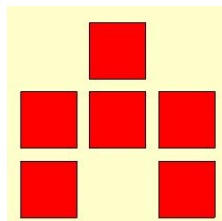


These are some examples of images from Level 1.



And these are from Level 2.

There were 3 in a line. There was one on top and 2 more under the end ones.



I saw a rectangle but the square in the middle at the bottom was moved to the top.

MAKING STICK PICTURES

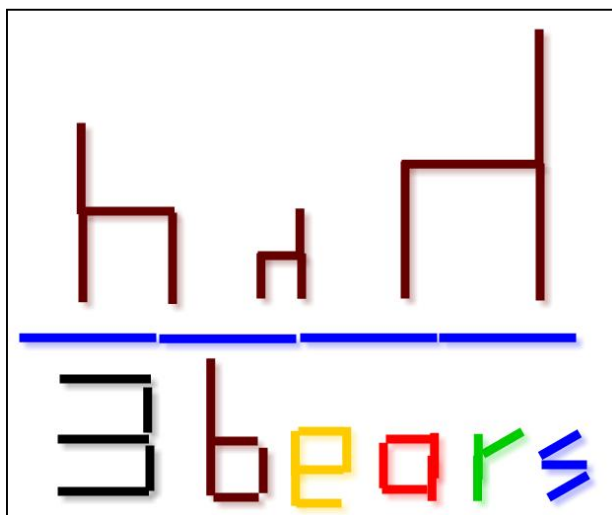
The purpose of this activity is to allow pupils to create pictures and patterns using mathematical decisions and talking about them using mathematical vocabulary.

Creating pictures with sticks can generate:

- Numbers
- Shapes
- Positional language

For example, the picture below shows the chairs that belong to the 3 Bears. From this picture we could make these observations:

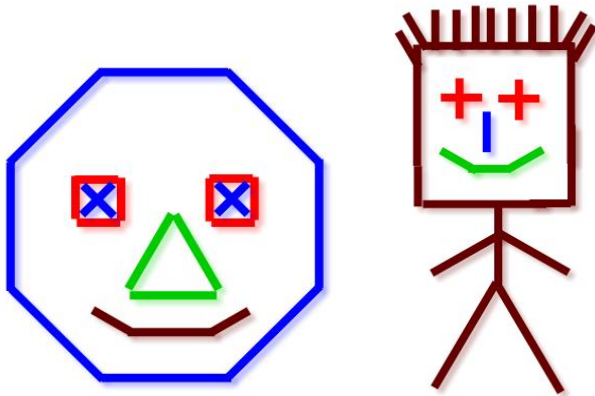
- **4** sticks for each chair, **8** for two of them and **12** altogether
- Each chair has one **horizontal** stick and 3 **upright** or **vertical** sticks
- The baby's chair is **in between** the other two chairs and is **facing** the mother bear's chair.
- The mother bear's chair is **larger than** the baby's chair and **smaller than** the daddy bear's chair.
- The daddy's bear chair is the **largest**.



In the words below the picture,

- The **3** uses 5 sticks (*3 horizontal and 2 upright/vertical*)
- The **b** and the **a** have **squares**
- Some of the sticks **overlap**

Ideas for pictures:



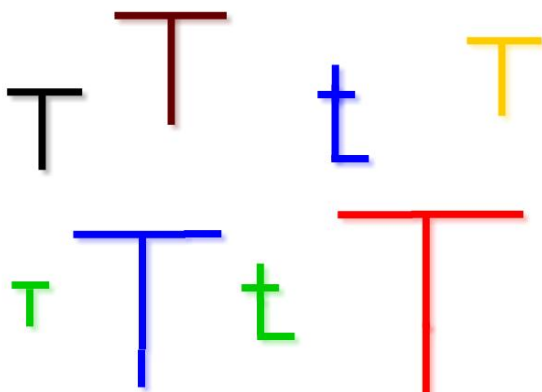
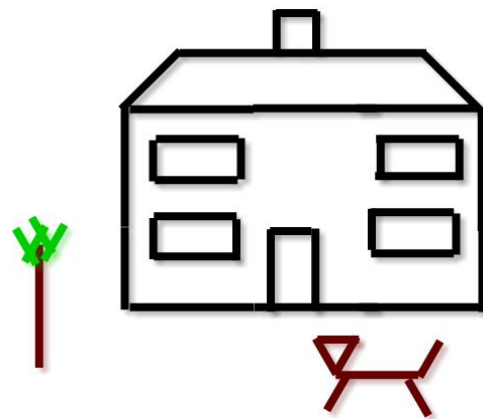
Faces/People/Clowns

These will have an element of symmetry and be likely to necessitate the rotation of sticks through different angles.

Buildings

e.g. house, church,

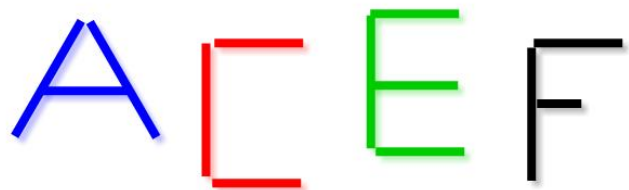
These will tend to involve the creation of rectangles, for windows/doors.

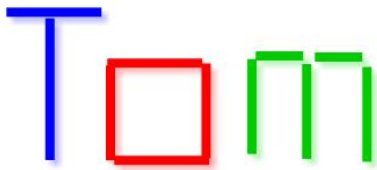


Letters

Becoming familiar with the shape of a particular letter or numeral.

Exploring how to make the letters using only straight lines



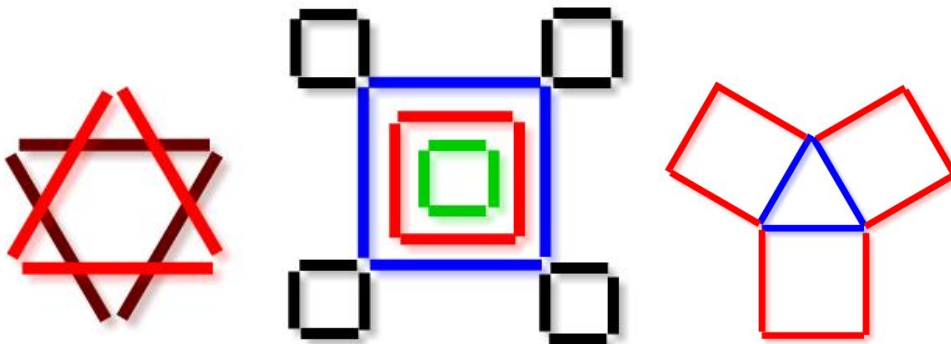
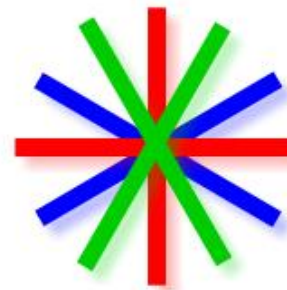
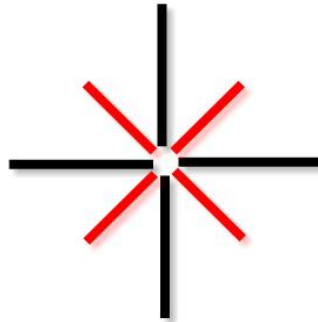


Making words

How many sticks altogether to make your name?

Stars

How many points on the star?



Patterns

Usually combining shapes with an element of symmetry.

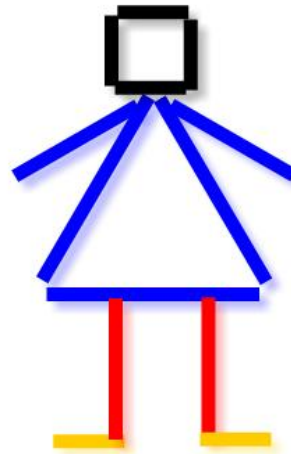
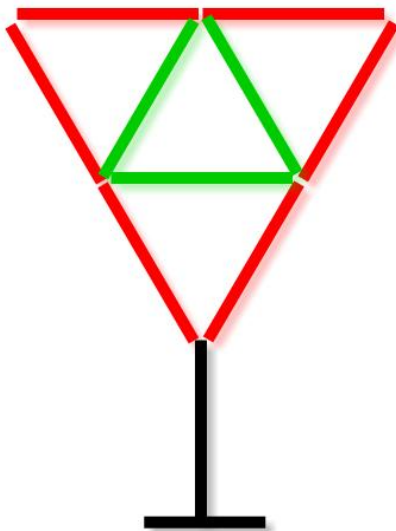
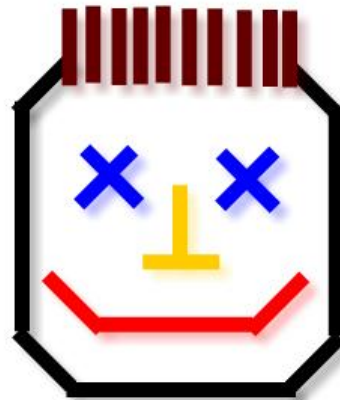
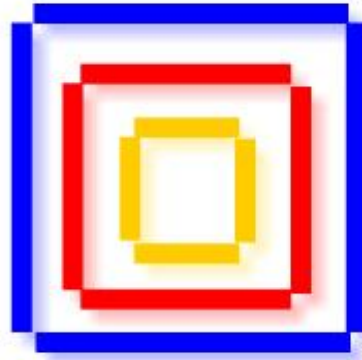
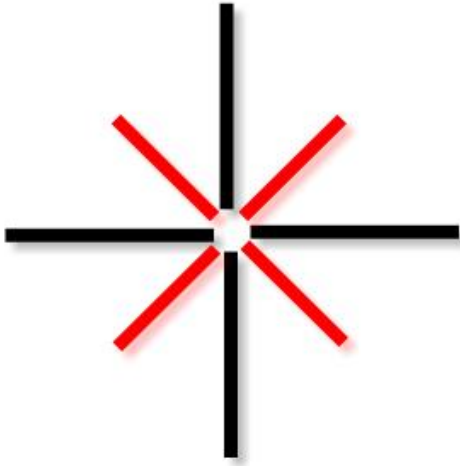
Showing pupils a picture or pattern and asking them to try and copy it is a good way of helping them become familiar with the decisions they will need to make –

- **Which length stick?**
- **Where to place it?**
- **How to rotate it?**
- **Which colour?**

It should also provide them with some ideas of what kind of picture or pattern to create when they are left to their own choice.

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Here are some images that could be offered to pupils to copy:

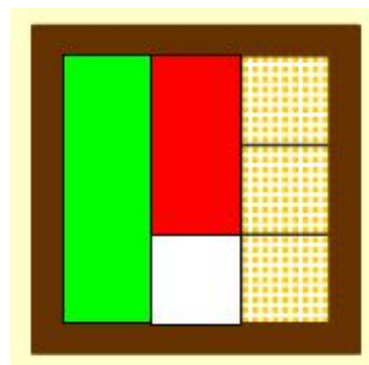


RODS SPINNER GAMES

In this game, players take turns to use the spinner to select a rod that they will place in their box. The winner is the first player to fill their box. Because the rods fill 1, 2 or 3 of the squares, playing this game offers them a chance to develop an intuitive knowledge of the spatial relationships between the rods.

e.g.

"I've got a line of 3 squares left. I could fill that with one green rod, or with a red rod and a white one, or"



With very little experience, they should be able to tell you that

- **2 white rods make a red rod**
- **3 whites make a green**
- **A green can be made with a red and a white**

You could also show them how these statements can be recorded using the initial letters of the rod names:

- **$w + w = r$**
- **$2w = r$**
- **$w + w + w = g$**
- **$g = 3w = r + r + w = 2r + w$**

In time, this experience will transfer to an awareness of number bonds – e.g. $1 + 1 = 2$; $1 + 2 = 3$

Conversation can be around ideas like

- *How many spaces are there left?*
- *How many squares have you covered?*
- *Who has filled more squares?*
- *Could you fill your box on the next go?*
- *How many rods are in your box now?*
- *How many squares need to be filled?*

Note that, removing the grid lines enforces a higher level of challenge – focusing on spatial awareness rather than a straight forward counting response.

We also offer boxes of size 4x4 and 5x5.

LAST ROD DOWN

This game encourages **strategic thinking**, whilst developing spatial awareness, e.g.



BUG selects a yellow rod



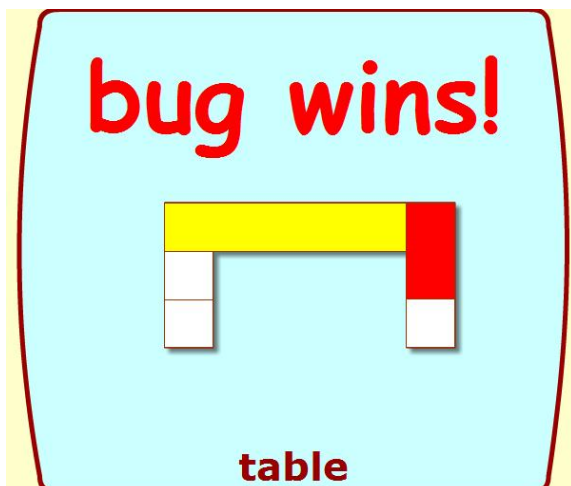
ELEPHANT selects a red rod and realizes that if it were to go on the left hand side, BUG could place a single (green) rod on the right hand side and win



BUG selects a white rod and realizes that if it were placed below the red rod, ELEPHANT could win by placing a red rod on the left hand side

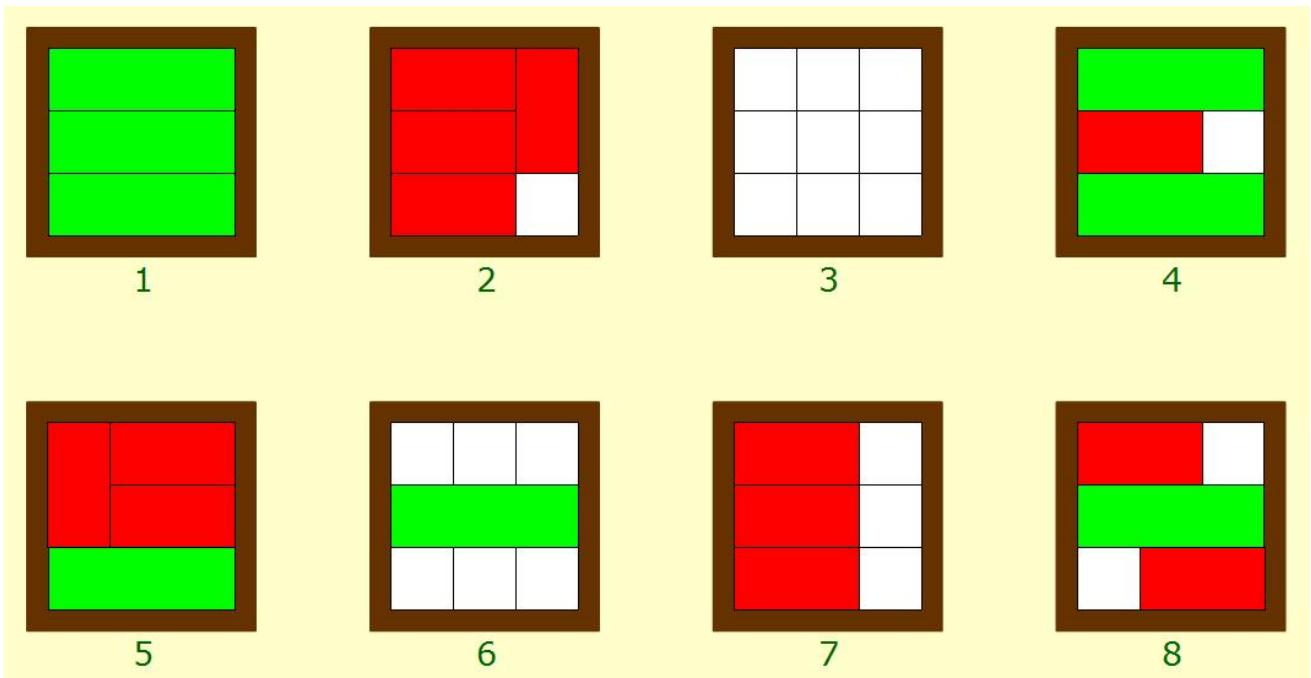


ELEPHANT realizes that the game is lost – whichever space is filled will leave only one space to be filled



RODS IN BOXES

This activity is to allow pupils to **explore** different ways of filling the boxes, to make different pictures.



These pictures might prompt observations like.....

- *I can make the picture all green and all white, but I can't make it all red*
- *I can fill it with 3 rods, 4 rods, 5 rods, 6 rods and 7 rods*
- *I can fill it with just one colour, two colours or three colours*
- *I could see if I can arrange the rods in Picture 6 in different ways to make different pictures*
- *I wonder if I could fill it with 8 rods*

There is a template grid in the Appendix which can be used to keep a record of each picture. Recording both the **number of rods** and the **number of colours** means that each picture generates a 2-digit identity e.g. *Picture 1 is a "3,1"*; *Picture 7 is a "6,2"*.

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This becomes a way of discovering that two very different looking pictures are actually composed of the same rods, because they share the same 2 digit label.

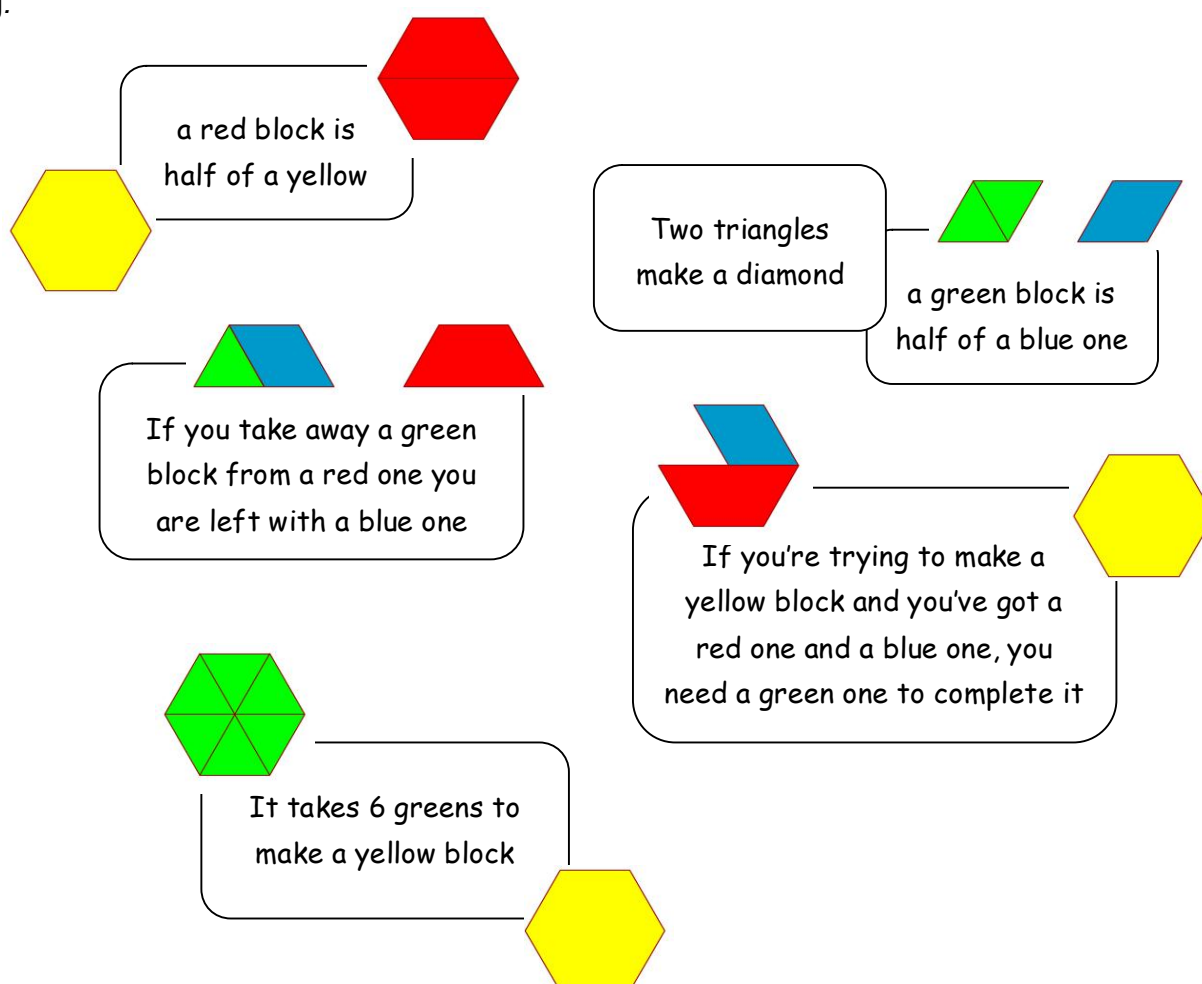
	w	r	g	How many rods?	How many colours?
<i>1</i>	<i>0</i>	<i>0</i>	<i>3</i>	<i>3</i>	<i>1</i>
<i>2</i>	<i>1</i>	<i>4</i>	<i>0</i>	<i>5</i>	<i>2</i>
<i>3</i>	<i>9</i>	<i>0</i>	<i>0</i>	<i>9</i>	<i>1</i>
<i>4</i>	<i>1</i>	<i>1</i>	<i>2</i>	<i>4</i>	<i>3</i>
<i>5</i>	<i>0</i>	<i>3</i>	<i>1</i>	<i>4</i>	<i>2</i>
<i>6</i>	<i>6</i>	<i>0</i>	<i>1</i>	<i>7</i>	<i>2</i>
<i>7</i>	<i>3</i>	<i>3</i>	<i>0</i>	<i>6</i>	<i>2</i>
<i>8</i>	<i>2</i>	<i>2</i>	<i>1</i>	<i>5</i>	<i>3</i>

PATTERN BLOCK SPINNER GAMES

In this game, players take turns to use the spinner. This indicates which block they can place in their box. The winner is the first player to fill their box. A block can be rotated just by clicking on it, but it is best to do this by dragging the block to a place outside the board and then dragging it in the desired orientation to fit inside the board.

Because the blocks fill 1, 2 or 3 or 6 of the squares, playing this game offers them a chance to develop an intuitive knowledge of the **spatial relationships** between the blocks, which can then be expressed in **simple mathematical language**,

e.g.



Pattern blocks offer an experience of **comparing Areas**, whereas the parallel Rod activities are mainly linear relationships.

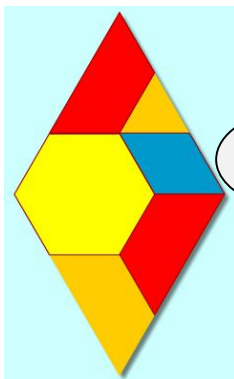
LAST BLOCK DOWN

The main difference between this activity and the Spinner Game is the element of choice. **LAST BLOCK DOWN** requires players to make **strategic** decisions:

- **Where shall I place a block?**
- **Which block will it be?**
- **Which orientation will it be?**

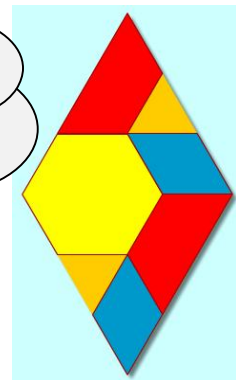
It encourages **reflection** about the outcomes of alternative choices –

- ***What am I trying to achieve?*** (to be the one to place the final block)
- ***What is the other player likely to do if I do this?***
- ***If I don't want this to happen, can I think of a better move?***



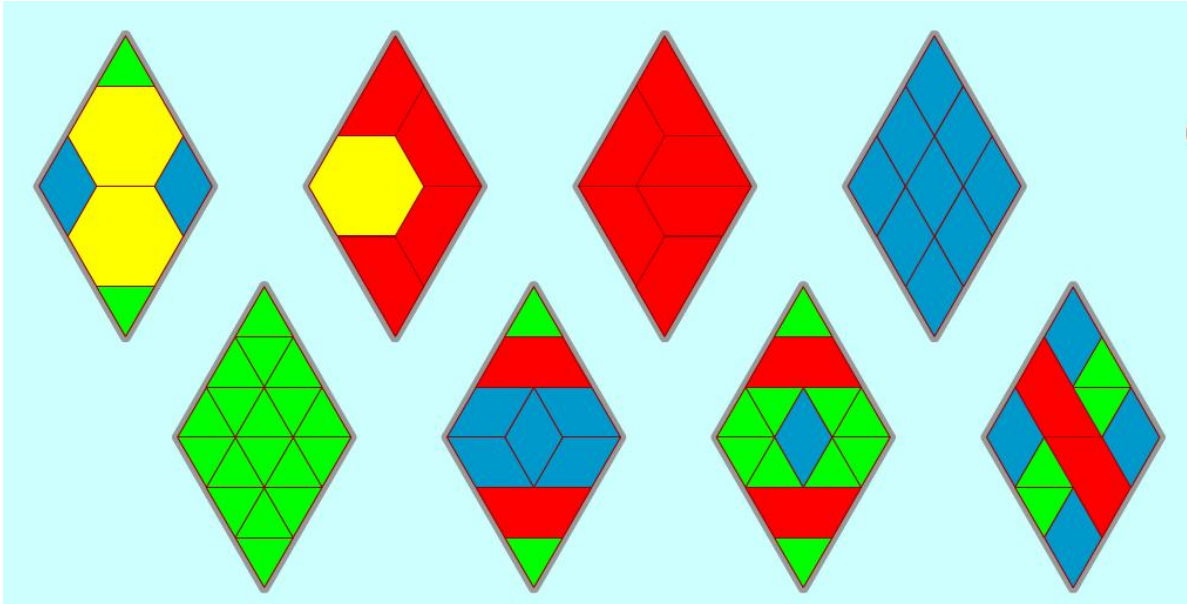
The spaces left could be filled with just 2 blocks – red one and a green one. I need to leave just 2 spaces – one for her to fill and the last one for me to fill. I'll put a blue diamond there.

Only two triangles to fill – whichever one I fill, she will fill the other one – I've lost!



BLOCKS IN BOXES

This activity is to allow pupils to **explore** different ways of filling the boxes, to make different pictures.



They might respond to prompts like.....

I wonder

- ***..... if you could make the shape all blue? All red?***
- ***..... if you could fill it with only two colours? Three colours?***
- ***.....how many yellow blocks you could fit into a picture?***
- ***.....what is the fewest number of blocks that will fill it?***
- ***.....if you could fill it with exactly 10 blocks? 7 blocks?***

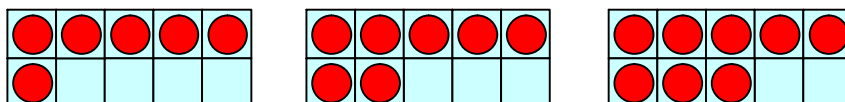
See the template recording sheet in the Appendix for recording each picture.

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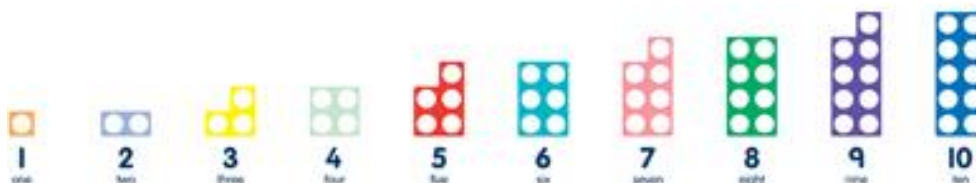
These games use a variety of images of small numbers that are designed to exploit children's capacity to **subitise** the quantity rather than count each object.

Familiar **dice or domino** images are accompanied by:

- **the five-rack images** that highlight the "5 and something" structure of numbers



- **Numicon*** images, that highlight the odd/even structure of numbers



**Find out more about Numicon materials at www.numicon.com*

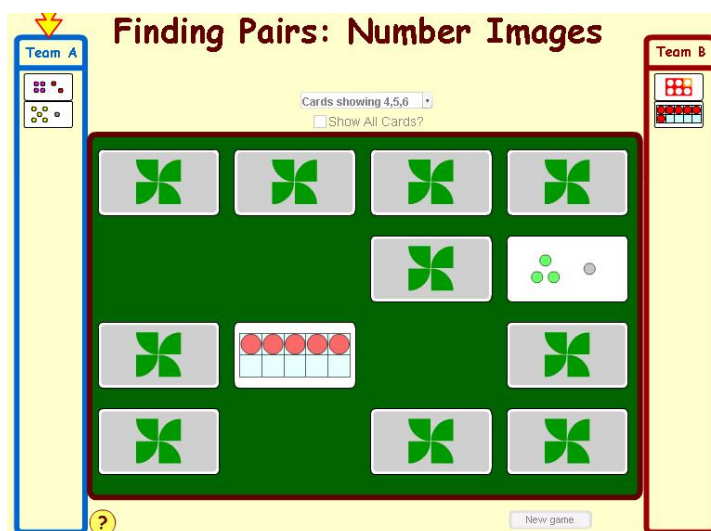
Offer children practical and visual experiences beforehand, responding to the images as PowerPoint flashcards or manipulating practical equipment.

As a first activity with **Pairs** show the set of cards "face up" and invite a child to identify two cards with the same number. Maybe this could be one child selecting any card at random and challenging another to find its pair.

This will familiarise them with the idea behind the activity that what is being matched is not the image itself but the idea behind the image – the idea of equivalence.

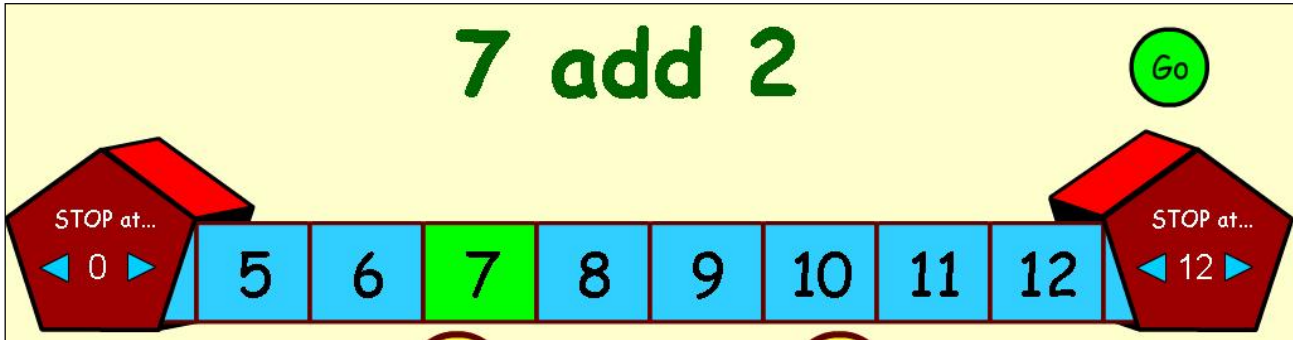
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Later, they can progress to playing the game with the cards face down –



- **Can they remember where a particular number image is located in the array?**
- **Do they adopt the strategy of selecting an unknown card as their first stage and following it with a known one?**
- **Can they keep track of their progress by counting how many pairs of cards they have won so far.?**
- **Can they count in twos to tell you how many cards they have won so far?**

NUMBER TRACK – A COUNTING CHALLENGE



First choose the activity by clicking on the drop-down box and selecting from the available options. You may then want to change the limits of the number track available by clicking on the blue triangular buttons at either end-stop.

By default the number track range will be set to 0 to 10. Once the options have been set click the Go button to initialise the score and present the first challenge.

The pupil will then need to solve this challenge by **clicking on the starting number** which, if correct, will turn green. Then they need to count on or back by the appropriate number of squares and then click and hold down over the answer.

APPENDIX

RODS IN BOXES: RECORDING SHEET

	W	r	g	How many rods?	How many colours?
1					
2					
3					
4					
5					
6					
7					
8					

	w	r	g	p	How many rods?	How many colours?
1						
2						
3						
4						
5						
6						
7						
8						
9						

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BLOCKS IN BOXES: RECORDING SHEET

	triangle	diamond	trapezium	hexagon	How many blocks?	How many colours?
1						
2						
3						
4						
5						
6						
7						
8						