

Summer Block 3

**Manipulate,
compose and
decompose**

Teacher guidance



Key books

- *Big Box of Shapes* by Wiley Blevins
- *Which One Doesn't Belong?* by Christopher Danielson
- *Mr Gumpy's Motor Car* by John Burningham
- *Tangram Cat* by Maranke Rinck and Martijn van der Linden
- *Three Pigs, One Wolf, and Seven Magic Shapes* by Grace Maccarone
- *Mouse Shapes* by Ellen Stoll Walsh
- *Pezzettino* by Leo Lionni
- *Jack and the Flumflum Tree* by Julia Donaldson
- *Perfect Square* by Michael Hall
- *Grandpa's Quilt* by Betsy Franco
- *Color Zoo* by Lois Ehlert
- *Cubes, Cones, Cylinders, & Spheres* by Tana Hoban
- *Boxitects* by Kim Smith

Key resources



Small steps

Step 1

Select shapes for a purpose

Step 2

Rotate shapes

Step 3

Manipulate shapes

Step 4

Explain shape arrangements

Step 5

Compose shapes

Step 6

Decompose shapes

Step 7

Copy 2-D shape pictures

Step 8

Find 2-D shapes within 3-D shapes

Select shapes for a purpose

Notes and guidance

Children have already had experience of selecting shapes for a purpose when using 3-D shapes for tasks. In this small step, this learning is extended to further exploring the properties of shapes and spatial relations.

Provide opportunities for children to explore the attributes of shapes and to select shapes for a particular purpose. Encourage them to explain why they chose a particular shape and why other shapes would not be suitable.

Prompt children to explore using pattern block shapes and encourage them to fill templates or make their own pictures. Children could also explore selecting shapes for a purpose outside by using large-scale construction to build large models such as vehicles or dens.



Books

- *Big Box of Shapes* by Wiley Blevins
- *Which One Doesn't Belong?* by Christopher Danielson
- *Mr Gumpy's Motor Car* by John Burningham

Key questions

- Which shapes will you need?
- Why have you chosen a _____?

Possible sentence stems

- I have chosen a _____ because _____.
- This one doesn't belong because _____.
- I need a _____ to complete my picture.

Links to the curriculum

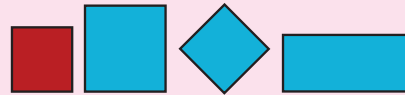
- *Development Matters* – Reception – Select, rotate and manipulate shapes to develop spatial reasoning skills.
- *Birth to 5 Matters* – Range 5
 - Chooses items based on their shape which are appropriate for the child's purpose
 - Responds to both informal language and common shape names
 - Shows awareness of shape similarities and differences between objects

Select shapes for a purpose

Adult-led learning



After reading books such as *Which One Doesn't Belong?* by Christopher Danielson with children, provide them with a range of shapes that could be used in a similar way to those in the book. Select the shapes so that there is a reason why each one of them doesn't belong.

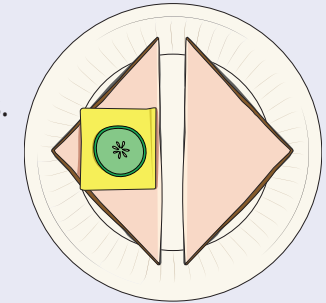


Ask children which one doesn't belong and encourage them to explain their reason why.

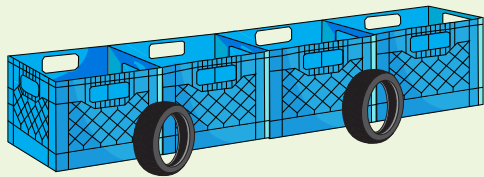


Provide children with real food or pre-cut paper shapes to represent sandwich ingredients, such as brown triangles for bread, yellow squares for cheese slices, green circles for cucumber slices and red circles for tomato slices.

Prompt children to design and make their own sandwich, explaining why they have chosen each of the shapes and placed them in that order.



After reading books such as *Mr Gumpy's Motor Car* by John Burningham, encourage children to make arrangements outside, such as a car, using a variety of resources.



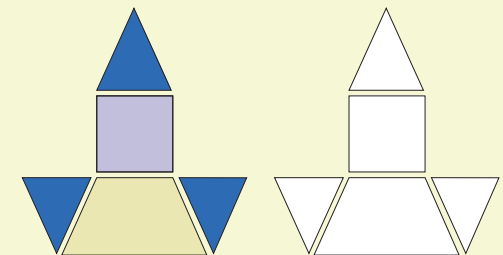
Prompt them to talk about which shapes to select and where to place them in relation to the other shapes.



Provide children with pattern blocks and encourage them to design their own picture.

Prompt them to create a template to help them to remember their design.

They could then ask a partner to use the template to recreate their picture.



Rotate shapes

Notes and guidance

In this small step, children will explore how shapes will appear when rotated. A key thing to look out for is that children may not recognise a shape when its orientation changes. For example, children often do not recognise triangles and squares when they have been rotated.

Rotating shapes is an important step, as it will help to support children to visualise how shapes and objects will fit together in later steps.

Provide opportunities for children to select and rotate shapes to fill a given space. Using jigsaws, number shape baseboards and pattern block templates can help to support this.

Prompt children to notice that some jigsaw pieces are corner pieces and that some have straight edges. They may also notice that the pieces have 'sticky-out bits' or holes. Encourage children to notice how the pieces fit together or why certain pieces will not fit together.



Books

- *Which One Doesn't Belong?* by Christopher Danielson

Key questions

- Which shape will match?
- What shapes have you used to make your picture?
- How did you make the shape fit?
- How did you manipulate the shape to make it fit?

Possible sentence stems

- This shape is a _____.
- I need to _____ the shape to make it fit.
- I need a _____ to complete my picture.
- This will not fit because _____.

Links to the curriculum

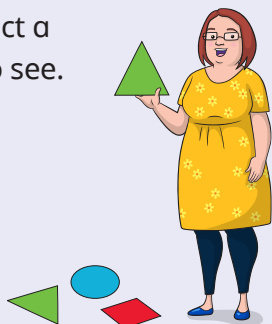
- *Development Matters* – Reception – Select, rotate and manipulate shapes to develop spatial reasoning skills.
- *Birth to 5 Matters* – Range 6 – Investigates turning and flipping objects in order to make shapes fit and create models; predicting and visualising how they will look (spatial reasoning)

Rotate shapes

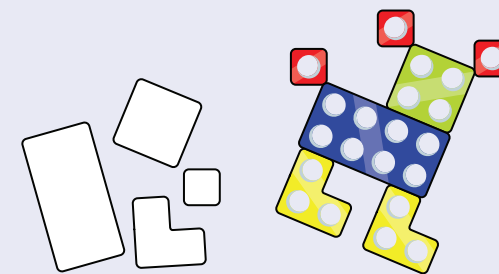
Adult-led learning

Provide children with a set of shapes. Select a shape and hold it up for all the children to see. Ask them to find the shape that matches yours.

This can be adapted by making the shapes more similar and changing the orientations.



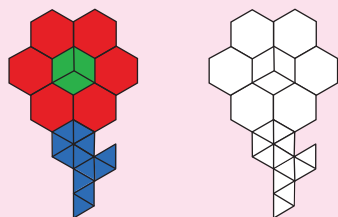
Provide children with number shapes and outlines of the number shapes in different orientations. Ask them to select shapes to match each outline.



Provide baseboard overlays or number shape outlines and encourage children to use positional language as they build.



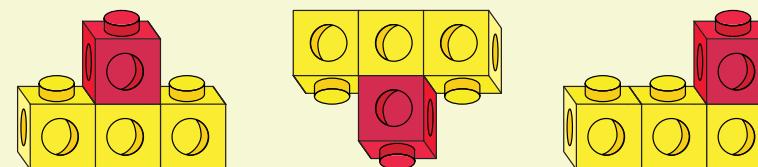
Provide children with pattern blocks or similar shapes, along with coloured picture templates for them to match. The children can progress from matching shapes with coloured pictures to pictures with outlines only.



Encourage children to look carefully and select the correct shapes. These may need to be rotated to fit in the outline.



Give children instructions to visualise a 3-D model without using equipment. For example, "Join three yellow cubes together in a line, place a red cube on top of the middle yellow cube. Then flip your model upside down." Show children three possible models and ask them which matches the model they visualised.



Manipulate shapes

Notes and guidance

In this small step, children build on the learning from previous steps by now manipulating shapes. Children will explore moving, turning, rotating and flipping shapes to fit into the spaces provided. Continuing to enhance provision with pattern block templates and number shape baseboards will support children to manipulate shapes.

As with rotating shapes, provide opportunities for children to see shapes in a variety of orientations and positions, so they learn that the same shape can look different. Shape sorters can support with this, as they encourage children to turn, rotate and flip shapes.

In this small step, tangram pieces are introduced for the first time. Allow some time for children to explore the tangram shapes in open-ended activities before moving on to using these in adult-led tasks.

Key questions

- Which shapes will you need to use?
- How have you moved the shape/shapes?
- How have you made your picture?
- How would you describe your picture?

Possible sentence stems

- I have chosen a _____ because _____.
- I need a _____ to complete my picture.
- I need to _____ my shape to make it fit.

Links to the curriculum

- *Development Matters* – Reception – Select, rotate and manipulate shapes to develop spatial reasoning skills.
- *Birth to 5 Matters* – Range 6 – Investigates turning and flipping objects in order to make shapes fit and create models; predicting and visualising how they will look (spatial reasoning)



Books

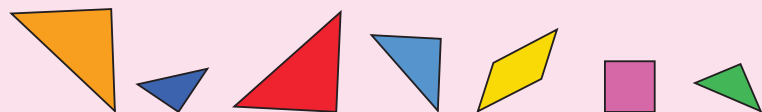
- *Tangram Cat* by Maranke Rinck and Martijn van der Linden
- *Three Pigs, One Wolf, and Seven Magic Shapes* by Grace Maccarone

Manipulate shapes

Adult-led learning

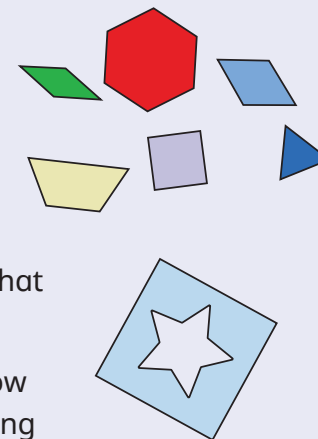


After reading stories such as *Tangram Cat* by Maranke Rinck and Martijn van der Linden, provide children with tangram pieces and encourage them to explore the different shapes.



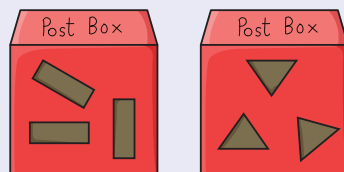
Once children are familiar with them, provide templates with the outlines of different pictures. Prompt them to manipulate the shapes to complete the picture.

Provide children with a set of pattern blocks or similar shapes. Cut out a star template. Encourage children to find different ways to build a star. How many different shapes have they used? Prompt them to talk about the shapes they choose and what they notice.



Encourage children to investigate how many ways they can build a star using the same shape.

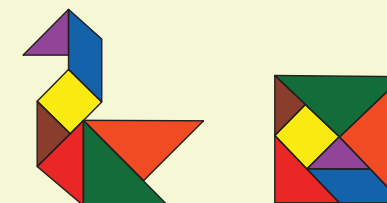
Use junk modelling boxes to make a range of postboxes with different-shaped openings, ensuring that there are three different orientations on each box.



Provide children with a range of shapes which will fit inside the openings of the box. Prompt them to manipulate the shapes to fit inside the postbox.



Provide children with a set of tangrams and prompt them to rotate and manipulate the shapes to make their own arrangements and pictures.



Can a partner guess what they have created? Encourage them to challenge their partner to recreate what they have made using their own pattern blocks.

Explain shape arrangements

Notes and guidance

In this small step, children use their previous knowledge of positional language and now progress to explaining more complex shape arrangements. Provide opportunities for children to match arrangements of shapes, prompting them to use positional language to describe where the shapes are in relation to one another.

In play, prompt children to describe the position of shapes, building blocks or small-world characters. This could also be done on a large scale outside when building and following obstacle courses.

Encourage children to play barrier games where two children sit opposite each other with a barrier in between them. A piece of cardboard or a book make good barriers. When playing the game, one child gives instructions to their partner for them to make the same arrangement as them. First, begin without a barrier, then progress to using a barrier but give quick peeks. Finally, extend to leaving the barrier in place so that children must rely on verbal instructions to copy the shape arrangements.



Books

- *Mouse Shapes* by Ellen Stoll Walsh

Key questions

- How are the shapes arranged?
- Which shapes have you used?
- How can you explain your model?

Possible sentence stems

- The _____ is next to the _____.
- The _____ is in front of the _____.
- The _____ is behind the _____.
- Move around the _____.
- Move under/over the _____.

Links to the curriculum

- *Development Matters* – Reception – Select, rotate and manipulate shapes to develop spatial reasoning skills.
- *Birth to 5 Matters* – Range 6 – Uses informal language and analogies, (e.g. *heart-shaped and hand-shaped leaves*), as well as mathematical terms to describe shapes

Explain shape arrangements

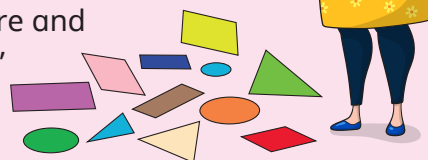
Adult-led learning



'Accidentally' drop a range of shapes onto the floor. See how they land.

Prompt children to explain where the shapes are in relation to each other.

Ask questions such as, "Can you find a square and describe its position?"



Provide children with a range of large outdoor construction equipment. Discuss how these could be used to develop an obstacle course for their peers.

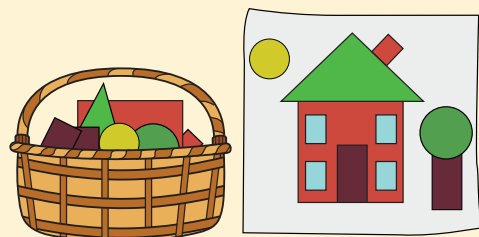


Ask children to construct an obstacle course. As they create it, encourage them to explain to a partner how the obstacles are arranged and talk to them about how to move around the course.



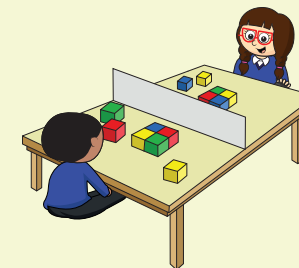
Read stories such as *Mouse Shapes* by Ellen Stoll Walsh with children. Provide a range of gummed paper or pre-cut felt shapes and prompt children to create arrangements.

Talk to children about where the different shapes are positioned in relation to each other.



Play a barrier game with children in an area of provision such as the construction area. Ensure that you and the child have identical objects before placing a barrier between you both. Arrange the objects and describe the arrangement to the child. Prompt them to create an identical arrangement.

This could be developed by encouraging children to describe arrangements to each other.



Compose shapes

Notes and guidance

In this small step, children understand that shapes can be combined to make new shapes. Provide opportunities for children to fit shapes together using resources such as pre-cut gummed shapes, pattern blocks and number rods. Encourage children to investigate how many different ways a given shape can be made using smaller shapes.

At first, support children by providing them with certain shapes to use, for example, only the correct shapes that they will need. Then progress to providing them with a larger selection of shapes so that children must decide which to use. Also, they can explore combining a given set of shapes in a variety of ways to make different shapes.

Exploring illustrations of how shapes have been combined to make new shapes in books can support children's understanding in this step and provide meaningful contexts for composing shapes.



Books

- *Pezzettino* by Leo Lionni
- *Jack and the Flumflum Tree* by Julia Donaldson

Key questions

- How are the shapes arranged?
- Which shapes have you used?
- What shape have you made?
- How many shapes did you use?
- Can you make a shape in a different way?

Possible sentence stems

- I used _____ shapes to make a _____.
- To make the smallest/largest _____, I used _____ pieces.

Links to the curriculum

- *Development Matters* – Reception – Compose and decompose shapes so that children recognise a shape can have other shapes *within* it, just as numbers can.
- *Birth to 5 Matters* – Range 6 – Enjoys composing and decomposing shapes, learning which shapes combine to make other shapes

Compose shapes

Adult-led learning

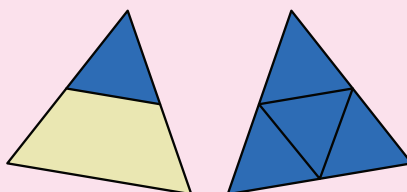


After reading books such as *Pezzettino* by Leo Lionni, leave the books out for children to look at independently. Provide a range of squares and triangles and encourage children to use them to make new shapes. Ask questions such as, “Which shapes have you used? How many squares did you need? How many triangles did you need?”



Provide a set of pattern blocks or similar shapes and challenge children to build as many different triangles as they can.

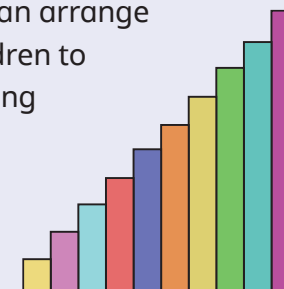
Who can build the largest triangle? Who can build a triangle with two, three or four pieces?



Prompt children to explore and discuss the different ways they can find to build the same-sized triangle. To support with this activity, provide templates or give children the correct number of pieces needed to make a triangle.

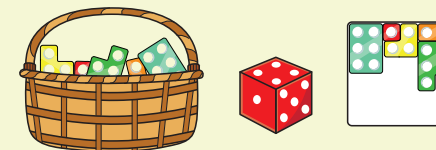
Provide children with a set of number rods. Encourage them to see how many different ways they can arrange the rods to build a square. Prompt children to make another square the same size using different rods.

How do they know they are square? What do they notice about the rods as they build?



Give children a set of number shapes and an outline of a 6 by 6 square. Each side of the square should be the same length as two number 6 pieces placed together end-to-end.

Working in pairs or small groups, prompt children to take turns to roll a dice, select the corresponding number shape and place this on their square. The winner is the first player to fill their square exactly.



Decompose shapes

Notes and guidance

In this small step, children explore identifying shapes within shapes.

Children understand that shapes can be separated to make new shapes. Provide children with paper or gummed shapes and encourage them to fold or cut them; for example, by folding a rectangle to make two squares or cutting a square to make two triangles.

Exploring how shapes are decomposed in books can provide meaningful contexts for identifying shapes within shapes. After reading these books together, encourage children to decompose shapes in similar ways in provision.

Once children have explored decomposing shapes in open-ended activities, ask them to predict what new shapes they can make by folding or cutting. Prompt children to talk about which shapes they will see or predict what will happen if they fold the shape in half.



Books

- *Perfect Square* by Michael Hall
- *Grandpa's Quilt* by Betsy Franco

Key questions

- How are the shapes arranged?
- Which shapes did you need to rotate?
- Which shapes did you separate?
- What is your new shape?
- What are your new shapes?
- What happens when you fold your shape?

Possible sentence stems

- I can make a _____ using ...
- I used a _____ to make ...

Links to the curriculum

- *Development Matters* – Reception – Compose and decompose shapes so that children recognise a shape can have other shapes *within* it, just as numbers can.
- *Birth to 5 Matters* – Range 6 – Enjoys composing and decomposing shapes, learning which shapes combine to make other shapes

Decompose shapes

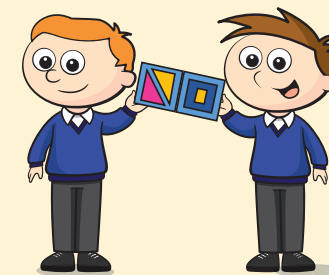
Adult-led learning



After reading books such as *Perfect Square* by Michael Hall, provide children with a square-shaped piece of paper. Ask them what they could make from a square. Encourage children to rip or cut the square and use it to create something new.



Read books such as *Grandpa's Quilt* by Betsy Franco. Prompt children to design one square for their own class quilt. Put all the individual squares together and discuss the designs children have made.



Encourage children to arrange the squares to make a long, thin rectangle or a short, fat rectangle.



Show children two identical right-angled triangles which have been made by cutting a rectangle in half diagonally. How many new shapes can they make by fitting the triangles together? Can they make shapes with three sides or with four sides?

Encourage children to return the two triangles back into a rectangular shape before investigating further.



To develop this activity, provide children with four identical right-angled triangles.



Provide children with a photocopy of their favourite picture or book cover. Prompt children to cut up the picture or book cover and give it to a partner to put back together.



How have you cut up your picture? How many pieces do you have? Is it easier to complete a jigsaw with more or fewer pieces?

Copy 2-D shape pictures

Notes and guidance

Children will already have had some experience of making shape pictures in previous blocks. In this small step, children will build on this prior learning and will progress to copying more complex 2-D shape pictures. They will use learning from earlier steps in this block, such as rotating, manipulating and composing shapes to help them when copying shape pictures.

Prompt children to talk about the properties of the 2-D shapes they use as they make their pictures and encourage them to use shape vocabulary to explain why they have used the shapes in that way.

Encourage children to explore shape pictures in books and prompt them to copy the pictures using pre-cut gummed shapes. Focus on more complex shape pictures that include more shapes and also include shapes in different orientations.



Books

- *Color Zoo* by Lois Ehlert
- *Mouse Shapes* by Ellen Stoll Walsh

Key questions

- How are the shapes arranged?
- Which shapes can you see?
- Which shapes can you see inside other shapes?
- Why have you used those shapes?
- How have you moved your shape to match the picture?
- How is the shape positioned?

Possible sentence stems

- I can see _____.
- I have made a _____ using ...

Links to the curriculum

- *Development Matters* – Reception – Select, rotate and manipulate shapes to develop spatial reasoning skills.
- *Birth to 5 Matters* – Range 6 – Investigates turning and flipping objects in order to make shapes fit and create models; predicting and visualising how they will look (spatial reasoning)

Copy 2-D shape pictures

Adult-led learning



After reading books such as *Mouse Shapes* by Ellen Stoll Walsh with children, revisit the later pages of the book where there are examples of more complex shape pictures. Provide children with pre-cut gummed or felt shapes and encourage them to copy pictures such as a robot or car.

Ask children to describe their pictures, focusing on the shapes used and their position.

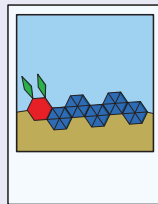
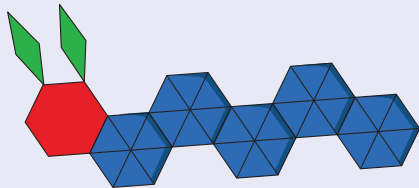


Provide a variety of complex shape pictures, such as a street scene or farm scene. Prompt children to talk about the shapes they can see and the positions they are in.

Encourage children to copy the pictures with their own shapes.



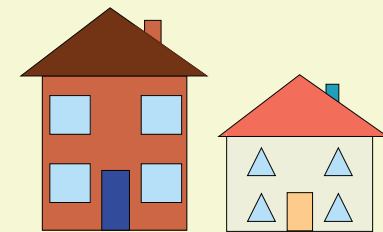
Provide children with resources, such as pattern blocks, to make their own shape pictures. Either photograph or photocopy the pictures they make and then give them to other children for them to replicate.



Ask children to talk about the shapes they used. Does it look the same as the picture? Encourage children to give reasons as to why it is the same or different.



Show children two shape pictures where some of the features are the same and some are different. Encourage children to reason and explain what the similarities and differences are.



To extend this, prompt them to design their own pictures in a similar way. Children can then discuss the similarities and differences with a partner.

Find 2-D shapes within 3-D shapes

Notes and guidance

Children will have experience of finding 2-D shapes within 3-D shapes from earlier blocks. In this small step, this learning is built on and children are encouraged to notice 2-D shapes within 3-D shapes in a range of contexts. Encourage children to make a range of constructions, using skills from the previous steps in this block to rotate, manipulate and explain shape arrangements.

When building, prompt children to talk about why they have chosen each shape or object, particularly focusing on the 2-D shapes within the 3-D shapes and why this makes it suitable for their construction.

As a class, explore books that use 3-D shapes and encourage children to notice where they can see 2-D shapes on the faces of the 3-D objects. Children can then build structures in a similar way to the books. Encourage them to talk about the shape properties as they build.



Books

- *Cubes, Cones, Cylinders, & Spheres* by Tana Hoban
- *Boxitects* by Kim Smith

Key questions

- What shapes can you see?
- Where can you see a _____?
- Why have you chosen that shape?
- Is that the best 3-D shape to use?

Possible sentence stems

- I can see a _____ within a _____.
- I can see a _____ in the _____.
- I know it is a _____ because it has a _____.
- I can feel that this shape is a _____ because...

Links to the curriculum

- *Development Matters* – Reception – Compose and decompose shapes so that children recognise a shape can have other shapes *within* it, just as numbers can.
- *Birth to 5 Matters* – Range 6 – Enjoys composing and decomposing shapes, learning which shapes combine to make other shapes

Find 2-D shapes within 3-D shapes

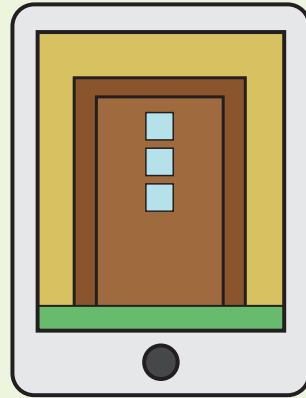
Adult-led learning



Read books such as *Cubes, Cones, Cylinders, & Spheres* by Tana Hoban and encourage children to notice 2-D shapes on the faces of 3-D shapes.

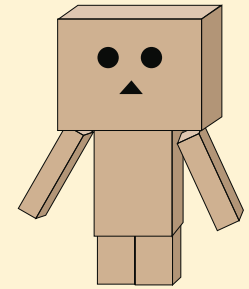
Go on a shape hunt to look for and identify 2-D shapes within 3-D objects.

Take pictures of the shapes children find and collate them into a class book.



After reading stories such as *Boxitects* by Kim Smith, place the books in the construction area for children to refer back to. Encourage them to construct their own 3-D models and discuss where they can see 2-D shapes.

To extend this, children could ask a partner to identify where they see 2-D shapes on the faces of their model.



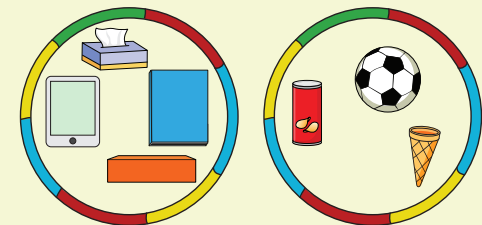
Create a feely box or bag with a variety of 3-D shapes inside.

Encourage children to feel inside the box or bag and identify the shapes they can feel.

Prompt children to say out loud what they can feel by using the language relating to 2-D shapes.

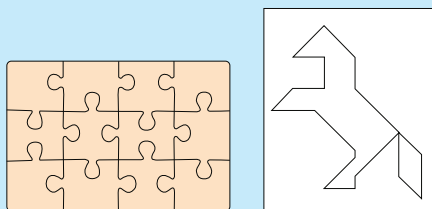
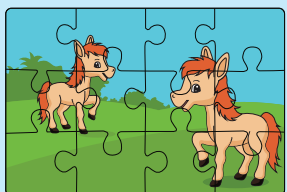


Sit children in a circle around two hoops and provide a range of 3-D shapes, including real-life objects. Pick a child to create a rule and then sort the shapes using this rule. For example, the rule could be all the shapes that have a rectangular face go in one hoop and those that don't go in the other.



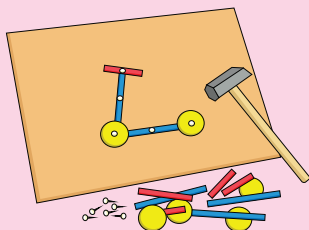
Continuous provision

Enhance provision with a range of jigsaws as well as pattern block and tangram templates. Encourage children to talk about how they are turning, rotating and flipping each piece as they complete the jigsaws and templates.

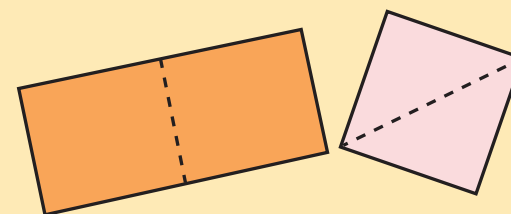


Children could begin by completing templates where all the individual pieces are clearly shown and then they can progress on to templates that just show the outline.

Provide children with hammer and nail shape boards. Encourage them to use these to copy shape pictures, or they could create their own pictures for a partner to copy.



Provide pre-cut paper rectangles, squares and triangles. Encourage children to explore what new shapes they can make by folding or cutting the paper. Prompt them to predict what the new shapes will be and then ask them to investigate to check.



Children could then make 2-D shape pictures with the new shapes they have made.

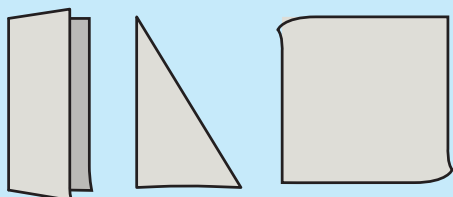
Enhance the construction area with real-life 3-D objects, such as crisp tubes and cereal boxes. Encourage children to talk about the 2-D shapes they can see within the 3-D shapes as they build.



End of block checkpoint

Checkpoint 1

Provide children with pre-cut paper shapes that they can fold to make new shapes. In pairs, one child folds a shape and their partner has to predict what the new shape will be after folding.

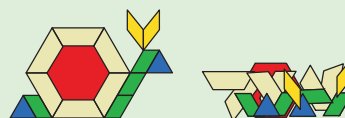


Can children correctly predict what new shapes will be made once the paper is folded?



Checkpoint 2

Encourage children to complete pattern block templates. These templates could be coloured, or to extend this further, provide children with black and white templates where they can see only the outlines of the shapes.



Can they select the correct shapes and rotate them to fit on the template?

Checkpoint 3

Provide children with a range of pre-cut gummed shapes or felt shapes to make their own shape pictures with. Can they talk about why they are choosing each shape and what it is going to represent on their shape picture?

