

# Concept Overview: Shape, Space and Measure for 3 -5 year olds



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## Shape Concept Overview: 2-5 years

### Ranges 4 to 6 from the *Birth to 5 Matters* (2021)

**RANGE**  
**4**

#### A Unique Child: what a child might be doing



- Shape**
- Chooses puzzle pieces and tries to fit them in
  - Recognises that two objects have the same shape
  - Makes simple constructions

#### Positive Relationships: what adults might do

- Chat about the shape of the pieces and the holes when fitting pieces into inset puzzles.
- Model comparing two objects to see if they have the same shape in purposeful contexts.
- Suggest choosing a particular shaped item for a purpose.
- Model your thinking when building.

#### Enabling Environments: what adults might provide

- Provide a range of inset and jigsaw puzzles of increasing complexity for children to choose.
- Provide a variety of construction materials including some with identical pieces so that children freely explore *same* and *different*.

**RANGE**  
**5**

#### Shape

- Chooses items based on their shape which are appropriate for the child's purpose
- Responds to both informal language and common shape names
- Shows awareness of shape similarities and differences between objects
- Enjoys partitioning and combining shapes to make new shapes with 2D and 3D shapes
- Attempts to create arches and enclosures when building, using trial and improvement to select blocks

- Help children to choose shapes for a purpose, e.g. a triangular block for a roof and the wedge-shaped block for a ramp.
- Offer an appropriate or inappropriate shape for what you think the child's purpose might be to investigate their thinking.
- As children experience shapes, use informal language (e.g. *slanty, pointy, twisty, wiggly, bumpy*), common shape names (e.g. *cylinder, cone, circle, square*) and "nearly" shapes (e.g. *This is almost a square but it's got curvy corners*). Find out and use equivalent terms for shapes in home languages.
- Discuss how shapes can be partitioned in everyday contexts, e.g. cutting food in different ways.
- Value children's constructions and solutions to problems they have set themselves and talk about how the shapes have combined to make new shapes.

- Provide differently shaped resources to handle, carry, move and explore.
- Provide large and small blocks and boxes for construction both indoors and outdoors.

**RANGE**  
**6**

#### Shape

- Uses informal language and analogies, (e.g. *heart-shaped and hand-shaped leaves*), as well as mathematical terms to describe shapes
- Enjoys composing and decomposing shapes, learning which shapes combine to make other shapes
- Uses own ideas to make models of increasing complexity, selecting blocks needed, solving problems and visualising what they will build

- Encourage children to use the names of shapes and their properties (e.g. *straight, curved, edges*) and prompt them to say what shapes remind them of.
- Discuss different examples of the same shape (e.g. equilateral and right-angled triangles) in a variety of orientations.
- Take opportunities to discuss the shapes that children paint, draw and collage and shapes noticed in their local environment using regular shapes and shapes with no name.
- When acting out their own stories encourage children to make the shapes involved on their own or with others.
- When constructing, sensitively discuss which shapes make other shapes (e.g. triangles making rectangles and hexagons with pattern blocks or mosaic tiles).
- Challenge children to make more complex constructions such as towers of arches, a window or a staircase.

- Provide resources for shape play including unit blocks, pattern blocks, mosaic tiles and jigsaw puzzles with different levels of challenge.
- Teach strategies for solving shape and jigsaw puzzles, describing shape properties and modelling the mathematical vocabulary such as *straight, corner, edges*.
- Play games focussing on the properties of shapes, such as hiding and partially revealing a shape, asking children to say what different shapes it could be or not, and why.

### Key mathematical vocabulary – Shape

<b>Mathematical Language</b>	Exploring patterns, shape and space, sort, make, build, draw Shape, pattern, flat, curved, straight, round Hollow, solid, corner, face, side, edge, end circle, triangle, square, rectangle, star, cube, pyramid, sphere, cone
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## Pattern - Concept Overview: 2-5 years

### Ranges 4 to 6 from the *Birth to 5 Matters* (2021)

	A Unique Child: what a child might be doing	Positive Relationships: what adults might do	Enabling Environments: what adults might provide
<b>RANGE</b> 4	<p><b>Pattern</b></p> <ul style="list-style-type: none"> <li>Joins in and anticipates repeated sound and action patterns</li> <li>Is interested in what happens next using the pattern of everyday routines</li> </ul>	<ul style="list-style-type: none"> <li>Talk with children about the patterns you notice around you.</li> <li>Comment on and help children to recognise the patterns they make in their mark making, loose parts and construction.</li> <li>Draw children's attention to the patterns in their routines by asking what comes next.</li> </ul>	<ul style="list-style-type: none"> <li>Provide a range of natural and everyday materials, as well as blocks and shapes, with which to make patterns.</li> <li>Plan opportunities for children to experience pattern such as percussion, music and action games that involve repeated sounds or actions.</li> </ul>
<b>RANGE</b> 5	<p><b>Pattern</b></p> <ul style="list-style-type: none"> <li>Creates their own spatial patterns showing some organisation or regularity</li> <li>Explores and adds to simple linear patterns of two or three repeating items, e.g. stick, leaf (AB) or stick, leaf, stone (ABC)</li> <li>Joins in with simple patterns in sounds, objects, games and stories dance and movement, predicting what comes next</li> </ul>	<ul style="list-style-type: none"> <li>Whilst playing alongside children, model simple repeating patterns of two or three items and encourage children to create and continue patterns.</li> <li>Demonstrate arranging objects in spatial patterns when building, collaging or playing with loose parts.</li> <li>Draw children's attention to patterns around them including from a range of cultures.</li> <li>When making patterns, help children to solve problems.</li> </ul>	<ul style="list-style-type: none"> <li>Provide a range of items for free exploration of patterning indoors and outdoors including natural materials, pattern blocks, loose parts, mats, trays and strips.</li> <li>Encourage children to join in with body patterns or repeating sections of songs.</li> <li>Pause to encourage prediction when enjoying stories and rhymes with repeating elements, sometimes using props.</li> <li>Emphasise the repeating pattern when turn taking.</li> <li>Provide patterned resources including those representing a range of cultures, such as clothing, fabrics or wrapping paper.</li> </ul>
<b>RANGE</b> 6	<p><b>Pattern</b></p> <ul style="list-style-type: none"> <li>Spots patterns in the environment, beginning to identify the pattern "rule"</li> <li>Chooses familiar objects to create and recreate repeating patterns beyond AB patterns and begins to identify the unit of repeat</li> </ul>	<ul style="list-style-type: none"> <li>Encourage children to notice and appreciate a range of patterns involving repetition and symmetry in the environment, including traditional patterns from a range of cultures.</li> <li>Model using symbols to represent a pattern in other ways (e.g. using a spot/cross/dash pattern of symbols and doing a twirl/jump/glide in response).</li> <li>Make deliberate mistakes when creating patterns alongside children and playfully challenge them to fix the problem.</li> <li>Make border patterns where the repeating pattern continues around an object or frame.</li> </ul>	<ul style="list-style-type: none"> <li>Provide opportunities for printing patterns using a variety of objects.</li> <li>Using photos, challenge children to copy and continue patterns.</li> <li>Invite children to create a pattern with the same structure using different objects (e.g. instead of a red/blue/blue pattern, create a sheep/cow/cow pattern).</li> </ul>

### Pattern and sequence – Key vocabulary

<b>Mathematical Language</b>	<p><b>Time:</b> Morning, afternoon, evening, night Bedtime, dinnertimes, playtime Today, yesterday, tomorrow Before, after, next, last, now, soon, early, late, later, sooner, earlier Takes longer, takes less time</p> <p><b>Patterns and symmetry</b> Size, bigger, larger, smaller Pattern, repeating pattern, match</p>
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## Spatial Awareness- Concept Overview: 2-5 years

### Ranges 4 to 6 from the *Birth to 5 Matters* (2021)

	A Unique Child: what a child might be doing	Positive Relationships: what adults might do	Enabling Environments: what adults might provide
<b>RANGE</b> <b>4</b>	<p><b>Spatial Awareness</b></p> <ul style="list-style-type: none"> <li>• Moves their bodies and toys around objects and explores fitting into spaces</li> <li>• Begins to remember their way around familiar environments</li> <li>• Responds to some spatial and positional language</li> <li>• Explores how things look from different viewpoints including things that are near or far away</li> </ul>	<ul style="list-style-type: none"> <li>• Encourage children to predict what they will see next on a familiar route.</li> <li>• Take everyday opportunities to use words for position and direction accompanied by gesture (e.g. <i>in, on, inside, under, over</i>) using equivalent terms for these in home languages through liaison with families where possible.</li> <li>• Enjoy games involving jumping, running and hiding and make very simple obstacle courses, e.g. <i>going up and down</i>.</li> <li>• Model your thinking when arranging things, using some position words.</li> <li>• Help children to create simple roads and rail tracks and talk about position.</li> <li>• Value children's explorations of spaces and viewpoints and their interest in how things look different.</li> </ul>	<ul style="list-style-type: none"> <li>• Design outdoor spaces where children can learn through a variety of spatial experiences (<i>going under, over, around, on top, through</i>) and hear spatial language in context.</li> <li>• Encourage children to freely communicate their mathematical thinking through gesture, talk and graphical signs.</li> <li>• Plan stimulating indoor and outdoor spaces where children make choices about where to go and create their own routes. Provide materials to create trails.</li> <li>• Provide resources for transporting.</li> </ul>
<b>RANGE</b> <b>5</b>	<p><b>Spatial Awareness</b></p> <ul style="list-style-type: none"> <li>• Responds to and uses language of position and direction</li> <li>• Predicts, moves and rotates objects to fit the space or create the shape they would like</li> </ul>	<ul style="list-style-type: none"> <li>• When children are exploring, use the language of position and direction in context (<i>in, on, inside, under, over</i>, progressing to <i>between, beside, next to, through, along</i>, including relative terms which depend on where you are, e.g. <i>behind, in front of, forwards, backwards</i>) using equivalent terms for these in home languages through liaison with families where possible.</li> <li>• On walks, in pictures or while playing, point out how things or people that are far away look smaller.</li> <li>• Support children in their problem solving when they are creating rail tracks and road layouts.</li> <li>• In block play, sensitively support and challenge experienced builders to make bridges and enclosures.</li> <li>• Encourage children to persevere with jigsaws, perhaps demonstrating "hovering" jigsaw pieces to check if they will fit.</li> </ul>	<ul style="list-style-type: none"> <li>• Provide spaces to display children's ongoing mathematical thinking, e.g. their own ways of representing their thinking and scribing children's words.</li> <li>• Provide opportunities for children to explore position themselves <i>inside, behind, on top</i> and so on.</li> <li>• Provide picture books to stimulate discussion about position and direction.</li> <li>• Create trails and treasure hunts with the children.</li> <li>• Organise the indoor and outdoor environment with outlines for objects or specific places for children to tidy up items by fitting them into the designated space.</li> </ul>
<b>RANGE</b> <b>6</b>	<p><b>Spatial Awareness</b></p> <ul style="list-style-type: none"> <li>• Uses spatial language, including following and giving directions, using relative terms and describing what they see from different viewpoints</li> <li>• Investigates turning and flipping objects in order to make shapes fit and create models; predicting and visualising how they will look (spatial reasoning)</li> <li>• May enjoy making simple maps of familiar and imaginative environments, with landmarks</li> </ul>	<ul style="list-style-type: none"> <li>• Encourage the use of relative terms (<i>in front of, behind, before and after, in a line, next to and between</i>).</li> <li>• Encourage children to explore what can be seen from different viewpoints.</li> <li>• Encourage children to describe position and give directions in play and in everyday routines.</li> <li>• Encourage children to create scaled-down models such as in small world play.</li> <li>• When children are fitting shapes into an outline or making a model from a 2D picture, help them to select more spatially challenging activities.</li> <li>• Encourage children to make maps of routes they have walked or travelled in some way.</li> </ul>	<ul style="list-style-type: none"> <li>• Play barrier games (where players have an identical set of objects which are hidden from each other; one player makes an arrangement of objects and gives instructions to the other to try to make the same arrangement).</li> <li>• Plan opportunities for children to describe and recall familiar routes.</li> <li>• Engage families in taking photos of familiar things from different viewpoints.</li> </ul>

# Spatial Reasoning

Spatial reasoning is how we understand how things (including ourselves) move and interact in relation to the physical space around them. It's a crucial skill for children to learn and can be used as a predicted indicator of children's future mathematical learning.

## What are the key elements of spatial reasoning?

The five core aspects of spatial reasoning include:

- **Understanding relationships** (how things fit together and how moving parts work)
- **Language** (hearing, describing, giving directions and understanding position)
- **Spatial memory** (remembering where things are)
- **A sense of direction** (noticing where you are going and finding your way back)
- **Spatial representations** (creating mental images, understanding perspective and movements, reading models and diagrams). (Williams, 2020)

Williams, Helen (2020) *What Is Spatial Reasoning in Early Maths and Why Is It Important?*

<https://www.famly.co/blog/helen-williams-spatial-reasoning>

## Space

To develop their knowledge of spatial relationships, children need:

- Opportunities to observe places and things from different places and viewpoints.
- Explore how things work and how objects fit together.
- Experiences to find out how their body coordinates and uses space and balance.

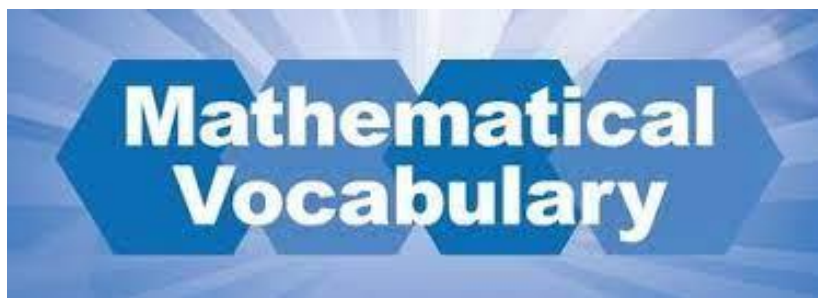
## Key Vocabulary

<b>Mathematical Language</b>	<b>Position, direction and movement</b> Position, over, under, above, below, top, bottom, side, on, in, outside, inside Around, in front, behind, front, back, before, after, beside, next to, opposite, apart, between Middle, edge, corner, direction Left, right, up, down, forwards, backwards, sideways, across, next to, close, far along, to, from, towards, away from Movement, slide, roll, turn, stretch, bend  <b>Everyday language of distance</b> Near, nearer, nearest, far, far away Nearby, long way, close, next to  <b>Patterns and symmetry</b> Size, bigger, larger, smaller Pattern, repeating pattern, match
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## Measure

### Key Mathematical Language

<p><b>Mathematical Language</b></p> <p><b>Measures, shape and space</b></p> <p>Measures Measure, size Guess, estimate enough, not enough too much, too little, too many nearly, about the same as, just over, just under</p> <p><b>Capacity</b></p> <p>Full, half full, empty, holds, container</p> <p><b>Mass</b></p> <p>Weigh, weighs, balances Heavy/light, heavier/lighter, heaviest/lightest Height, balance, scales</p> <p><b>Time</b></p> <p>Days of the week: Monday, Tuesday, Wednesday.... day, week Birthday, holiday, morning, afternoon, evening, night Bedtime, dinnertimes, playtime Today, yesterday, tomorrow Before, after. Next, last, now, soon, early, late, later, sooner, earlier Quick, quicker, quickest, quickly Slow, slower, slowest, slowly Old, older, oldest, new, newer, newest Takes longer, takes less time Hour, o'clock, clock, watch, hands</p>	<p>Length</p> <p>length, width, height, depth, long, short, tall high, low, wide, narrow, deep, shallow, thick, thin longer, longer than, short, shorter, taller, higher...and so on longest, shortest, tallest, highest ...and so on</p> <p>Problems involving 'real life' and money Compare, double Half, halve, pair Count out, share out, left, left over Money, coin, penny, pence, pound Price, cost, buy, sell Spend, spent, pay, change Cost more, cost less, costs the same as How much... How many... Total</p> <p>Everyday language of distance Near, nearer, nearest Far, far away Nearby Long way Close Next to</p>
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## Measure - Concept Overview: 2-5 years

### Ranges 4 to 6 from the *Birth to 5 Matters* (2021)

#### A Unique Child: what a child might be doing

#### Positive Relationships: what adults might do

#### Enabling Environments: what adults might provide

#### RANGE 4

##### Measures

- Explores differences in size, length, weight and capacity
- Beginning to understand some talk about immediate past and future
- Beginning to anticipate times of the day such as mealtimes or home time

- Use everyday opportunities to describe everyday items and contexts using informal language of size (*giant, teeny, big, little, huge, small*), length (*long, tall, short*), weight (*heavy, light*) and capacity (*full, empty*).
- Observe children's problem-solving when ordering things by size, e.g. stacking cups, sensitively supporting by offering one if they are really struggling.
- Look out for opportunities to compare things purposefully such as finding out whether a teddy will fit in a bed.
- When children talk about their experiences at home and in the setting, use some language of time (*before, later, soon, next, after, morning, afternoon, evening, night-time*).
- In everyday activities, make a commentary about the sequence of events.
- When sharing stories and books, draw attention to routines and time sequences within them.

- Provide similar items of contrasting sizes so that children have many opportunities to encounter the language of size.
- Provide resources with clearly different weights to support direct comparison, and something to carry them in.
- Provide equipment with varied capacities and shapes in the sand, water, mud kitchen and role play areas.

#### RANGE 5

##### Measures

- In meaningful contexts, finds the longer or shorter, heavier or lighter and more/less full of two items
- Recalls a sequence of events in everyday life and stories

- During play, model comparing lengths and distances.
- Look out for meaningful opportunities for children to compare by length, weight, capacity and time using comparative language (*longer/shorter, heavier/lighter, holds more/holds less, longer time/shorter time*).
- Encourage children to participate in seesaw and balance scale play.
- Encourage children to respond to and use words such as *before, after, soon or later* when talking about routines, recent events and events in a story or rhyme.

- Provide problem-solving opportunities indoors and outdoors for comparing length, weight and capacity, e.g. *Which is the best bottle so we'll have enough drink for everyone at the picnic?*
- Ask children to predict *What happens next?* using visual timetables, books and stories.
- Provide items that can be ordered by size, such as plates and clothes in role play.

#### RANGE 6

##### Measures

- Enjoys tackling problems involving prediction and discussion of comparisons of length, weight or capacity, paying attention to fairness and accuracy
- Becomes familiar with measuring tools in everyday experiences and play
- Is increasingly able to order and sequence events using everyday language related to time
- Beginning to experience measuring time with timers and calendars

- When comparing the length, weight and capacity of things in play and everyday activities, encourage children to predict and give reasons.
- Discuss accuracy, for instance matching ends or starting points, balancing exactly or "fullness".
- Support timed challenges by timing runs, trails, obstacle courses, etc. and teach children how to use the stopwatch.
- Discuss the order and sequence of events in routines and role play using the language of time (*first, then, after, before, next, sooner, later*).
- Draw children's attention to visual timetables and clock times, focusing on the hour hand.

- Have areas where children can explore the properties of objects, compare lengths, weigh and measure.
- Provide objects in a range of contexts varying in length, capacity or weight, including tall thin, short fat, large light and small heavy things.
- Provide pictorial sequences for instructions.
- Model using measuring tools including height charts, rulers, tape-measures, scales and timers.
- Sing songs about the days of the week and months of the year, referring to a calendar. Countdown to events.

Measuring is a practical area of mathematics that must be learnt through hands-on, meaningful experiences. Children should be given opportunities to compare and discuss:

- **length** (is this person or thing taller/shorter/longer than that one?)
- **weight** or mass (is this person or thing heavier/lighter than that one?)
- **capacity** (does this container hold more/less than that one?)
- **time** (does this event take a shorter/longer time than that one?)