

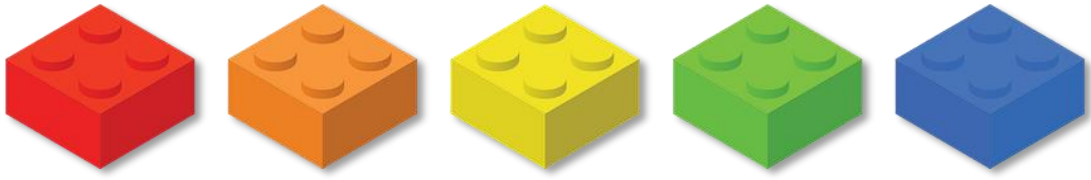


## Ideas for applying these findings at home or school

### ■ ■ Ways to engage maths-relevant spatial skills in Lego play ■ ■ ■ ■ ■ ■ ■ ■


*For these examples, please first read the “spatial skills explained” section (pages 4-6) for more detail about the spatial skills referenced here.*


-  **Disembedding:** Encourage children to think about the various ways in which Lego bricks combine to form new shapes. Children could look at a set of instructions to see different examples of Lego bricks combining to form whole shapes. This encourages children to understand proportions and how small parts make up wholes. This skill is useful for understanding maths concepts such as fractions and percentages. During Lego play, use words such as: ‘small, smaller, big, bigger, part, whole, half’
-  **Visuospatial working memory:** Encourage children to check their part-finished model against the instructions and to align their part-finished model with the instructions. This encourages the child to hold images of the complete model in mind while building, which engages their visuospatial working memory. This is a skill that is useful in maths activities. Use words during Lego play such as ‘same, different views, corner, sides, opposite, across, around, turn, high, low’

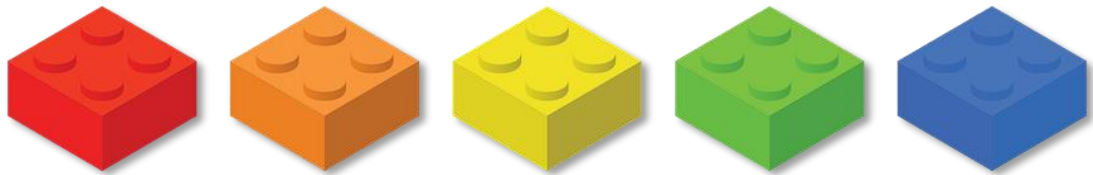


## Ideas for applying these findings at home or school

### ■ ■ Ways to engage maths-relevant spatial skills in Lego play ■ ■ ■ ■ ■ ■ ■ ■

 **Mental rotation:** When recreating models from instructions, talk to children about how they need to rotate bricks to fit them in the right place. Point out to the child that they could try turning the brick in their mind. This encourages visualisation, which is a useful skill for solving maths problems. This is also a good way to practise thinking about magnitudes (in this case, the degrees of rotation), which might be helpful for maths activities that involve comparing magnitudes (e.g., comparing sets of numbers). Example words to use during Lego play: ‘turn, on, next to, fit, short side, long side’

 **Spatial Numerical Associations:** Encourage children to compare the size, length, and width of different bricks, and to compare how different size bricks have different numbers of pips on them. Encourage children to attempt challenging models that consist of varying brick sizes, and to estimate the length of pieces that they need to use. Ask children what would happen to the model if they estimated incorrectly and used a brick that was too long or too short (e.g., a 2 x 4 brick when a 2 x 3 brick is needed)? This helps children to think about spatial proportions and the relationships between space and numbers - a skill underlying many maths activities



## Spatial Skills and Link to Maths Explained

Here you can find out more about how the spatial skills we assessed might have helped children complete the Lego construction tasks and maths tasks.

### Disembedding

Disembedding is the ability to locate a shape that is embedded within a larger image or pattern of diverse shapes. This ability helps children to understand how small parts can make up a whole.



Disembedding might help children to identify a specific piece from an instructional Lego diagram and then locate it within a diverse stockpile of Lego bricks.



Disembedding skills might help children to solve place value column problems by identifying individual digits within big numbers. It is also helpful for understanding fractions.

### Visuospatial Working Memory

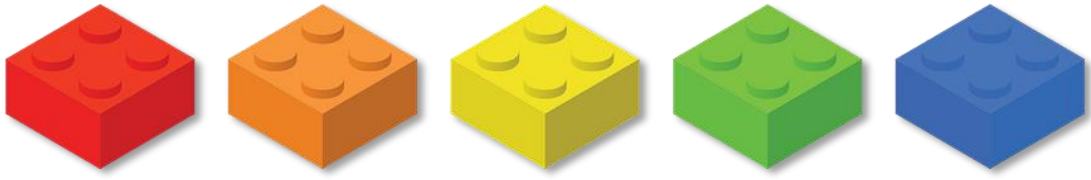
Visuospatial working memory (VSWM) is the ability to hold visual and spatial information in mind while solving problems.



Children engage their VSWM when holding the components of a Lego model's instructions in mind whilst building.



VSWM is used to hold numerical information in mind while solving a problem.



## Spatial Skills and Link to Maths Explained

### ■ ■ Mental Rotation

Mental rotation is the ability to use your mind's eye to rotate a shape or object.



In order to match the placement of a brick with the instructional diagram, children must first mentally rotate the brick before placing it.



Mental visualisation and manipulation of information is frequently used to solve maths problems, particularly in geometry.

### ■ ■ Spatial Numerical Associations

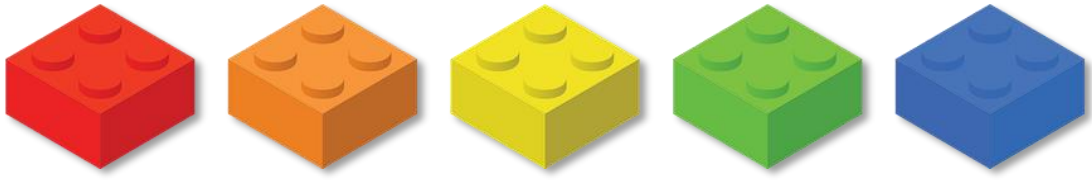
Spatial numerical association relies on spatial representation of numbers, and is the ability to estimate where a number should be placed along a physical or mental number line.



Children might use this skill to estimate the length of bricks and distance between bricks.

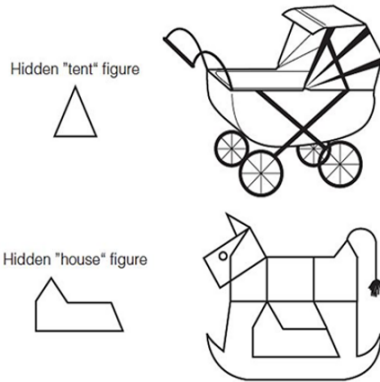


Being able to spatially represent number helps many mathematical activities, such as making judgements about size or proportions, or when estimating lengths.



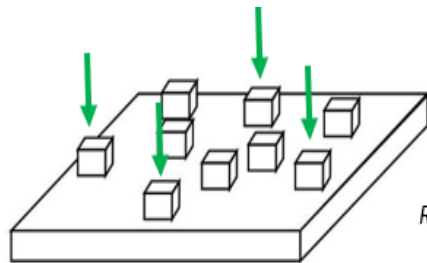
## Spatial Skills and Link to Maths Explained

### Disembedding



Which number is in the tens place?

536,342



### Visuospatial Working Memory

*Remember the sequence and repeat it back!*

### Mental Rotation



**Mental rotation**

$$7 + \_ = 15$$

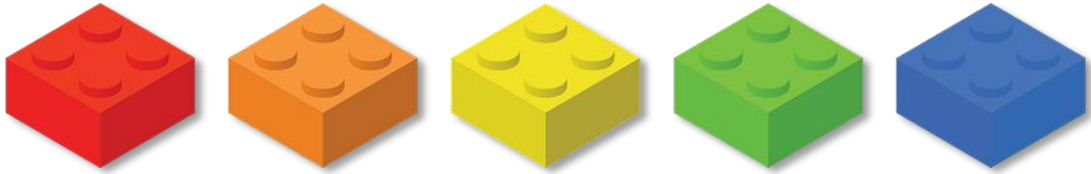
*becomes...*

$$15 - 7 = \_$$

Where is the number 36?

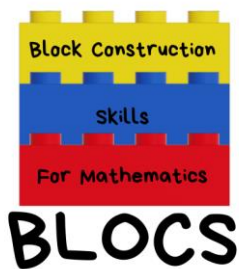
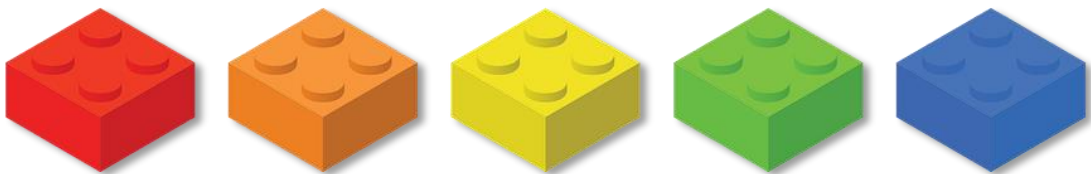


### Spatial Numerical Associations



Thank you for reading about our research.

A special thank you to the children who participated in the BLOCS study, to their parents who signed them up, and to schools for accommodating us.



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