G2

NumberSense

COMPANION

MEASUREMENT, GEOMETRY AND DATA HANDLING

English

Teacher Guide

ABOUT THE NUMBERSENSE COMPANION TEACHER GUIDE FOR FOUNDATION PHASE

The NumberSense Mathematics Programme consists of the NumberSense Workbooks, the NumberSense Companion Series and a range of resources to support the effective learning of mathematics from Grade R to Grade 7. The NumberSense Workbooks address the Number and Pattern components of the curriculum while the NumberSense Companion Series deals with Measurement, Space and Shape (Geometry) and Data Handling.

There are two NumberSense Workbooks for Grade R. Grade R teachers are expected to mediate the activities in the workbooks with the children. There are 12 workbooks altogether for Grade 1 to Grade 3 with four workbooks for each grade. This requires that a page be done each day for a workbook to be completed each term. In the Foundation Phase, the workbooks are used to consolidate the daily mat work sessions.

There are also 12 workbooks for Grade 4 to Grade 7 with three to four workbooks per year. Children complete pages in the workbooks in preparation for the focus group sessions with the teacher.

The NumberSense Companion Teacher Guides for Grades R to 3 describe classroom-based activities for developing Measurement, Space and Shape (Geometry) and Data Handling. The activities in the NumberSense Companion Teacher Guides for Grades R to 3 assume that teachers also have the NumberSense Activity cards and the corresponding range of resources.

In Grades 4 to 7, the NumberSense Companion Workbooks provide learning materials for the children while the Teacher Guides for the Grade 4 to 7 NumberSense Companion Workbooks provide page by page support (including answers) for teachers.

The Foundation Phase NumberSense Companion Teacher Guide

The NumberSense Companion Teacher Guide for the Foundation Phase has been designed to support teachers in creating learning opportunities for children to develop geometric and spatial reasoning, measuring skills and the ability to critically analyse data.

The Teacher Guide assumes that teachers have a number of resources, in particular the activity cards that are available individually or as a set in the NumberSense Companion Activity Kit.

This Teacher Guide is a first draft that will continually be updated and teachers are encouraged to visit the NumberSense website (www.NumberSense.co.za) frequently to ensure that they have the latest version. While the Teacher Guide remains under development, teachers can download the various drafts at no charge from www.NumberSense.co.za.

Children can engage with most of the activities described in this Teacher Guide independent of the teacher. The role of the teacher is to reflect on each activity with the children to ensure that learning takes place.

RECOMMENDED PACING OF ACTIVITIES IN GRADE 2:

Approximate Time (mins)	Activity
TERM 1	
30	Tangram Puzzle Activity Cards 5 to 8
20	Mosaic Puzzle Activity Cards 5 to 8
200	Attribute Block Activity Cards 1 to 29
50	Geoboard Activity Cards 7 to 9
60	GeoGenius Construction Kit Activity Cards 1 and 2
160	Time Activities 1 to 5 (Sequencing daily routines, Sequencing according to morning, afternoon and evening, Duration, Matching analogue, digital and written time and Telling the time)
75	Three length activities
75	Three mass activities
75	Three capacity activities
75	Three sorting activities
50	Two opinion poll activities
25	One ongoing data collection activity
TERM 2	
40	Mosaic Puzzle Activity Cards 9 to 13
110	Attribute Block Activity Cards 30 to 40
50	Connecting Cube Activity Cards 2 and 5 to 8
60	GeoGenius Construction Kit Activity Cards 3 and 4
75	GeoGenius Visualisation Kit Beginner_1 Card Sets 1 to 6
160	Time Activities 1 to 5 (Sequencing daily routines, Sequencing according to morning, afternoon and evening, Duration, Matching analogue, digital and written time and Telling the time)
75	Three length activities
75	Three mass activities
75	Three capacity activities
100	Four opinion poll activities
50	Two ongoing data collection activities

Approximate Time (mins)	Activity
TERM 3	
50	Tangram Puzzle Activity Cards 9 to 13
50	Geoboard Activity Cards 10 to 12
90	GeoGenius Construction Kit Activity Cards 5 to 7
100	GeoGenius Visualisation Kit Beginner_2 Card Sets 1 to 6
30	Connecting Cube Activity Cards 9 to 12
160	Time Activities 1 to 5 (Sequencing daily routines, Sequencing according to morning, afternoon and evening, Duration, Matching analogue, digital and written time and Telling the time)
75	Three length activities
75	Three mass activities
75	Three capacity activities
75	Three sorting activities
50	Two opinion poll activities
25	One ongoing data collection activity
TERM 4	
150	Geoboard Activity Cards 13 to 18
90	GeoGenius Construction Kit Activity Cards 8 to 10
150	GeoGenius Visualisation Kit Novice_1 Card Sets 1 to 6
160	Time Activities 1 to 5 (Sequencing daily routines, Sequencing according to morning, afternoon and evening, Duration, Matching analogue, digital and written time and Telling the time)
75	Three length activities
75	Three mass activities
75	Three capacity activities
100	Four opinion poll activities
50	Two ongoing data collection activities

Space and Shape (Geometry)

INTRODUCTION

"Geometry begins with play" (van Hiele, 1999).

The activities described in this section of the study guide are informed by the research of Pierre van Hiele. According to van Hiele (1986), there are five levels of geometric thought that are sequential and hierarchical. These include visualisation, description, abstraction, deduction and rigour (although it is unlikely that children in the early grades will move beyond the descriptive level). For children to function at any given level, they must have developed confidence at the preceding level. Progression from one level to another is largely based on instruction and experience rather than age or physical development.

For a child at the visual level of geometric thinking, figures and shapes are identified in terms of what they 'look like'. If asked why a square is a square, a child will say that it is a square because it looks like one. However, if the square is tilted so that its sides appear to be at a 45˚ angle, then the child may not recognise the shape as a square, instead, they may call it a diamond.

Children at the descriptive level of geometric thinking recognise the properties of shapes. Children at this developmental level may identify a shape as a square because the shape has four sides that are the same length, or because the angles are right angles. However, at this level, the properties are not yet logically ordered or related. Children at this developmental level may identify a shape as an equilateral triangle because the shape has three sides that are equal in length, or because the shape has three angles that are equal in size. However, they don't recognise a relationship between the properties and cannot yet see a relationship between the equal angles and the equal sides of the equilateral triangle.

Recognising the relationships between the different properties of shapes happens during the deductive level of geometric thinking. Children at this developmental level are able to deduce some unknown properties of a shape, from the known properties of the shape.

Teachers of children in the early grades typically work with children who are usually at the visual level of geometric thinking. The teacher's role is to create learning situations that develop the children's confidence in moving from the visual to the descriptive level of geometric thinking. Such learning situations can even lead to the informal deductive level.

Van Hiele described five kinds of activities that promote the transition from one level to the next. These activities are as follows:

1. Free play (inquiry phase): Children are given materials that encourages them to explore and become aware of certain structures.
2. Focused play (direct orientation): Tasks are presented in such a way that the characteristic structures of the objects gradually appear to children.
3. Explicitation: The teacher introduces terminology.

4. More focused play (free orientation): The teacher presents tasks that can be completed in different ways and supports children in developing an awareness of what they have already noticed.
5. Integration (seldom included in geometric activities in the early years): Children are given opportunities to synthesize what they have learned (van Hiele, 1999).

In light of the activities described by van Hiele, developing geometric thinking in the early grades is reliant on play and playing with resources. Many resources can be made (like tangram puzzles) or collected (beads to put on string). Some resources have to be purchased.

This section of the teacher guide has been developed with the assumption that the teacher has a range of geometric resources in her classroom. By encouraging the children to use these resources in a range of carefully structured learning situations, teachers support children's growing awareness of the geometric and other properties of shapes and objects.

To conclude, the role of the teacher in developing children’s geometric thinking is to:

- Organise the learning situations (activities) described in this guide so as to direct the children’s attention to the geometric properties of shapes and objects.
- Introduce terminology.
- Engage the children in reflective discussion on the activities, encouraging explanations that incorporate appropriate geometric terms.

RESOURCES

Resource	**Number required**	**Available from**
Mosaic Puzzle	1 for every pair of children	Brombacher & Associates
Mosaic Puzzle Activity Cards	1 set for every four children	Brombacher & Associates
Tangram Puzzle *10 cm by 10 cm*	1 for every pair of children	Brombacher & Associates
Tangram Puzzle Activity Cards	1 set for every four children	Brombacher & Associates
Geoboard with 5-by-5 square pin grid array	1 per child	
Geoboard Activity Cards	1 set for every four children	Brombacher & Associates
Attribute Blocks	1 set for every four children	Brombacher & Associates
Attribute Block Activity Cards	1 set for every four children	Brombacher & Associates
GeoGenius Visualisation Kit	Minimum 1 set for every 12 children	Brombacher & Associates
GeoGenius Visualisation Kit additional Card set_2	Minimum 1 set for every 12 children	Download from www.GeoGenius.co.za
GeoGenius Construction Kit	1 Superkit for every 12 children	Brombacher & Associates
GeoGenius Construction Kit Activity Cards	1 set for every 12 children	Brombacher & Associates
Connecting Cubes	1 set of 40 blocks for every five children	Brombacher & Associates
Connecting Cubes Activity Cards	1 set for every 12 children	Brombacher & Associates

TANGRAM PUZZLE ACTIVITIES

In this activity we expect children to develop:

- Confidence in recognising, identifying and describing 2-D shapes (the focus of the activities is on triangles and rectangles)
- An increased awareness of the properties of, and relationships between, the edges and angles of 2-D shapes

For this activity you will need:

- Tangram Puzzles (For these activity cards the Tangram Puzzle should be 10 cm by 10 cm)
- Tangram Puzzle Activity Cards 5 to 13

Teacher's role:

Give the children a Tangram Puzzle Activity Card and Tangram Puzzle. Tell the children to complete the instructions on the card. The children are able to work on these cards independently of the teacher and may work individually or in pairs. The children should not pack away until the teacher has seen that they have successfully completed the activity or recorded their results appropriately.

When possible, the teacher should take the opportunity to observe how the children use the pieces and informally assess how the children think and talk about the shapes. The teacher should discuss the activity with the children after they have completed it. The real learning lies in the reflective discussion that the teacher facilitates.

In Activity Cards 5 and 6, the children are not able to fit the pieces onto the shapes but need to build the same shape next to the image.

In Activity Cards 7 to 10 and 12, the children can fit the Tangram Puzzle pieces onto the Activity Card but only the outline of the shape to be covered is visible. The children have to decide which pieces to use to complete the shape.

In Activity Cards 11 and 13, the children are to put the Tangram pieces together to look like the outline of the shapes on the Activity Card. However, the shapes are not the same size as the pieces. Draw the children's attention to the edges and vertices of the shapes by asking:

- How many edges does this shape have?
- How many corners (vertices) does this shape have?
- What is the same about these shapes?
- What is different about these shapes?

What to expect from the children:

The main focus of these activities is for the children to play and gradually start to recognise some of the properties of polygons.

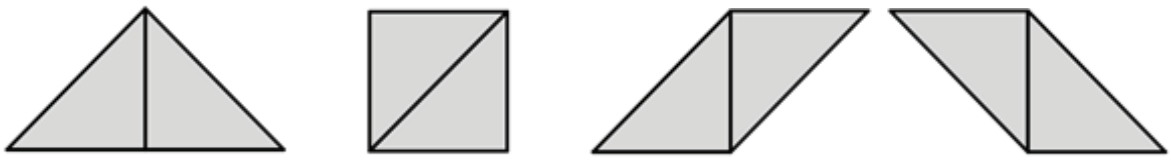
The children may start to notice that some pieces will fit either side up, while other pieces (the parallelogram) will only fit one way up. The children will also start to focus on matching edges that are equal in length and angles that are equal in size.

The children should know the names 'triangle' and 'rectangle' and recognise them as such. They may be able to explain that they know that triangles are triangles because they have three edges or three corners (vertices), whereas the other shapes all have four edges. The rectangle, however, is different to the other shapes with four sides because it has square corners (right-angles).

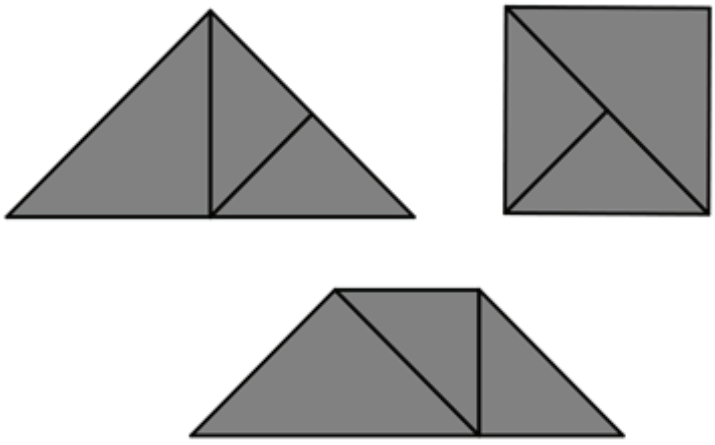
The children may notice similarities and differences between the rectangles and the other shapes. The children may describe the rectangles as being different to the five-sided shape (pentagon) because it has only four edges and that it is different to the parallelogram because the corners are square (i.e. right angles). The children do not have to know the name 'parallelogram' yet and could just say 'the other four-sided shape'.

The children should notice that the rectangle, trapezium and parallelogram have four edges and four corners (vertices), the rectangle has square corners (right angles), and the trapezium and parallelogram have sharp and blunt corners.

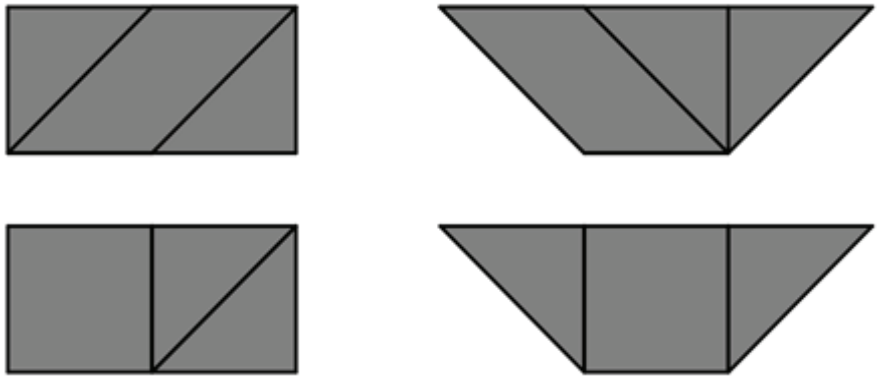
Activity Card 7 solutions:



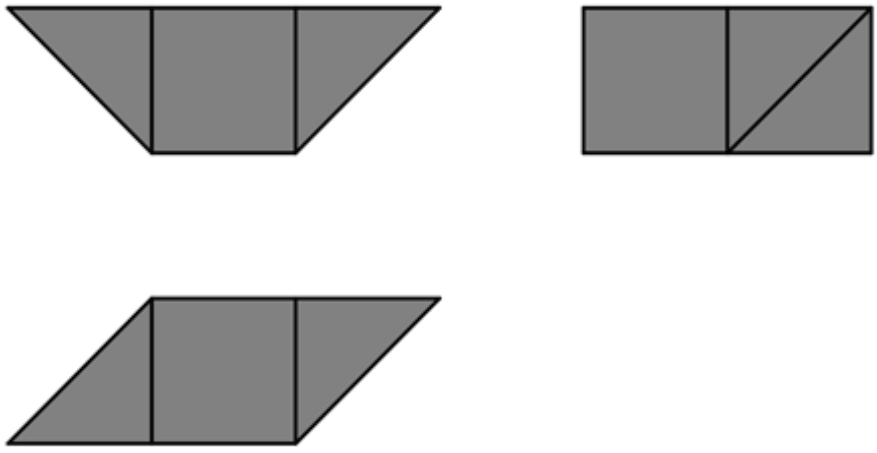
Activity Card 8 solutions:



Activity Card 9 solutions:



Activity Card 10 solutions:



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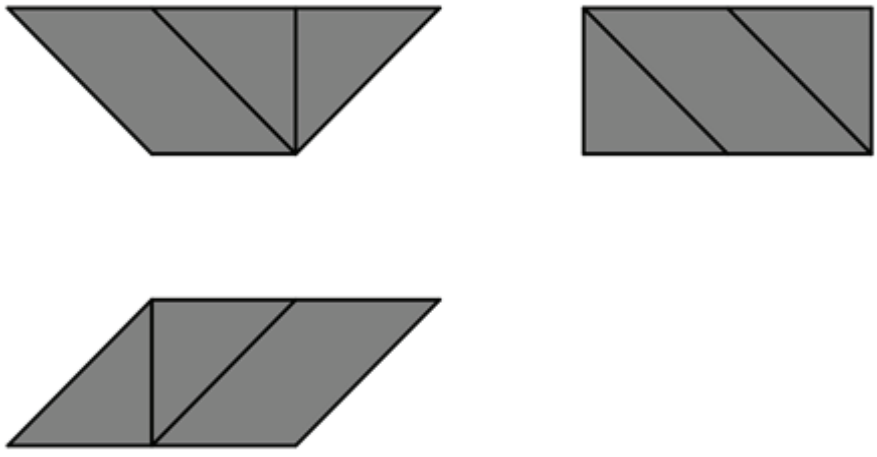
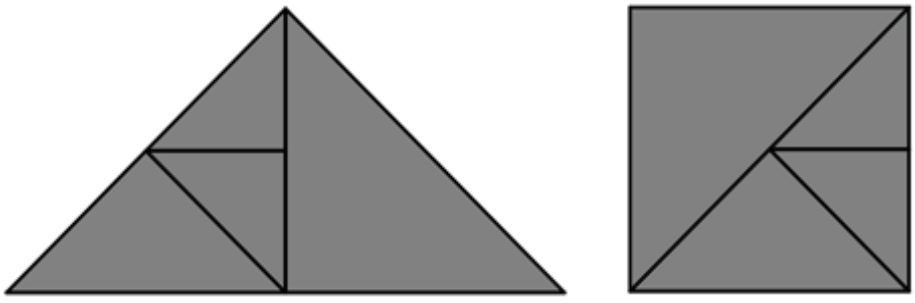
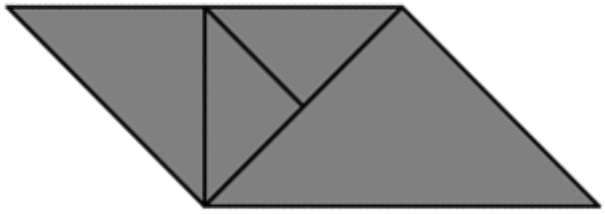


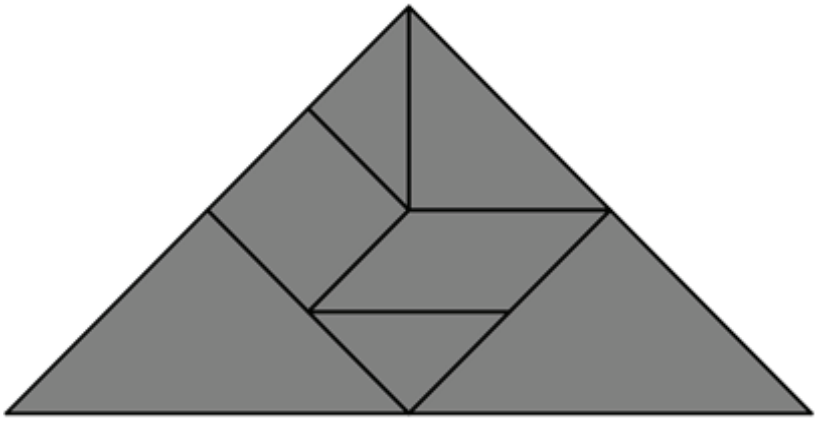
Activity Card 11 solutions:



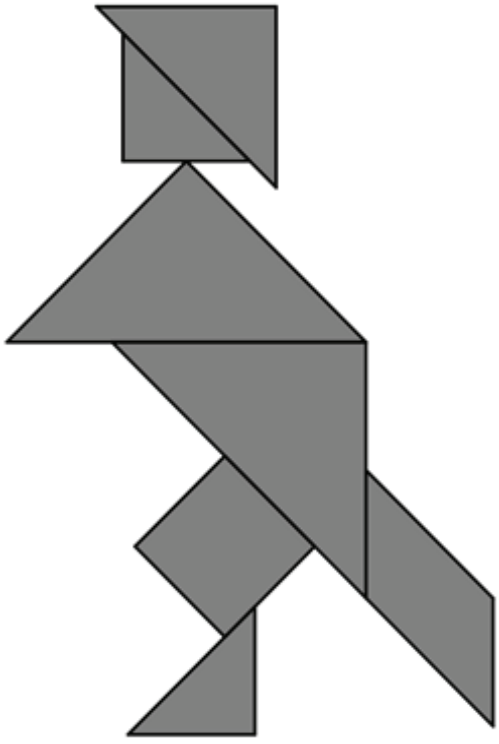
Activity Card 11 solutions continued:

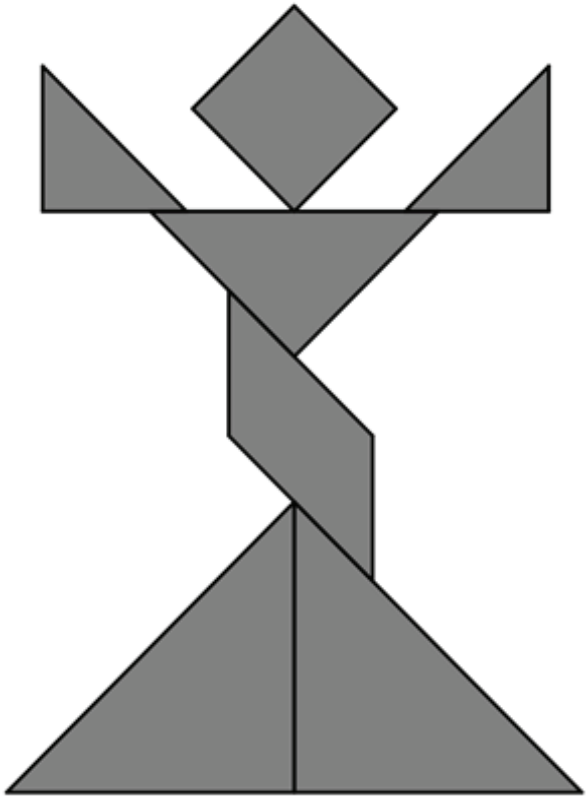


Activity Card 12 solution:



Activity Card 13 solutions:





MOSAIC PUZZLE ACTIVITIES

In this activity we expect children to develop:

- Confidence in recognising, identifying and describing 2-D shapes (the focus of the activities is on triangles, squares and rectangles)
- An increased awareness of the properties of, and relationships between, the edges and angles of 2-D shapes

For this activity you will need:

- Mosaic Puzzles
- Mosaic Puzzle Activity Cards 5 to 13

Teacher's role:

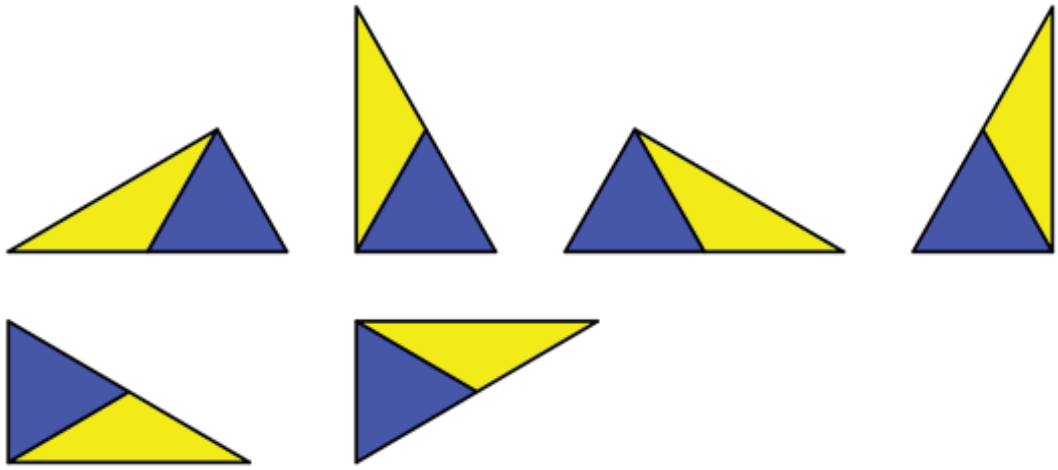
Give the children a Mosaic Puzzle Activity Card and a Mosaic Puzzle. Tell the children to complete the instructions on the card. The children are able to work on these cards independently of the teacher and may work individually or in pairs. The children should not pack away until the teacher has seen that they have successfully completed the activity or recorded their results appropriately.

When possible, the teacher should take the opportunity to observe how the children use the pieces and informally assess how the children think and talk about the shapes. The teacher should discuss the activity with the children after they have completed it. The real learning lies in the reflective discussion that the teacher facilitates.

In Activity Cards 5 and 6, the children are not able to fit the pieces onto the shapes, but need to build the same shape next to the image.

In Activity Cards 7 to 9 and 11 to 12, children can fit the mosaic puzzle pieces onto the Activity Card but only the outline of the shape to be covered is visible.

In Activity Card 10, the children will focus on making different shapes. Make sure that it is understood what is meant by *different* shapes. For example, all these shapes are the same because if they trace around the outside of one of the shape and turn or flip it they will see that it will fit on all the other shapes.



The children should record their results on a piece of paper by tracing around the outside of the new shape that they create.

In Activity Card 13, the children are to put all the Mosaic pieces together to look like the picture on the Activity Card. The shapes are not the same size as the pieces.

Draw the children's attention to the edges and vertices of the shapes by asking:

- How many edges does this shape have?
- How many corners (vertices) does this shape have?
- What is the same about these shapes?
- What is different about these shapes?

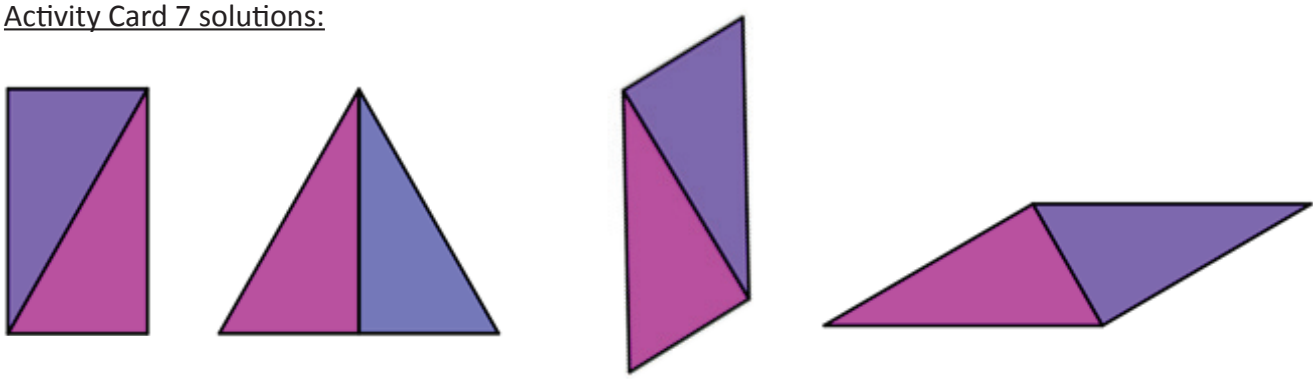
What to expect from the children:

The main focus of these activities is for the children to play and gradually start to recognise some of the properties of polygons.

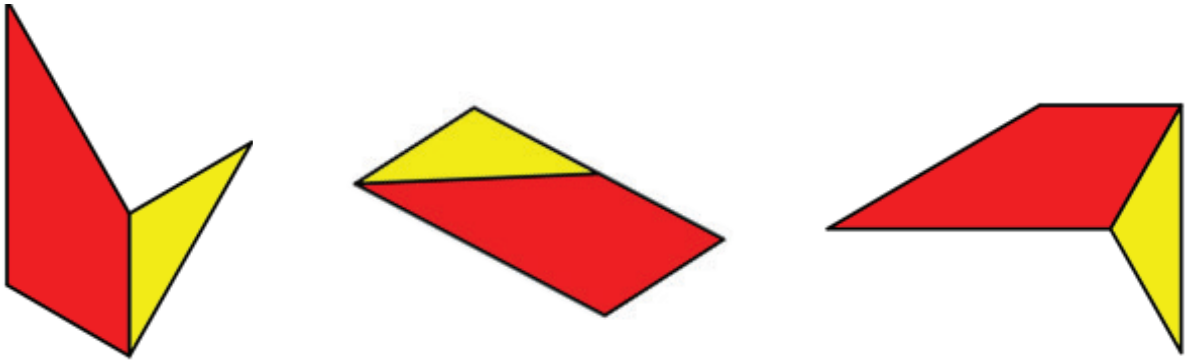
The children should know the names 'triangle', 'square' and 'rectangle' and recognise them as such. They may be able to explain that they know that the triangles are triangles because they have three edges or three corners (vertices) whereas the other shapes all have four edges. The rectangle however, is different to the other shapes with four sides, because it has square corners (right-angles). The children do not have to know the names trapezium, parallelogram, quadrilateral or pentagon and could just say 'four-sided shape' and 'five-sided shape'.

The children should notice that the parallelogram has four edges and four corners (vertices), whereas the other shapes have five edges and five corners (vertices). The children may describe opposite corners of the parallelogram as being blunt or sharp, but in the trapezium, the corners next to each other are blunt or sharp. The children may also notice that shapes can be convex (a reflex-angle) and describe this as 'dented-in'.

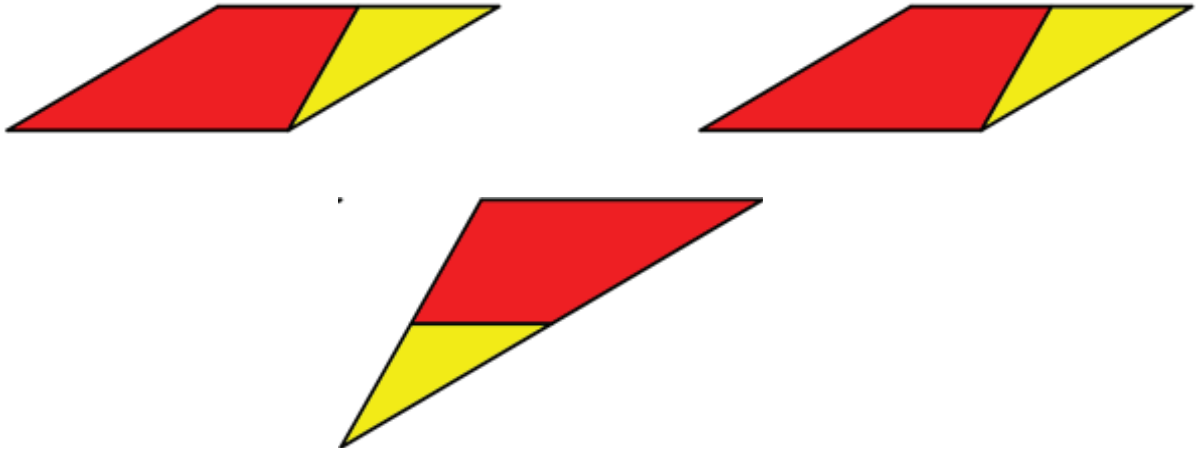
Activity Card 7 solutions:



Activity Card 8 solutions:

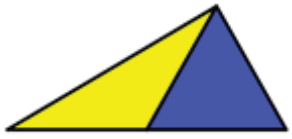


Activity Card 9 solutions:



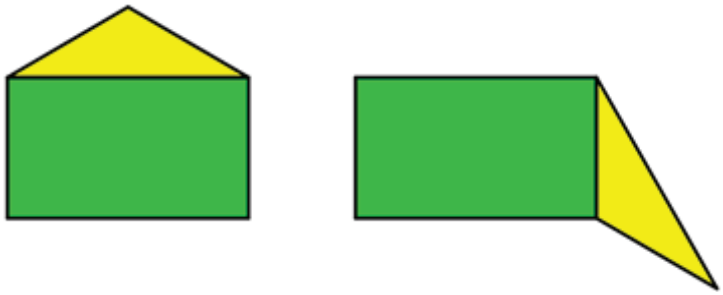
Activity Card 10 solutions:

1. There is only one shape that can be made by joining piece 1 and piece 2.

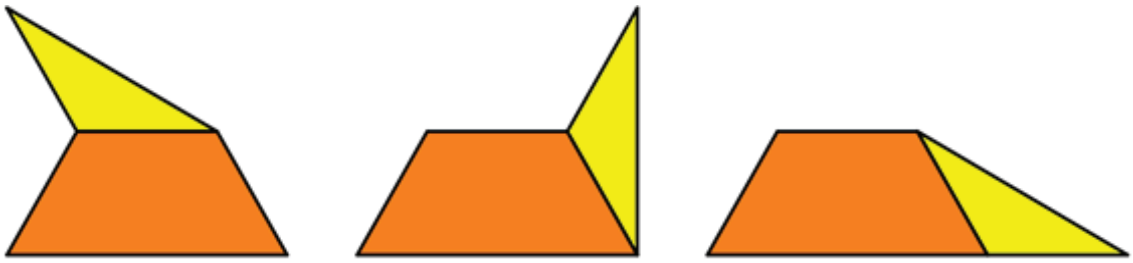


Activity Card 10 solutions continued:

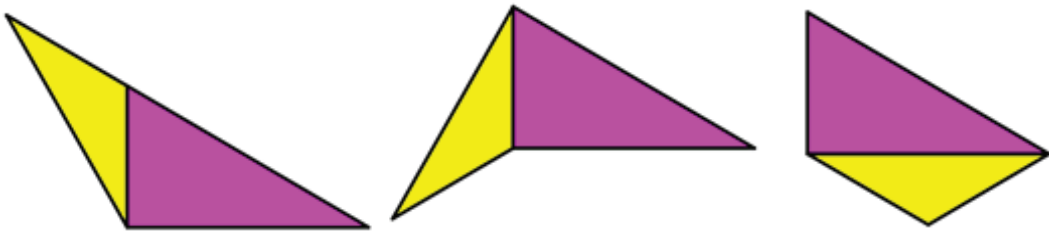
2. There are two different shapes that can be made by joining piece 1 and piece 3.



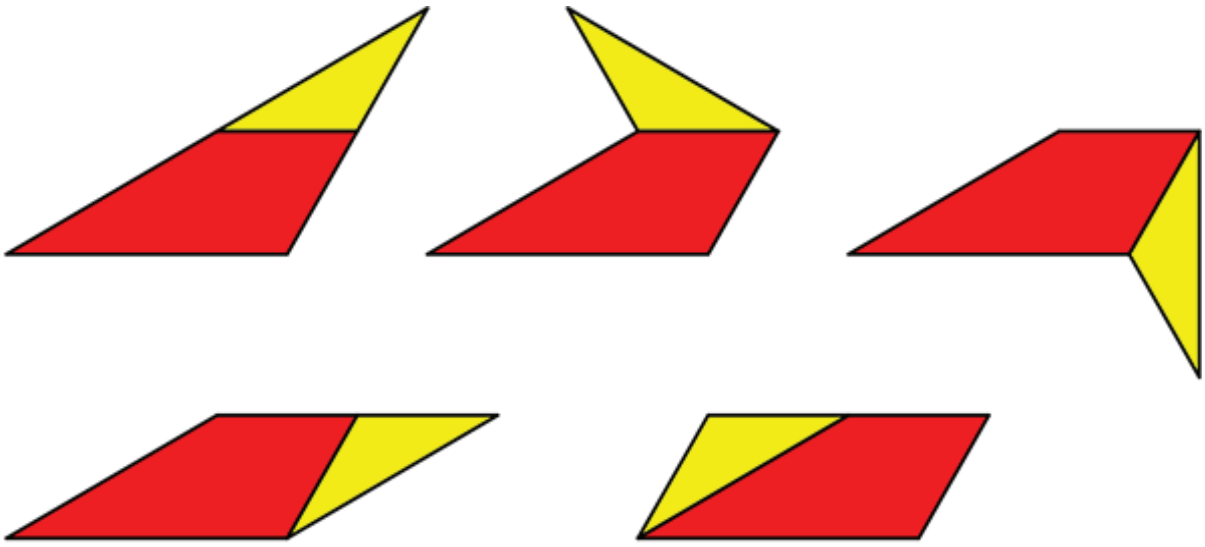
3. There are three different shapes that can be made by joining piece 1 and piece 4.



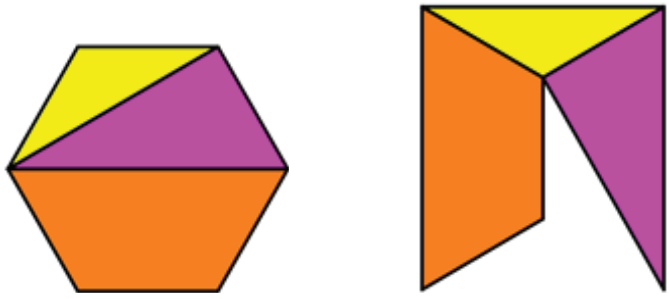
4. There are three different shapes that can be made by joining piece 1 and piece 5.



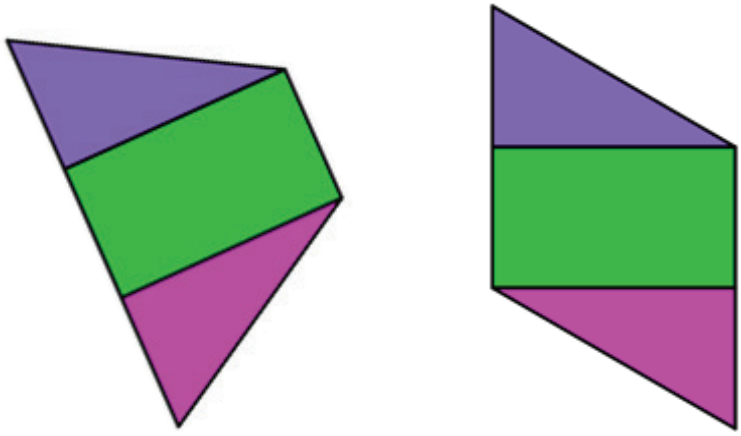
5. There are five different shapes that can be made by joining piece 1 and piece 7.



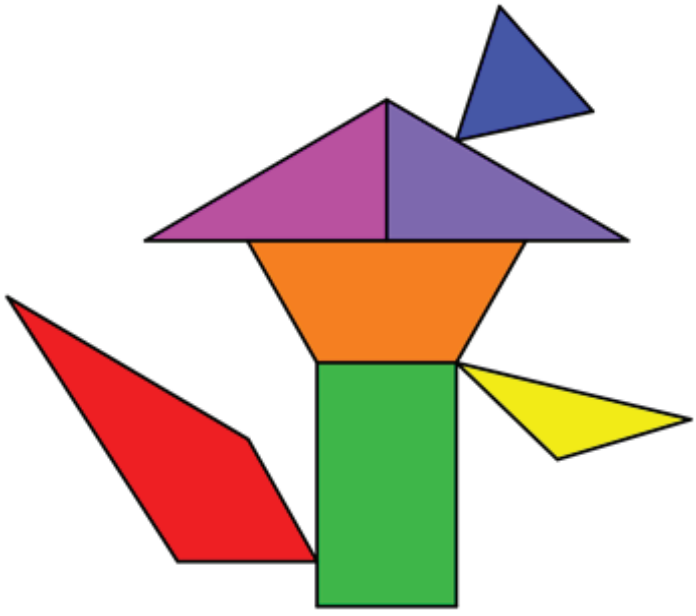
Activity Card 11 solutions:



Activity Card 12 solutions:



Activity Card 13 solution:



GEOBOARD ACTIVITIES

In this activity we expect children to develop:

- Confidence in recognising, identifying and describing 2-D shapes (the focus of the activities is on triangles, squares and rectangles)
- An increased awareness of the properties of, and relationships between, the edges and angles of 2-D shapes

For this activity you will need:

- Geoboard (minimum 5-by-5 square pin grid array)
- Elastic bands in varying colours and sizes
- Geoboard Activity Cards 7 to 18
- Pages of square-dotted paper (see print master at the end of the guide)

Teacher's role:

Give the children a Geoboard Activity Card and a 5-by-5 geoboard with elastic bands. If the children have larger geoboards, you may want to restrict their use to 5-by-5 pins, otherwise there will be too many solutions for some of the investigations. Tell the children to complete the instructions on the card. The children are able to work on these cards independently of the teacher and should not pack away until the teacher has seen that they have successfully completed the activity or recorded their results appropriately.

The children will need square-dotted paper and a pencil for recording their solutions. The nature of the work on geoboards means that important learning often goes unrecorded. In these tasks the children are required to record what they do on the geoboard onto square-dotted paper so that the properties of the shapes can be discussed. It is recommended that children stick this square-dotted paper into their mathematics jotters.

In Activity Cards 7, 9, 10 and 11, the children's attention is drawn to what is the same and what is different. To convince the children that shapes are the same (or different), they may need to trace the shape onto tracing paper and lay the tracing paper over the other shape. These activities also help children to focus on length of edges and size of angles at the vertices.

In Activity Card 8, children are to focus on triangles and in Activity Card 12, children focus on squares and rectangles and what makes squares special when compared to other rectangles.

In Activity Cards 14 and 15, the children are to start to focus on the relationship between the number of edges and the number of vertices, as well as the length of the edges. Encourage the children to think of concave shapes as well as convex shapes.

In Activity Cards 16, 17 and 18, the children are to investigate how many different rectangles and triangles they can make within certain restrictions. They should be encouraged to work systematically through these investigations. The children should start with all the possible rectangles or triangles that have a base of one unit, then two units, then three units etc. Only then should they consider tilted rectangles and triangles.

What to expect from the children:

The children should notice that shapes can use different pegs, but can still be the same.

The children should start to recognise the properties of triangles and rectangles, e.g., that triangles have three edges and three corners (vertices) and rectangles (squares included) have four edges and four corners (vertices). The children may describe right angles as being "square" corners and although this terminology is not mathematically correct, it conveys the meaning and is acceptable for young children. The teacher, however, should use the correct vocabulary.

The children should start to notice the difference and similarities between squares and other rectangles, and the difference and similarities between rectangles and other quadrilaterals. The children may not yet recognise that a square is a special case of a rectangle. The children should now realise that a polygon will always have the same number of edges as vertices.

Activity Card 7 solutions:

3. Harriet and Sabelo's rectangles are the same. The one has just been turned around.

Activity Card 8 solutions:

A, C, H and I are triangles. They have three edges and three vertices (corners).

Activity Card 9 solutions:

3. Sabelo and Harriet's triangles are the same. It is the same size and shape, the one has just been flipped over.

Activity Card 10 solutions:

3. Sabelo and Harriet's triangles are the same. It is the same size and shape, the one has just been flipped over or turned around.

Activity Card 11 solutions:

2. A rectangle has four edges and four corners (vertices).

Activity Card 11 solutions continued:

4. Harriet's rectangle is different to Sabelo's because it is thinner. The two shorter sides are not the same length as the shorter sides of Sabelo's rectangle.

Activity Card 12 solutions:

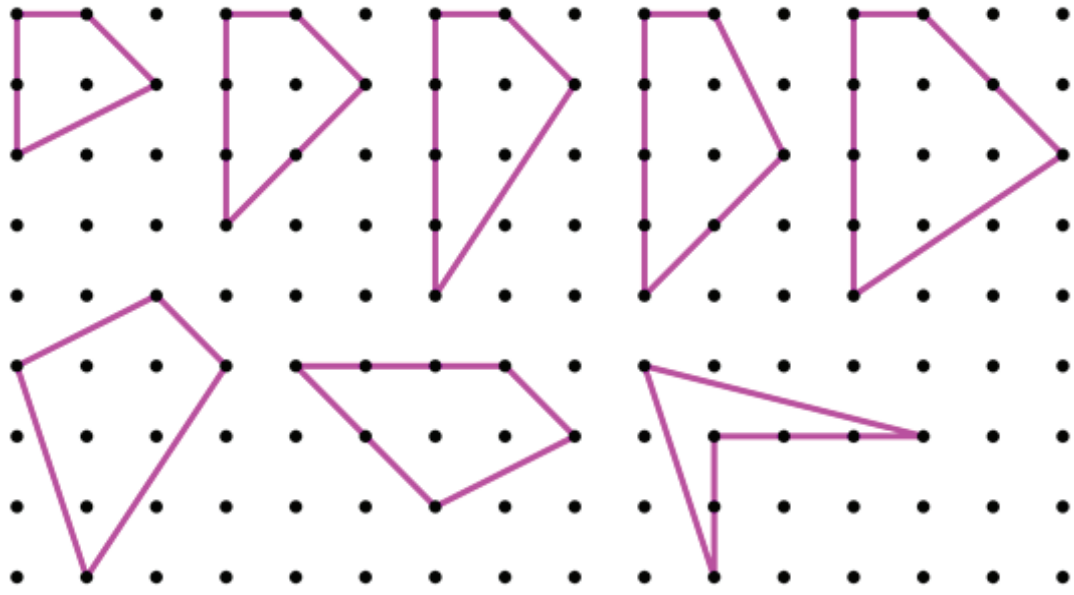
2. All the shapes have four edges and four vertices (corners). The edges of each shape are equal to the other edges in that shape. They all have "square" corners (right angles).
3. The squares are different sizes and some are turned around.
4. These shapes are called squares.
6. These rectangles also have four edges and four vertices (corners) and their corners are "square" (right angles).
7. These rectangles don't have all four edges equal, only the opposite edges are equal in length.
8. These shapes are called rectangles.

Activity Card 13 solutions:

2. Sabelo's shape is a rectangle because it has four edges and four corners. The opposite edges are the same length and the corners are "square" (right angles).
5. Harriet's shape is not a rectangle because the corners are not "square" (angles at the vertices are not right angles).
6. Both Sabelo and Harriet's shapes have four edges and four vertices (corners) and the opposite edges are the same length. They are different sizes and Sabelo's shape has "square" corners (right angles at the vertices), whereas Harriet's shape does not have "square" corners (right angles at the vertices).

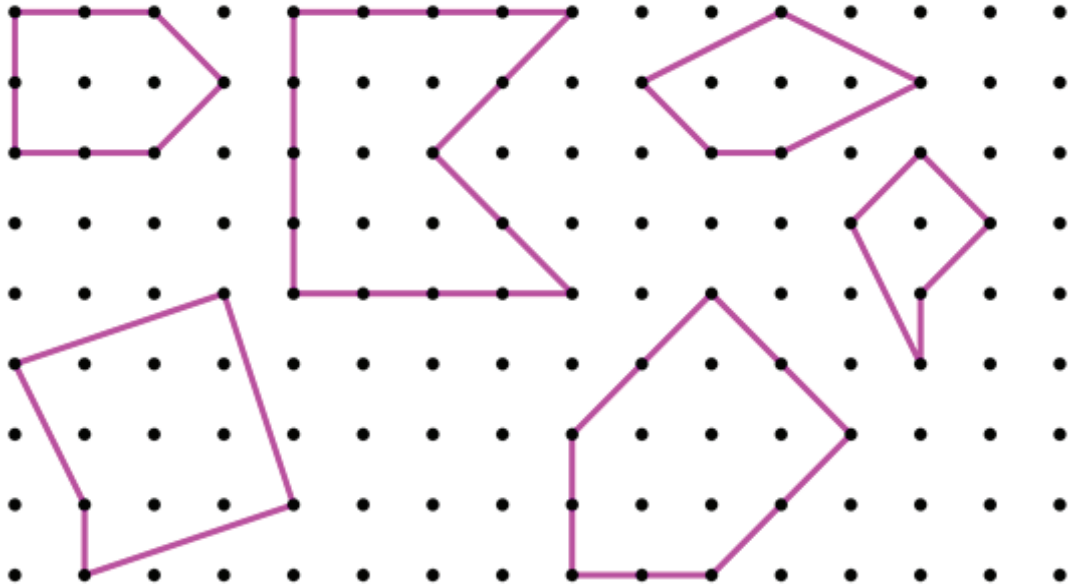
Activity Card 14 solutions:

1. It is impossible to make a shape with four vertices and three edges.
2. There are many solutions, of which the following are only a few:

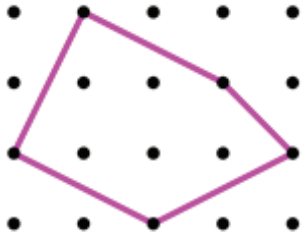


Activity Card 14 solutions:

3. There are many solutions, of which the following are only a few:



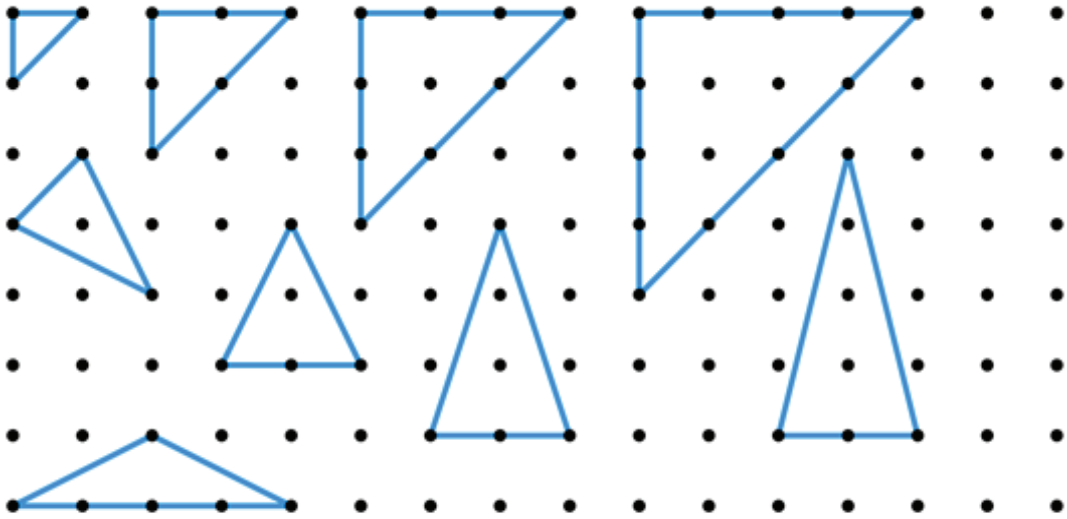
4. One solution is:



Activity Card 15 solutions:

1. It is impossible to make a shape with five vertices and six edges.

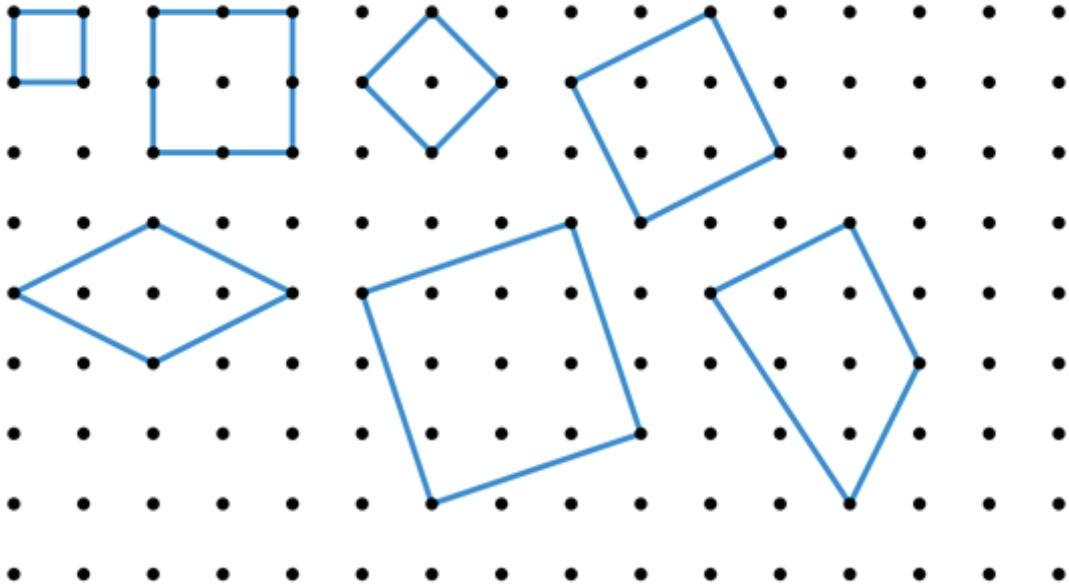
2. There are many solutions, of which the following are only a few:



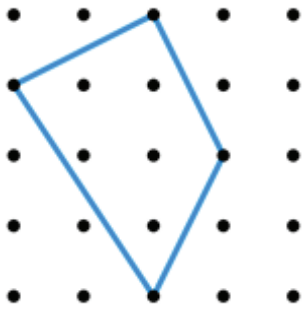
3. It is impossible to make a triangle with three equal sides on a geoboard. **This does not mean that a triangle with three equal sides does not exist – it just cannot be done on a geoboard.**

Activity Card 15 solutions continued:

4. There are many solutions, of which the following are only a few:



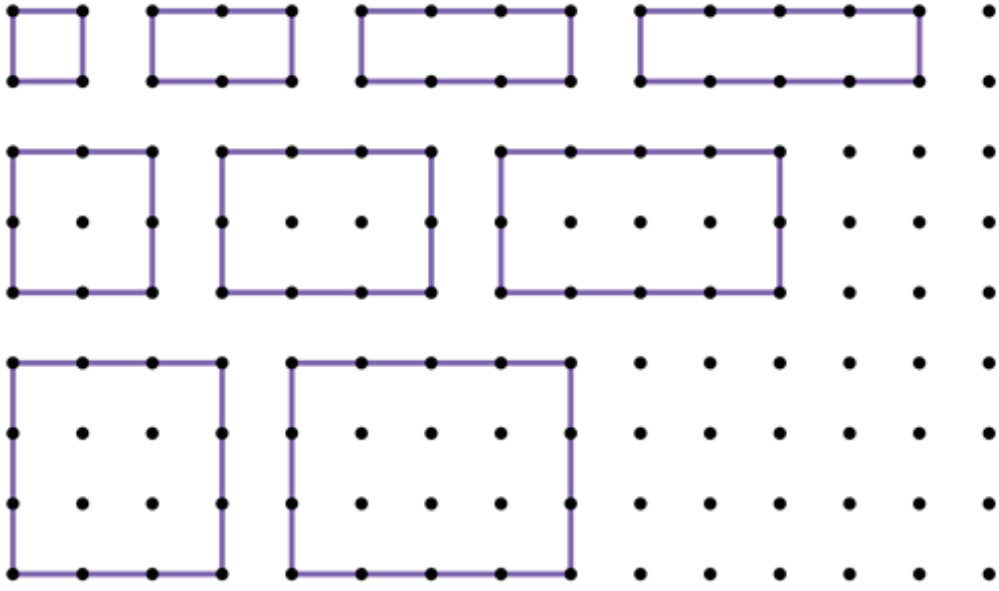
5. There is only one solution (when restricted to a 5-by-5 pin geoboard):



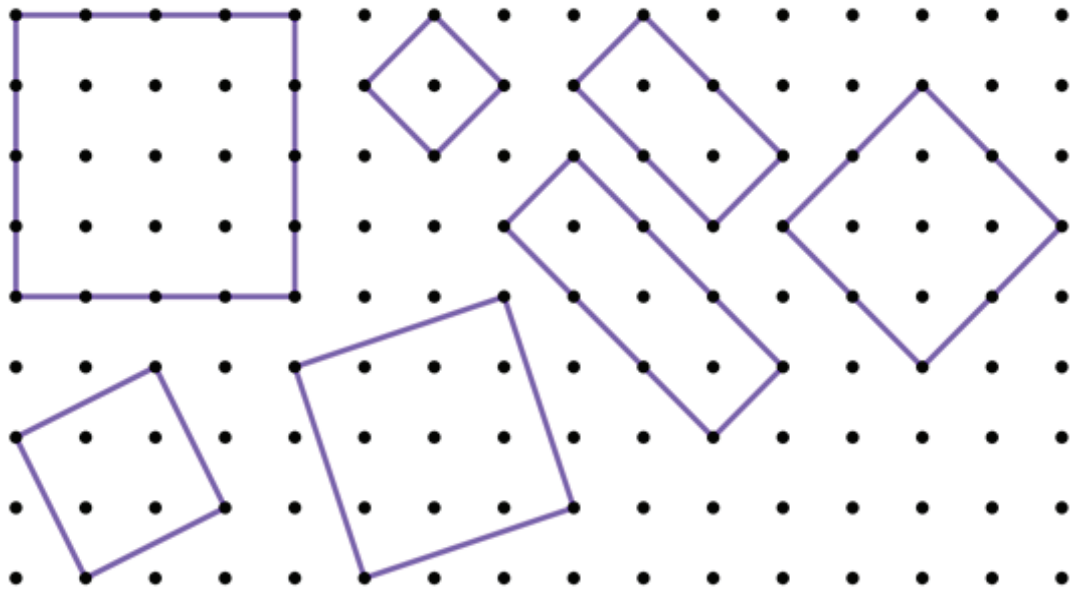
Activity Card 16 solutions:

Squares have been included in this solution for completeness. However, children at this developmental level may not recognise that a square is a special case of a rectangle. Accept children's solutions without the squares.

There are 16 different rectangles (8 if squares are excluded):

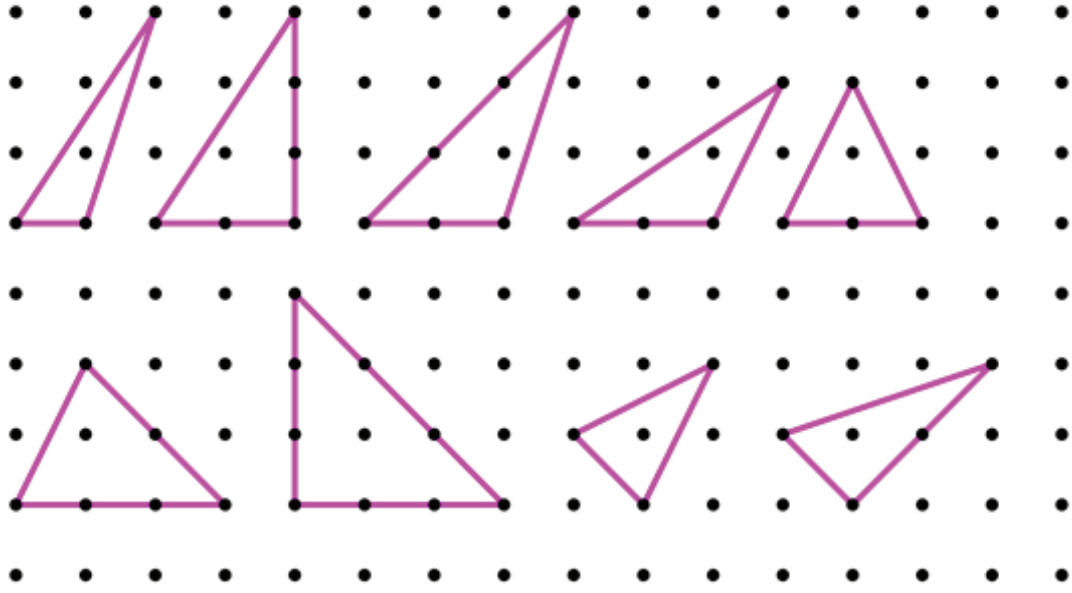


Activity Card 16 solutions continued:



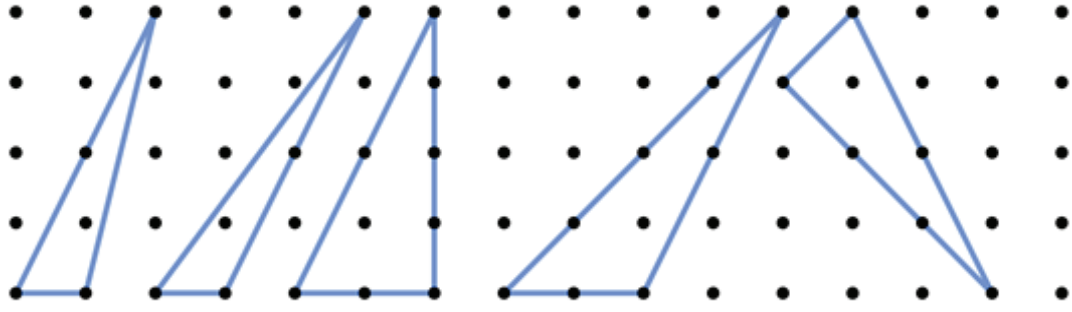
Activity Card 17 solutions:

There are nine possible triangles with 1 pin in the middle on a 4-by-4 grid.

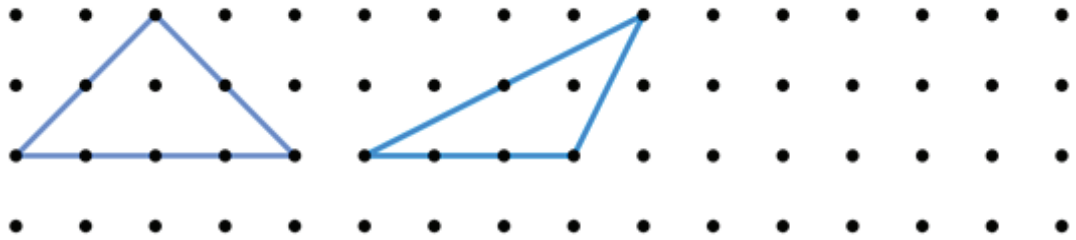


Activity Card 18 solutions:

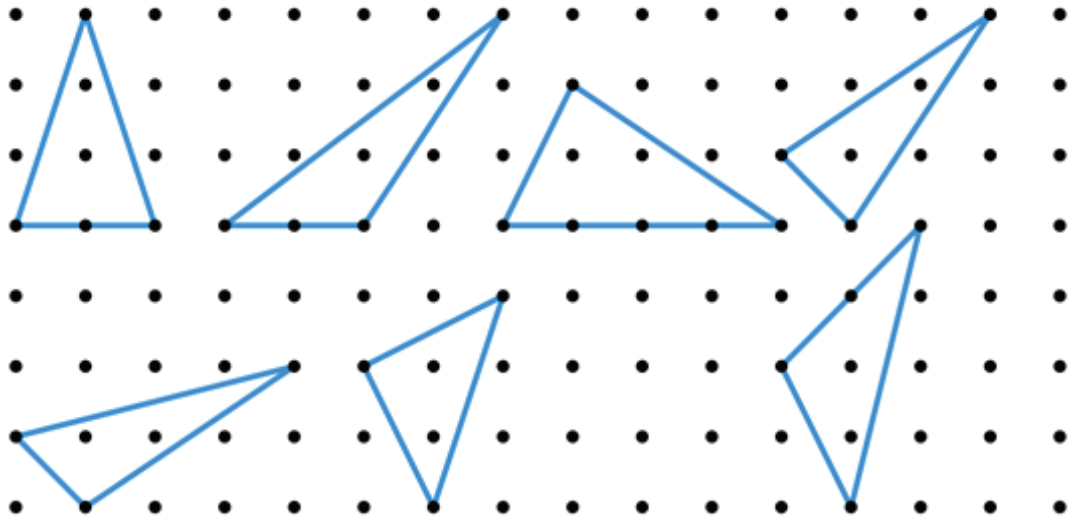
For 1 pin inside, there were 9 different triangles on a 4-by-4 geoboard (see Card 16 solutions). On a 5-by-5 grid, there are another 7 different triangles, so 16 different triangles in total.



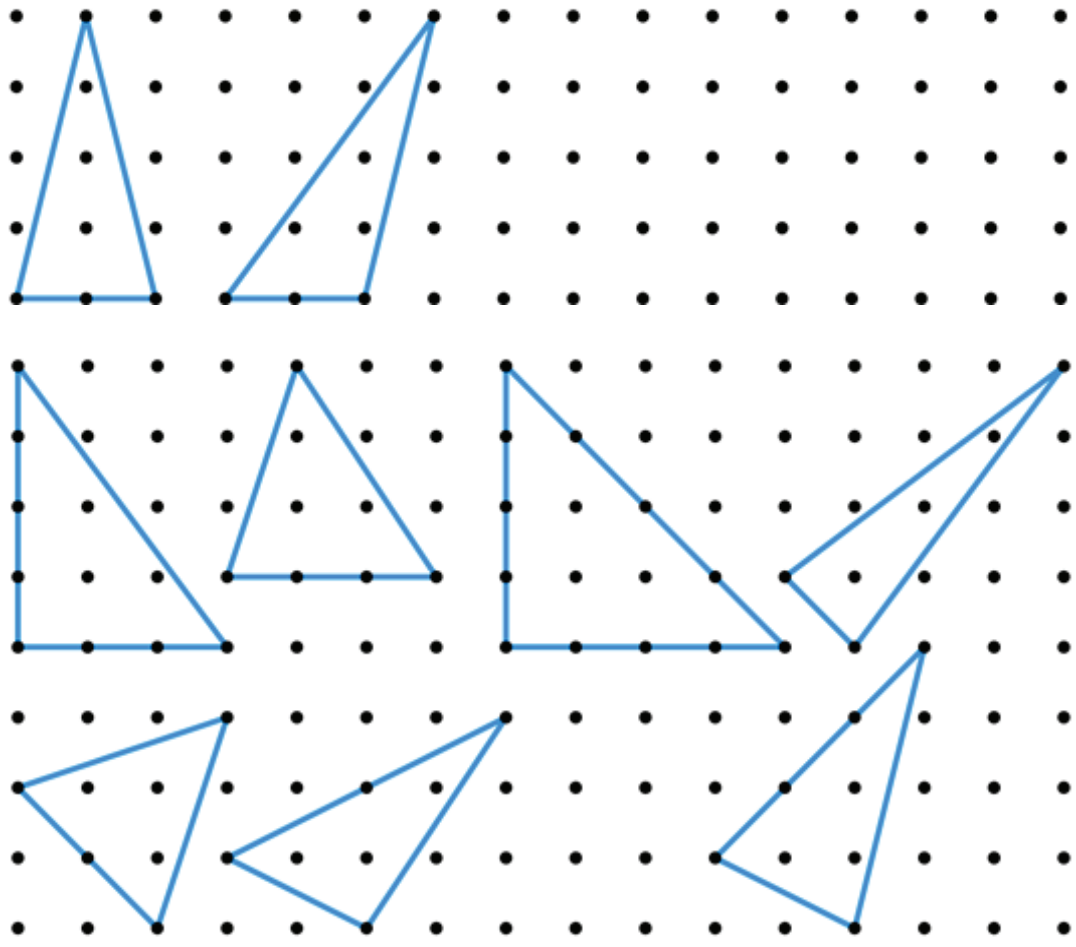
Activity Card 18 solutions continued:



For 2 pins inside, there are 7 different triangles.

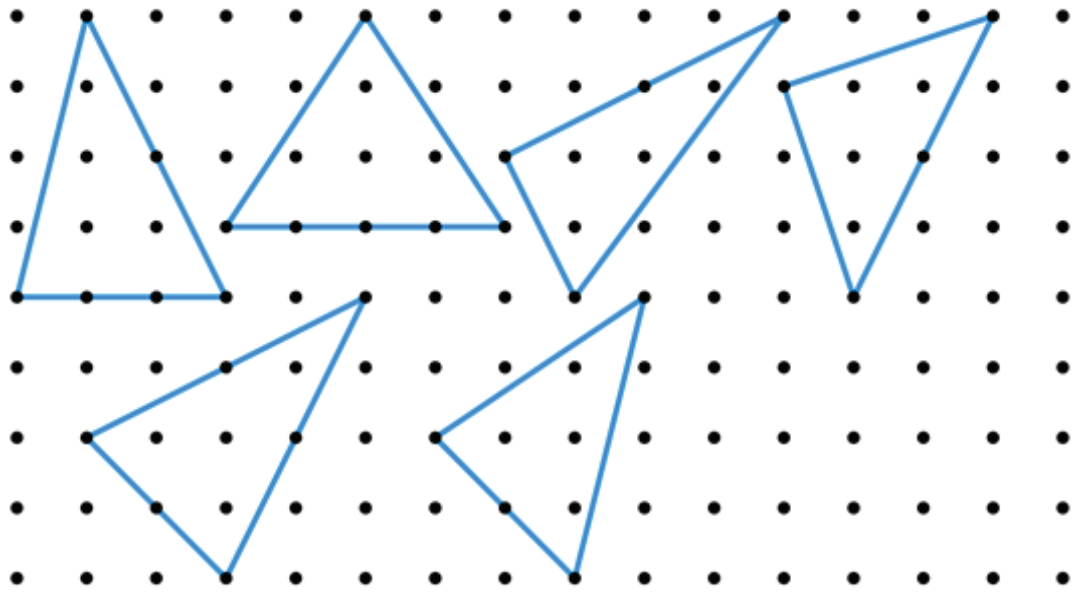


For 3 pins inside, there are 9 different triangles.

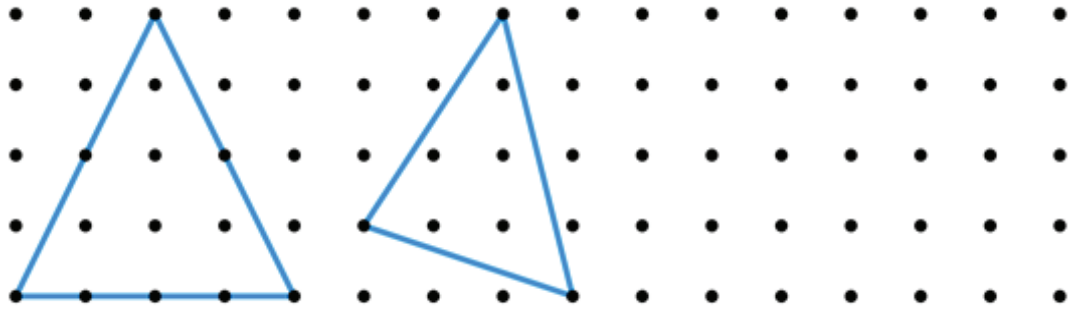


Activity Card 18 solutions continued:

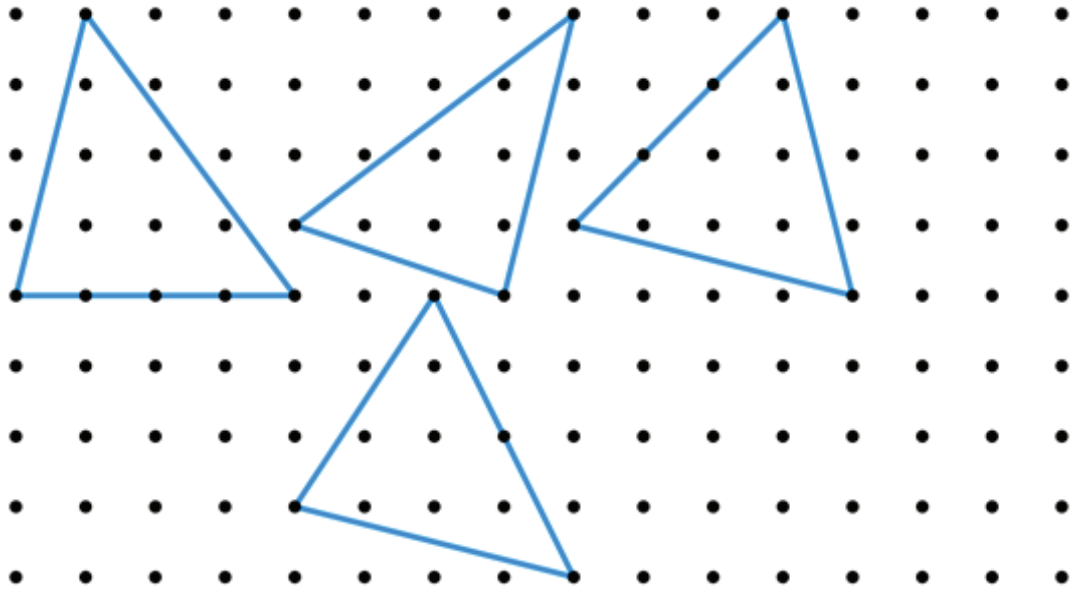
For 4 pins inside, there are 6 different triangles.



For 5 pins inside, there are 2 different triangles.



For 6 pins inside, there are 4 different triangles.



There are no triangles that have more than 6 pins inside.

ATTRIBUTE BLOCK ACTIVITIES

In this activity we expect children to develop:

- Confidence in recognising, identifying and describing shapes
- An increased awareness of the properties of, and relationships between, the edges and angles of shapes

For this activity you will need:

- Attribute Blocks (one set per four children)
- Attribute Block Activity Cards 1 to 40 (one set per four children)
- Mathematics jotters and pencils for recording

Teacher's role:

Before the children start to do the activities on the cards, allow for several sessions of free play where the children can make their own pictures with the blocks. Let the children touch and feel the pieces to become familiar with the different shapes, sizes, thicknesses and colours.

Give the children an Attribute Block Activity Card and a set of blocks. Tell the children to complete the instructions on the card. The children are able to work on these cards independently of the teacher and the children may work individually or in pairs. The children should not pack away until the teacher has seen that they have successfully completed the activity or recorded their results appropriately.

The teacher should observe how the children use the blocks and informally assess how the children think and talk about the shapes. The teacher should discuss the activity with the children after they have completed it. The real learning lies in the reflective discussion that the teacher facilitates.

The cards are divided into five sets. In Set 1 (Activity Cards 1 to 6), the children are to select blocks that are different shapes and sizes of the same colour and which fit the blocks on the card. The children can use thick or thin pieces in these activities as the focus is on developing their ability to match and sort shapes. The children can then be asked to repeat the activity using the other colours.

In Set 2 (Activity Cards 7 to 14), the children are to make the pictures, using the small blocks, by

placing them on the card to match the shapes. In Activity Cards 7 to 11, the children use blocks that are the same colour, before introducing the different colours in Activity Cards 12 to 14.

The children can use either thick or thin pieces. With these cards, the children develop matching and sorting skills and begin to explore how shapes can be joined together. Ask the children to repeat the activity with the same shapes but in a different colour. Ask the children to then repeat the activity using the large blocks that do not fit on the card. This is more demanding because they can no longer check their work by fitting the shapes - they need to develop a sense of "sameness" that involves an evaluation of the properties of the shape.

In Set 3 (Activity Cards 15 to 20), the children are to compose fun pictures using the blocks. Matching, sorting and joining shapes are still the focus of the activities but the blocks no longer fit on the card. The children need to build the pictures next to the image. Blocks of different sizes, shapes, colours and thickness are combined to make the pictures. The children can be asked to trace around the resulting shapes in their jotters to create a record of their work.

In Set 4 (Activity Cards 21 to 24), the focus is on making and extending patterns. The children are to join and sort shapes as well as recognise the geometric patterns. The children are to use the thick and thin pieces to complete these activities. The blocks will no longer fit on the card so the children need to make the pattern with the blocks next to the image, trace it in their mathematics jotter and then use the blocks to further extend the pattern. NOTE: Completing the activities on each of these cards may take more time than the earlier cards in the series.

In Set 5 (Activity Cards 25 to 40), the children are to sort and match blocks of various colours and sizes in order to see how one shape can be composed by joining other shapes. The children need to consider side lengths and angles to determine how the shapes fit together. The children should start to see that a larger shape can be made either by using smaller shapes or by using shapes of varying sizes. Thick or thin pieces can be used in Activity Cards 25 to 39, however thickness has to be considered in Activity Card 40.

In Grade 2, children can start with the cards in Set 2. However, those children who are not yet developmentally ready can start with the cards in Set 1. Once the children have completed the cards, they can redo them two or three times. By revisiting the important concepts, their fluency and confidence will improve each time they complete the cards.

What to expect from the children:

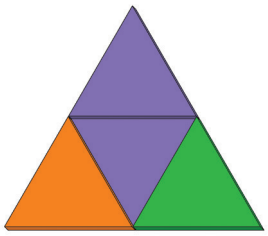
The attribute blocks allow the children the opportunity to experience shapes and investigate their similarities and differences. At first it might be difficult for children to sort and identify the blocks and to distinguish among the many shapes and colours. During free play, the children should explore the blocks and become aware of the shapes, colours, sizes and thicknesses.

The children might form their own prototypes of shapes based on colour or size. For example, they may think that triangles can only be blue or small. The children then need to engage in sorting and matching activities to start to realise that colour, thickness and size are irrelevant to theinherent properties of a shape. While doing these activities the children might talk about the shapes but use the names incorrectly. For example, they might say that all squares and rectangles are squares. Do not draw too much attention to this as a child's understanding of the true meaning of the word develops over time.

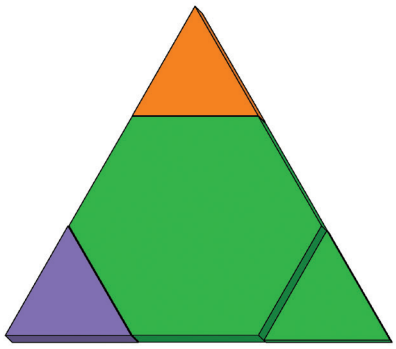
The children will initially have difficulty in discovering what combinations of corners and sides fit together as they start to join blocks to make shapes. Expect the children to use trial and error as they make the shapes on the Activity Cards. Turning and sliding the blocks in order to see how the shapes fit together is an important part of the learning process. When the children are joining and composing shapes, encourage them to come up with other ways to make the shape on the card or to make their own shape with the given pieces. or to make their own shape with the given pieces.

Activity Card 29 solutions:

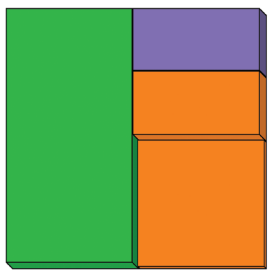
The blocks can be arranged in the following way to make a triangle.

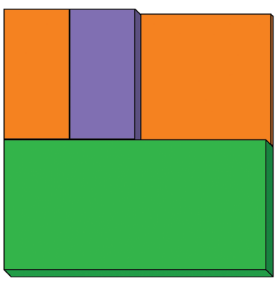


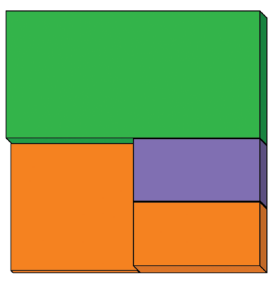
The blocks can be arranged in the following way to make a triangle.

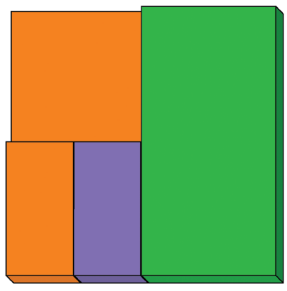


There are four different ways that the pieces can be arranged to make a rectangle.

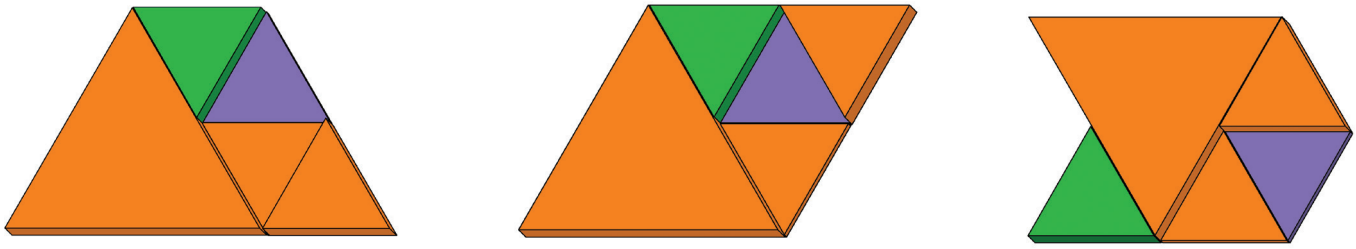




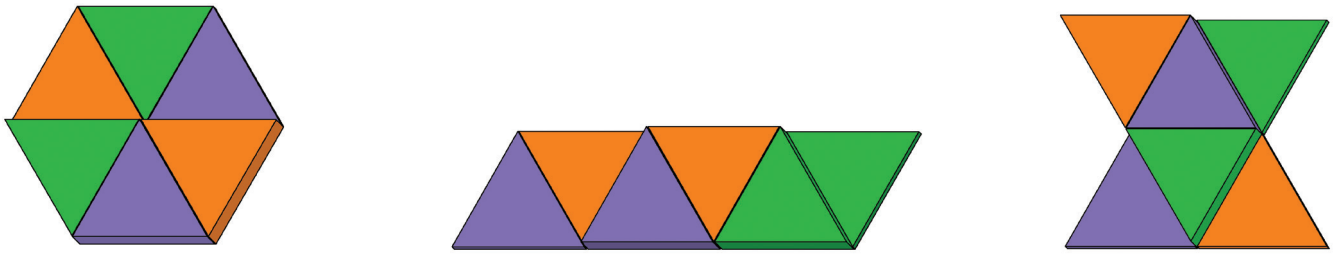




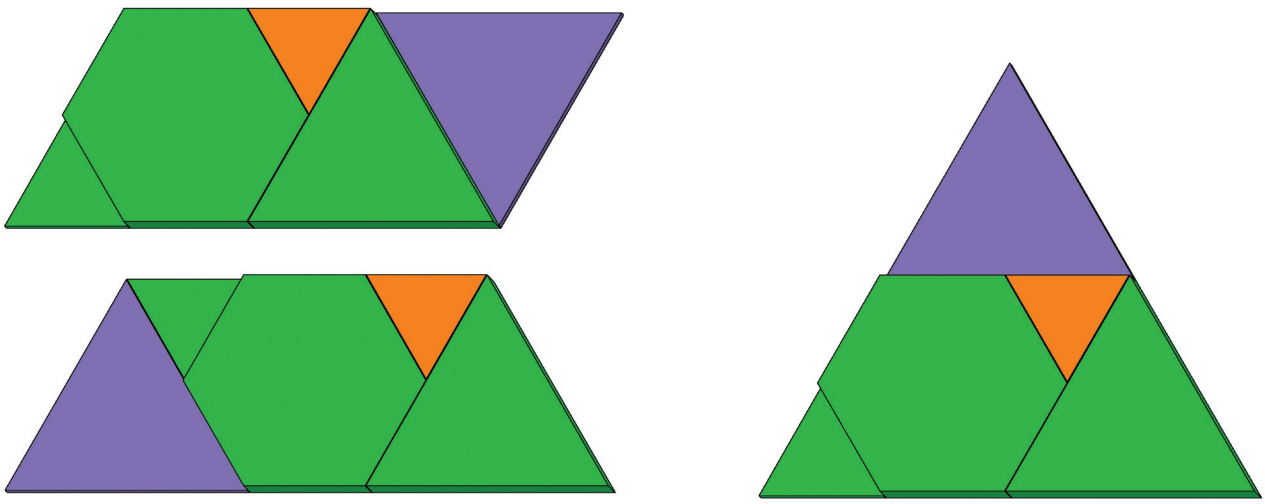
Activity Card 30 solutions:



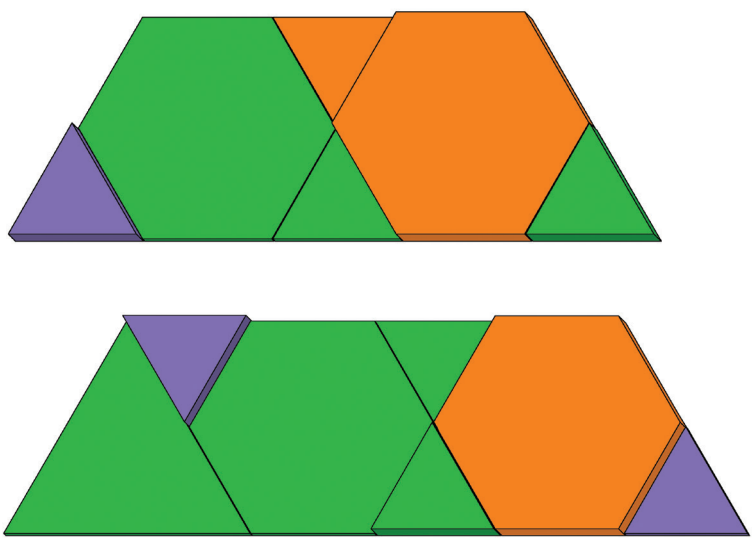
Activity Card 31 solutions:



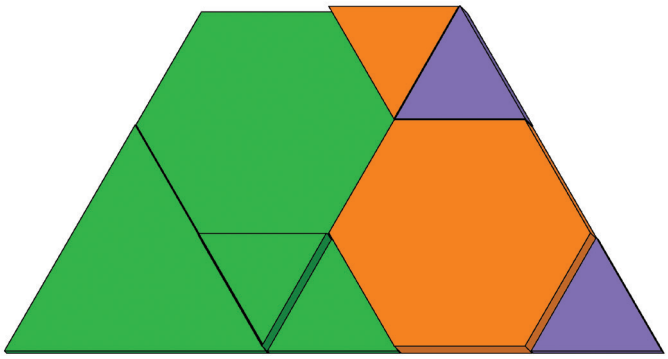
Activity Card 32 solutions:



Activity Card 33 solutions:

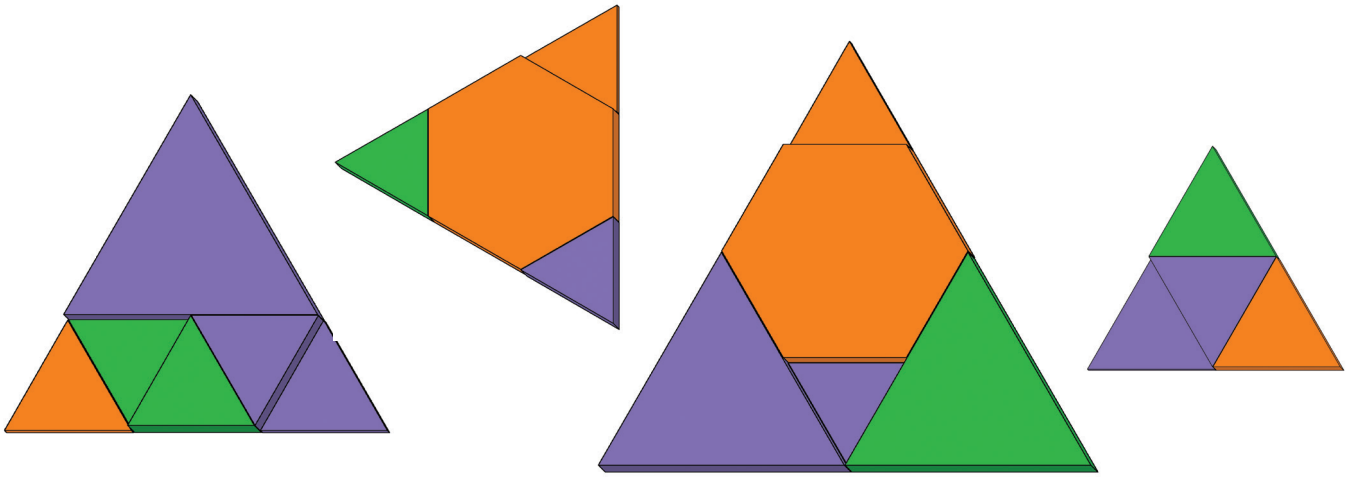


Activity Card 33 solutions continued:

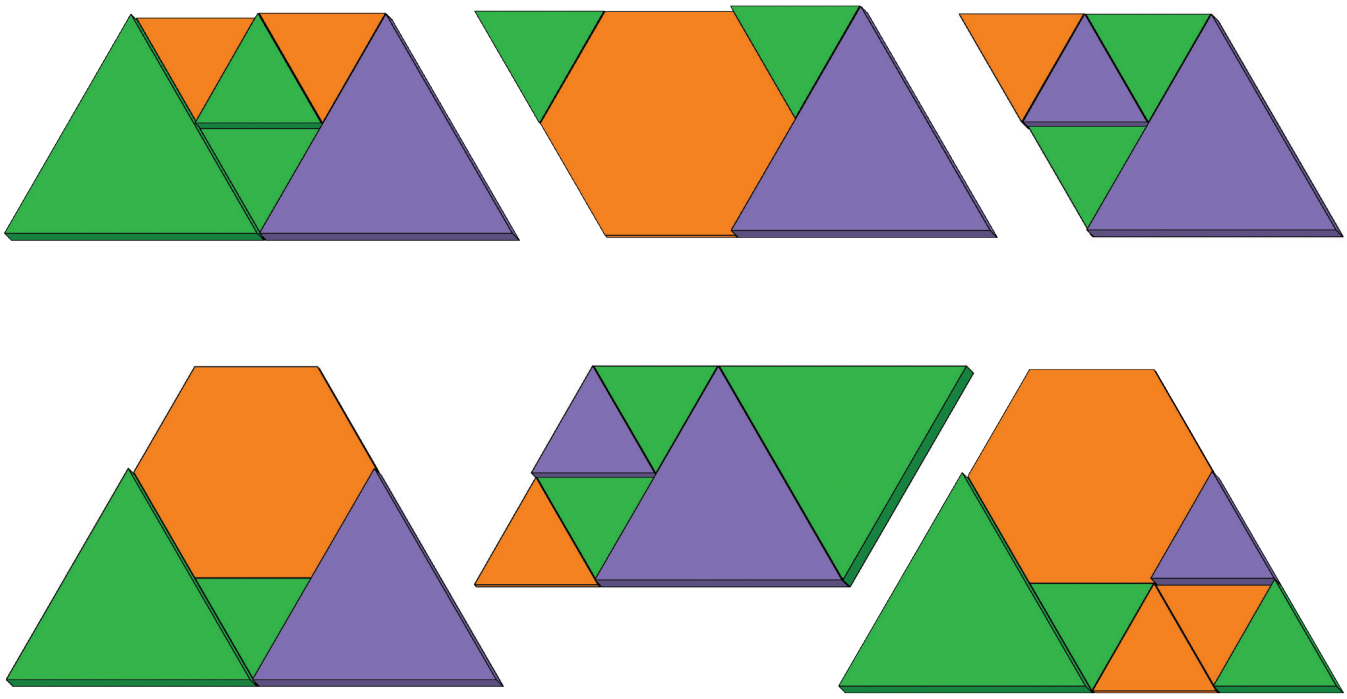


Activity Card 34 solutions:

Four triangles:



Other shapes:

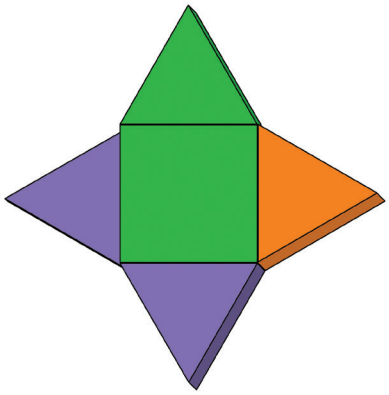


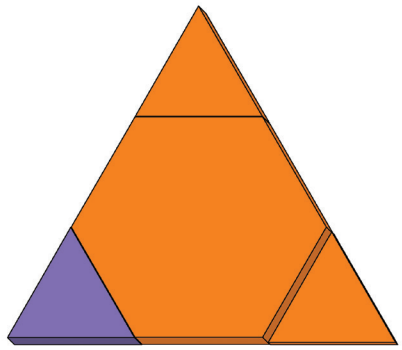
Children can also make their own irregular shapes.

Activity Card 35 solutions:

Children may need assistance with Activity Cards 35 to 40. Many will only be ready to attempt these cards at the end of Grade 1 or early on in Grade 2.

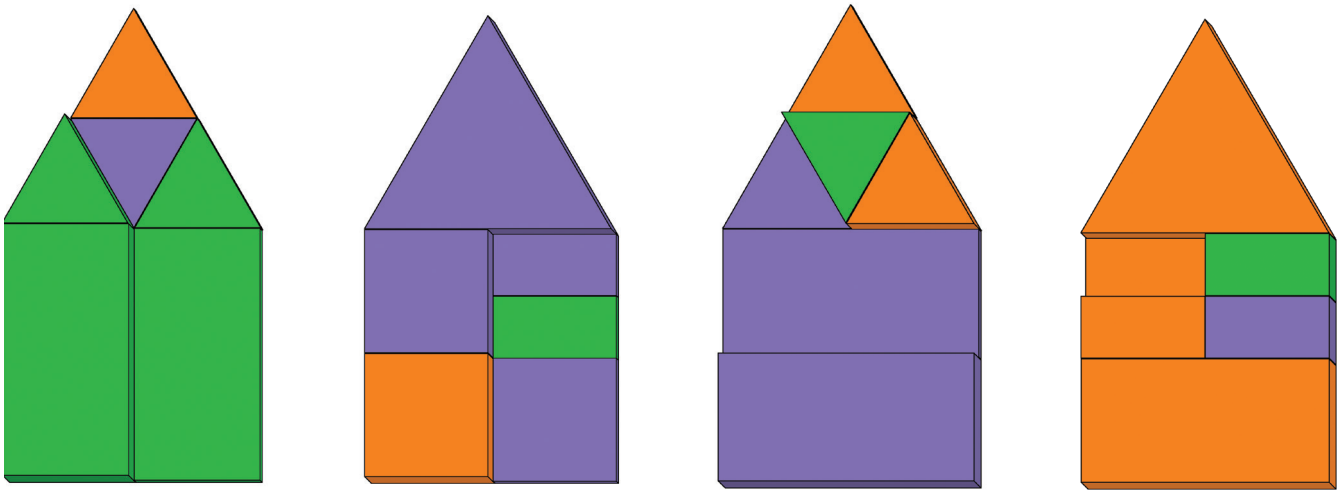
The small and large blocks can be used to make these shapes:



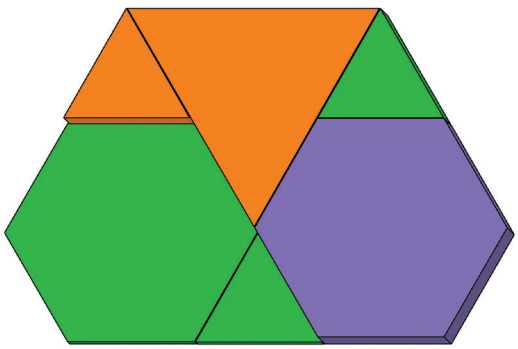


Activity Card 36 solutions:

There are four different ways to make the shape using six blocks.

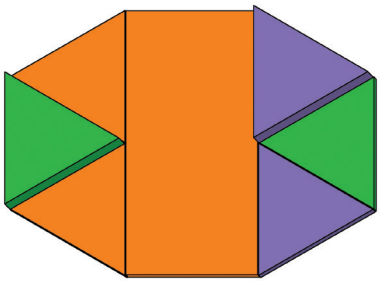


The next shape can be made by using these blocks:

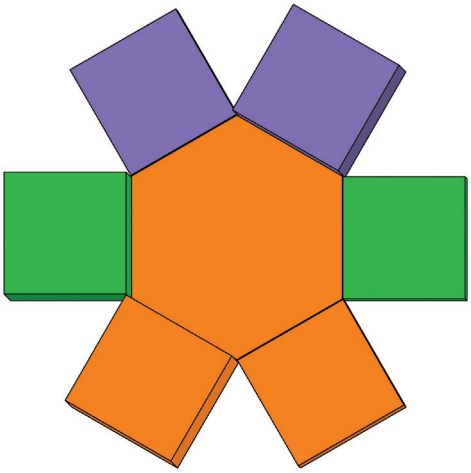


Activity Card 37 solutions:

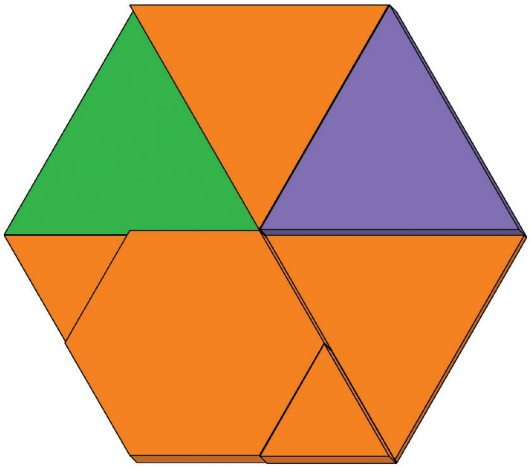
Use all six small triangles and a large rectangle of any colour and thickness to make the first shape.



Use all six small squares and a large hexagon of any colour and thickness to make the second shape.

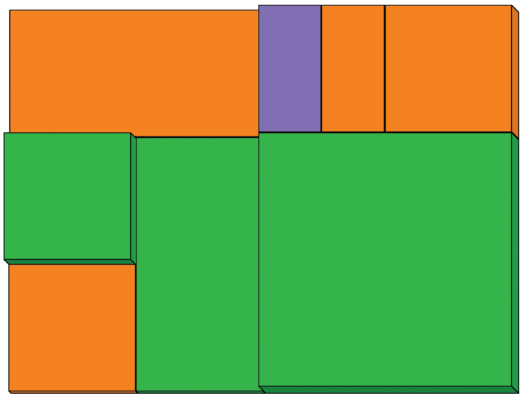


The colours and thickness of the shapes may vary but only this combination of seven shapes and sizes can be used to make the third shape.

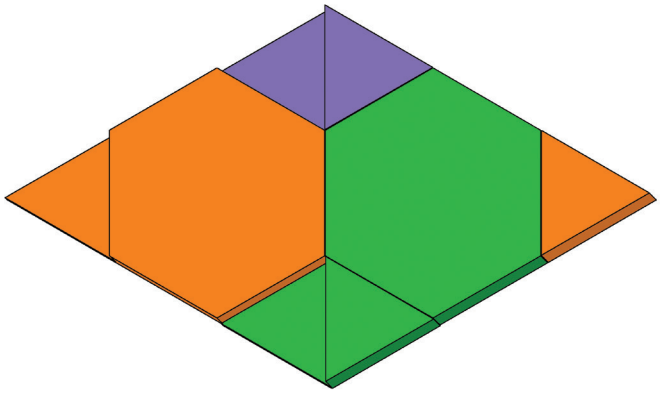


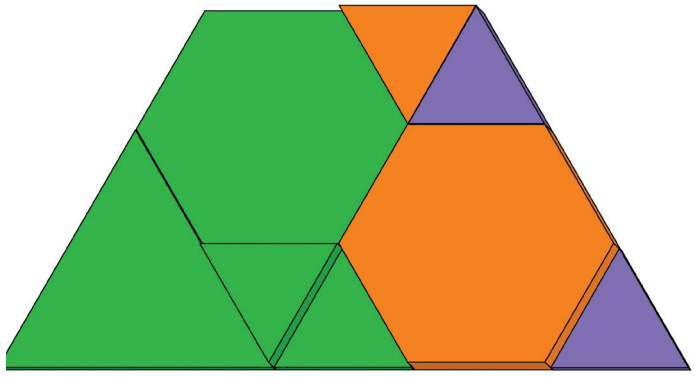
Activity Card 38 solutions:

The position and arrangement of the small and large blocks may change but only this combination of eight blocks can be used to make a rectangle.



The colours and thickness may vary but only these combinations of eight shapes and sizes can be used to make the kite and trapezium.

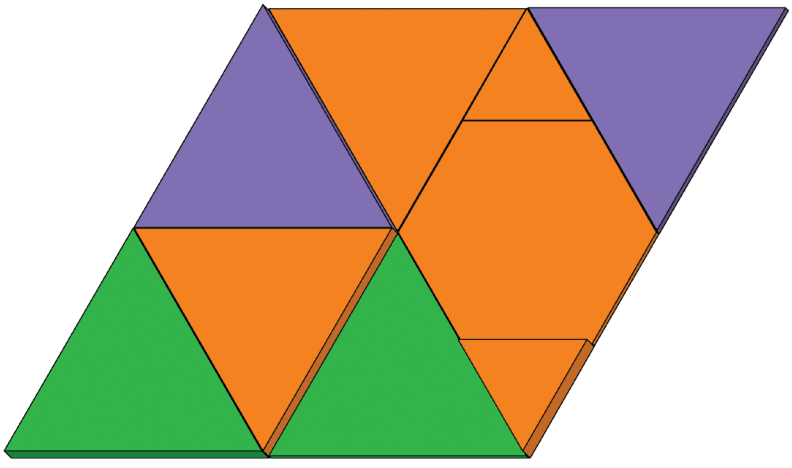




Activity Card 39 solutions:

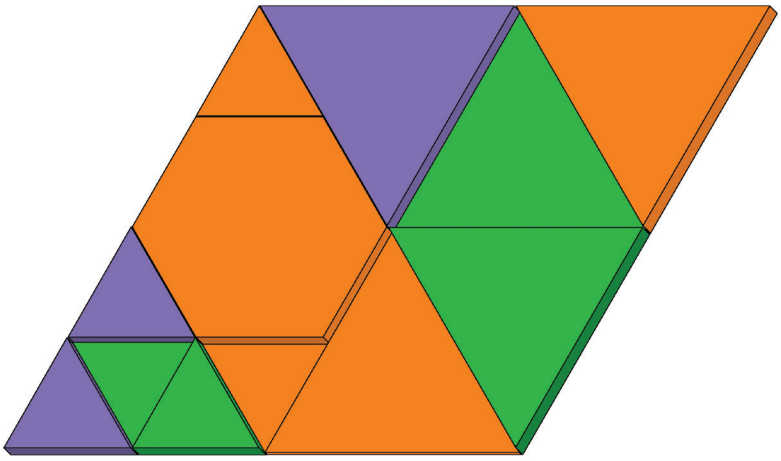
The colours and thickness of the shapes can vary, but only this combination of sizes can be used to make the shapes.

Nine block rhombus:

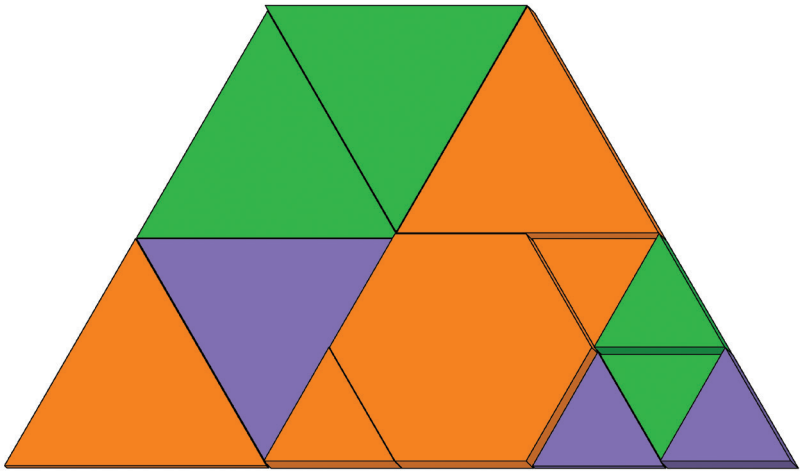


Activity Card 39 solutions continued:

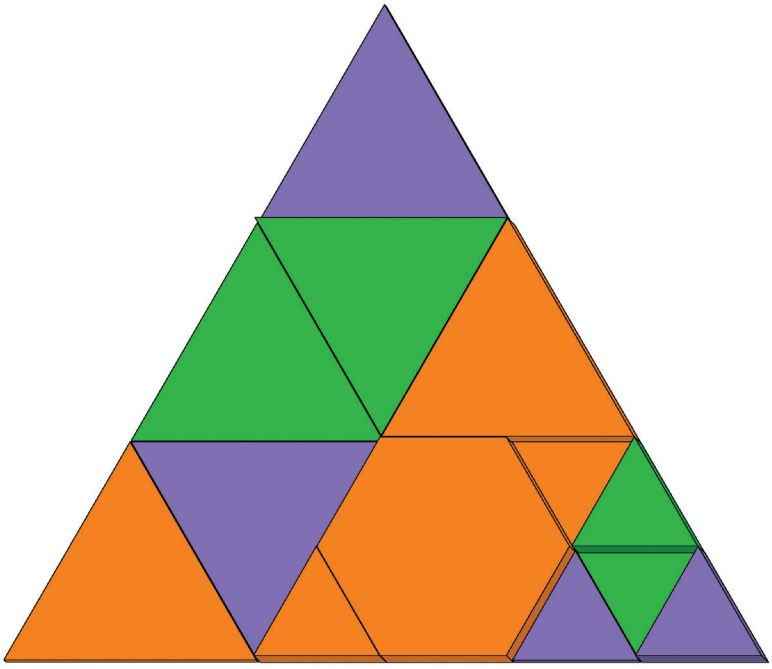
Twelve block rhombus (replace any of the big triangles with four small triangles):



A trapezium is made by moving one large triangle from the corner of the rhombus to create a shorter side then adding it to another side to make it longer.

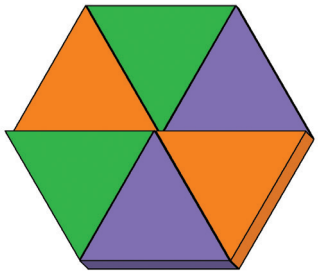


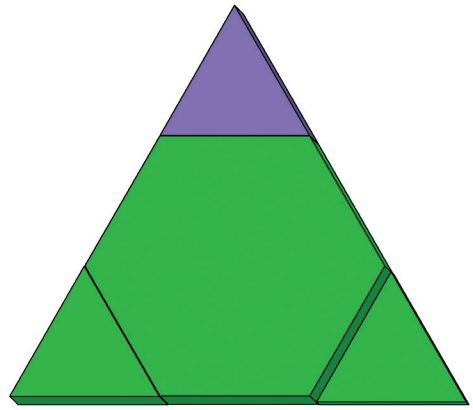
A large triangle block is added to the trapezium to make a triangle.

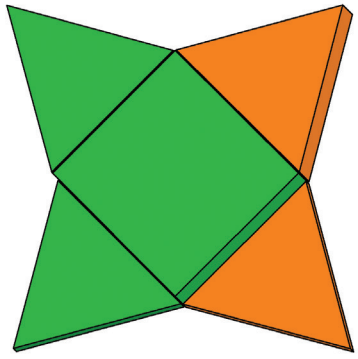


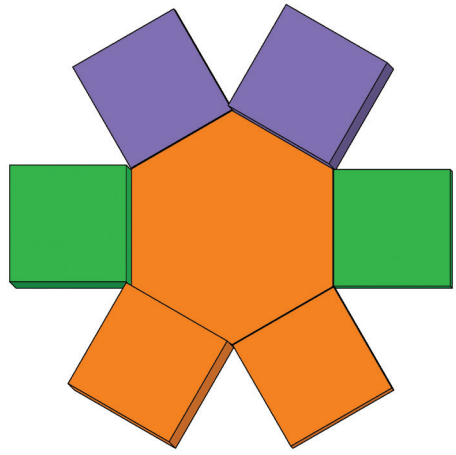
Activity Card 40 solutions:

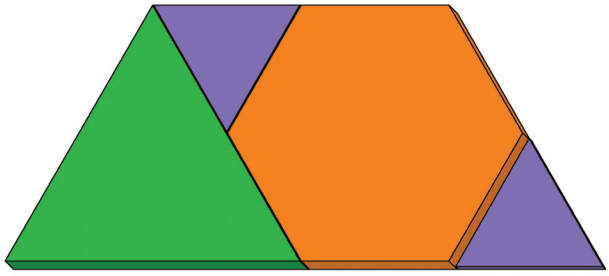
The completed shapes are as follows:

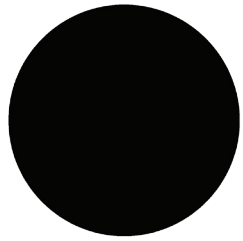












GEOGENIUS VISUALISATION KIT ACTIVITIES

In this activity we expect children to develop:

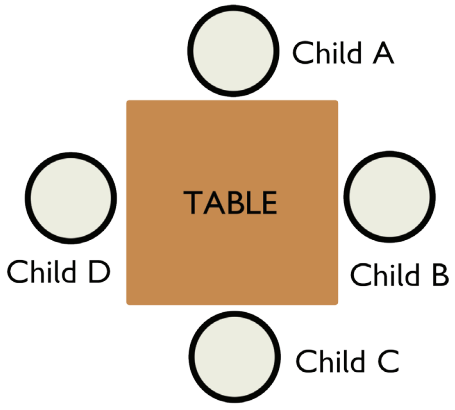
- Confidence in recognising, identifying and describing 2-D shapes (the focus of the activities is on square prisms, rectangular prisms and triangular prisms)
- Confidence in recognising 3-D objects from different positions and positioning 3-D objects in relation to each other
- Confidence in describing positional relationships (alone and/or as a member of a group) between 3-D objects and him/herself and a peer

For this activity you will need:

- GeoGenius Visualisation Kit (at least one kit per 4 children)
- Beginner_1 Card Sets 1 to 6. These come with the GeoGenius Visualisation Kit
- Beginner_2 Card Sets 1 to 6. These can be printed as per instructions from www.GeoGenius.co.za.
- Novice_1 Card Sets 1 to 10. These come with the GeoGenius Visualisation Kit
- Blank view cards. These come with the GeoGenius Visualisation kit. More can be printed from www.GeoGenius.co.za or the Instruction Guide found in the kit.

Teacher's role:

Arrange the children participating in this activity into groups of four. The desks should be arranged so that all four children in the group can face the middle of the table.



General GeoGenius Visualisation kit instructions (also see the instruction book that comes with the kit):

The grid is placed in the middle of the table. For the card set that is being used, each child is given the card that corresponds to their view. Working together, the children in the group select the appropriate block(s) and arrange/rearrange them on the grid until the arrangement of blocks corresponds to the view on each view card. Each child should only look at their own card while the group works together to complete the task.

Initially, as children get used to working with the kit, the teacher may want to place the grid on top of a box in the middle of the table so that the grid is at the children's eye level. Alternatively the children could kneel down to look at the grid from eye level.

In the beginning, the children struggle to accept that their cards do not show depth. The children often want to move the block(s) towards themselves so that they are up against the edge of the grid on the side that they are facing. To help them deal with this, the teacher could ask the children how they think the card would look different if the block was further back or further forward on the grid.

Allow opportunity for the children to complete blank viewing cards. To do this, tell the group to choose any one block in the GeoGenius Visualisation Kit and place it on the Visualisation grid. Give each child a blank view card. Each child in the group should then draw their view (A, B, C or D) of the block on the grid. They should label their view A, B, C or D. When they are done, the children should remove their block from the grid.

Swap viewing cards between the groups so that each group gets another groups set of cards. Ask the groups to use the cards drawn by the other children to reposition the block that that group chose on the grid. The groups may pick up errors. If so, ask them to justify how they can be sure that it is an error. Return the cards back to the original groups to correct errors if necessary.

When each child in the group is satisfied that the arrangement corresponds to the view on their card, lead a reflective discussion that includes answering the specific questions provided for each set of cards.set of cards.

What to expect from the children:

Specific questions for each of the cards are provided for the teacher. The answers that children are expected to give are suggested in green text after each question.

Questions for reflective discussion with expected answers:

<u>Beginner 1 Set 4:</u>

- Does the arrangement look the same on all four cards?
  No. In View A and C the block is a 2 by 3 rectangle and in View B and View D it is a 1 by 3 square.
- Is the arrangement in the same position on all four cards?
  No. In View A, the block is further left than in View C. In View B and View D it is the same.
- Is it possible to place the arrangement on the grid in such a way that every view will be the same in terms of shape and position?
  No. All the dimensions are different lengths.

Beginner 1 Set 5:

- Does the block look the same in all four cards? *No. In View A and View C we see a triangle, but in Views B and D we see a square. The triangles in Views A and C look different in that the triangle in View A slopes up, whereas the triangle in View C slopes down.*
- Is the block in the same position in all four cards? *No. In View A and View D, the block is far right and in View B and View C the block is far left.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking. *No. We could hide the "triangleness" of the block by placing it on one of its triangular faces. If the block is restricted to the gridlines, then no, it is not possible. If the block is not restricted to the gridlines and can be placed exactly in the middle of the grid, then yes, it is possible when the block is placed on the square base.*

Beginner 1 Set 6:

- Does the block look the same in all four cards? *No. In View A and View C we see a triangle, but in Views B and D we see a square. The triangles in View A and View C look different in that the triangle in View A slopes down, whereas the triangle in View C slopes up.*
- Is the block in the same position in all four cards? *No. In View B the block is far left, in View D the block is far right and in View C the block is more right than in View A.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking. *We could hide the "triangleness" of the block by placing it on one of its triangular faces. If the block is restricted to the gridlines, then no, it is not possible. If the block is not restricted to the gridlines and can be placed exactly in the middle of the grid, then yes, it is possible when the block is placed on the square base.*

Beginner 2 Set 1:

- Does the block look the same in all four cards? *Yes, it is a 1 by 1 square*
- Is the block in the same position in all four cards? *No. In View B and View C it is in the same position, but the block is further right than in View A than in View C.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? *Yes, if the block is placed in the middle of the grid then every view will be the same.*

Beginner 2 Set 2:

- Does the block look the same in all four cards? *No. In View A and View C the block looks like a 2 by 2 square but in View B and View D the block looks like a 1 by 2 rectangle.*
- Is the block in the same position in all four cards? *No.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking. *If the block is restricted to the gridlines, then no, it is not possible. If the block is not restricted to the gridlines and can be placed exactly in the middle of the grid, then yes, it is possible when the block is placed on the square base.*

Beginner 2 Set 3:

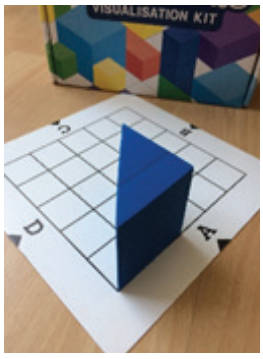
- Does the block look the same in all four cards? *Yes, the block looks like a 1 by 3 rectangle from all views.*
- Is the block in the same position in all four cards? *No.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking *Yes, if the block is placed upright, so that it is a 1 by 3 rectangle, then every view will be the same. when it is placed in the middle of the grid.*

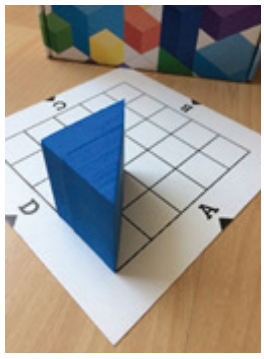
Beginner 2 Set 4:

- Does the block look the same in all four cards? *No. In View A and View C the block looks like a 1 by 2 rectangle. In View B and View D the block looks like a 3 by 2 rectangle.*
- Is the block in the same position in all four cards? *No. In View A and View B the block is far left and in View C and View D the block is far right.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking. *No. All dimensions of the block are different.*

Beginner 2 Set 5:

- Does the block look the same in all four cards? *Yes, it is a 2 by 2 square.*
- Is the block in the same position in all four cards? *No. In View A and View B it is in the same position and in View C and View D it is in the same position.*
- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? *Yes. If the block is placed in the middle of the grid then every view will be the same.*
- Is there more than one way that you can place the block to satisfy the arrangement from all views? *Yes. There are four different ways. The possible ways are:*





Beginner 2 Set 6:

- Does the block look the same in all four cards? *No. From View A and View C the block looks like a 1 by 1 square and from View B and View D the block looks like a 2 by 1 rectangle.*
- Is the block in the same position in all four cards? *No. In View A and View B the block is far left and in Views C and D the block is far right.*

Beginner 2 Set 6 continued:

- Is it possible to place the block on the grid in such a way that every view will be the same in terms of shape and position? Explain your thinking. *If the block is restricted to the gridlines, then no, it is not possible. If the block is not restricted to the gridlines and can be placed exactly in the middle of the grid, then yes, it is possible when the block is placed on the square base.*
- Is there more than one way that you can place the block to satisfy the arrangement from all views? *Yes, there are four different ways that children could place the block. The possible ways are:*

Novice 1 Set 1:

- Do the blocks look the same in all four cards? *Yes, the blue block looks like a 1 by 3 rectangle in all views and the green block looks like a 1 by 1 square in all views.*
- Are the blocks in the same position in all four cards? *No. The blocks are in the same position in Views A and B but in opposite positions in Views C and D*

Novice 1 Set 2:

- Do the blocks look the same in all four cards? *Yes. The blue block looks like a 1 by 3 rectangle in all views, the green block looks like a 1 by 1 square in all views and the yellow block looks like a 2 by 1 rectangle in all views.*
- Are the blocks in the same position in all four cards? *No. In View A and View C the blocks are mirror opposite positions. Similarly, in View B and View D the blocks are mirror opposite positions.*

GEOGENIUS CONSTRUCTION KIT ACTIVITIES

In this activity we expect children to develop:

- Confidence in building given 3-D objects using concrete materials

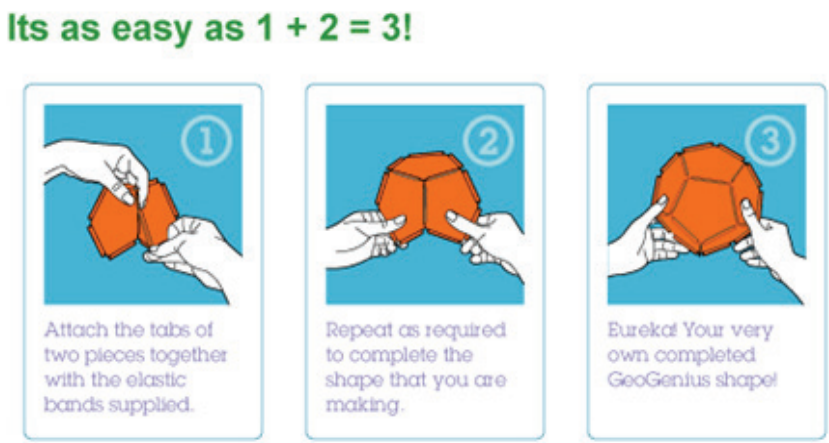
For this activity you will need:

- GeoGenius Construction Kit (at least one Super Kit per 5 children)
- GeoGenius Construction Kit Activity Cards 1 to 10

Teacher's role:

Give each child (or pair of children) a GeoGenius Construction Kit Activity Card and sufficient pieces from a GeoGenius Construction Kit and elastic bands. Tell the children to follow the instructions on the card. The children should be able to work on these cards independently of the teacher. The advantage of working in pairs is that the children can talk about what they are doing. The disadvantage of working in pairs is that only one child can actually do the building at a time. It is not recommended that these Activity cards are done in groups of more than two.

In these activities, the children are going to recreate the polyhedra in the images on the cards, using pieces from the GeoGenius Construction Kit. If the children have not had the opportunity to play with this kit before, the teacher may need to help them by showing them how to use elastic bands to join the tabs.



As the children are working, the teacher could ask them:

- Which shape did you start with?
- Could you have started with a different shape?
- How did you decide which shapes to join together?
- Can you see any patterns in the shapes that you are joining?

Make time for constructions to be taken apart and packed away neatly so that the kit can be used again.

What to expect from the children:

The main focus of these activities is for the children to play with and gradually start to recognise some of the properties of polyhedra.

The children are not expected to use formal mathematical vocabulary yet.

The notes on specific cards give guidance to teachers on what the children may notice, but should not be explicitly taught to the children.

Activity Card 1:

In this activity the children are to make polyhedra using squares, rectangles and (equilateral) triangles. They will build a cube, a rectangular prism (or cuboid) and a triangular prism. The children do not have to know the names of these polyhedra yet, although the teacher may want to encourage the use of the name 'cube'. It is sufficient for children to talk about boxes and differentiate between the rectangular box and the triangular box. Teachers may use the terminology prism.

The children are encouraged to notice that the cube is made up of 6 squares, the rectangular prism is made up of 2 squares and 4 rectangles, while the triangular prism is made up of 2 triangles and three rectangles.

Activity Card 2:

In this activity the children are to make polyhedra using squares and (equilateral) triangles. The base of the pyramid and elongated pyramid are hidden. The intention is for these to be square-based, however children may use triangular bases or even try pentagonal bases. If this happens, use this opportunity to discuss the limitations of 2-D pictures for 3-D objects and how a different view of the object may make it more clear what shape was used at the base.

A square-based pyramid has one square and four triangular faces. An elongated square pyramid has five squares and four triangular faces. The cuboctahedron has 6 squares and 8 triangular faces.

Activity Card 3:

In this activity the children are to use only (equilateral) triangles to create three of the five Platonic solids. The tetrahedron uses 4 triangles, the octahedron uses 8 triangles and the icosahedron uses 20 triangles.

The teacher could ask children if they notice anything special about the points (vertices) where the shapes meet. In all these polyhedra there are the same number of shapes (faces) meeting at every point (vertex). 3 triangles meet at every vertex of the tetrahedron. 4 triangles meet at every vertex of the octahedron and 5 triangles meet at every vertex of the icosahedron.

Activity Card 4:

In this activity children build three types of pyramids. While they may know the vocabulary 'triangle' and 'square', they are not expected to know the name pentagon, but could call it a pyramid with a base that is five-sided.

The children are asked to compare these pyramids. They may describe them in terms of triangles that meet at a point. The difference is the base or shape that the triangles are attached to.

Activity Card 5:
In this activity the children are to build polyhedra from pentagons and (equilateral) triangles. The first polyhedron is a dodecahedron and the second is an icosidodecahedron. The dodecahedron is made from 12 pentagons and the icosidodecahedron is made with 12 pentagons combined with 20 (equilateral) triangles. Neither the children nor the teacher are expected to use or know the names of these polyhedra. The names are simply provided for fun.

Activity Card 6:
In this activity, the children are to build a pyramid, a prism and an anti-prism, all with a pentagonal base. The pentagonal-based pyramid is made using 5 (isosceles) triangles and one pentagon. These triangles meet at a point. The pentagonal-based pyramid is made using 5 rectangles which connect two parallel pentagons. The pentagonal-based anti-prism is made using 10 interlocking (isosceles) triangles which connect two parallel pentagons.

Activity Card 7:
In this activity children use 12 pentagons, 30 squares and 20 (equilateral) triangles to build a rhombicosidodecahedron.

The teacher may want to encourage the children to focus on the vertices and ask what shapes need to be joined to create the point. At every vertex is a pentagon, a square, a (equilateral) triangle and another square.

Activity Card 8:
In this activity children use 8 hexagons, 12 squares and 6 octagons to build a great rhombicuboctahedron.

The teacher may want to encourage the children to focus on the vertices and ask what shapes need to be joined to create the point. At every vertex is a hexagon, a square and an octagon.

Activity Card 9:
In this activity children build five types of prisms and compare the similarities and differences. The triangular-based prism is made from two (equilateral) triangles and three rectangles. The square-based prism is made from two squares and four rectangles. The pentagonal-based prism is made from two pentagons and five rectangles. The hexagonal prism is made from two hexagons and six rectangles. The octagonal-based prism is made from two octagons and eight rectangles.

All the prisms are made by joining two identical shapes with rectangles. It is the shape joined by the rectangles that is different in each prism.

Activity Card 10:
In this activity the children are to use 12 pentagons and 20 hexagons to build a truncated icosahedron. The teacher may want to encourage the children to focus on the vertices and ask what shapes need to be joined to create the point. At every vertex are two hexagons and a pentagon.

CONNECTING CUBES ACTIVITIES

In this activity we expect children to develop:

- Confidence in building given 3-D objects using building blocks
- Opportunities to describe one 3-D object in relation to another

For this activity you will need:

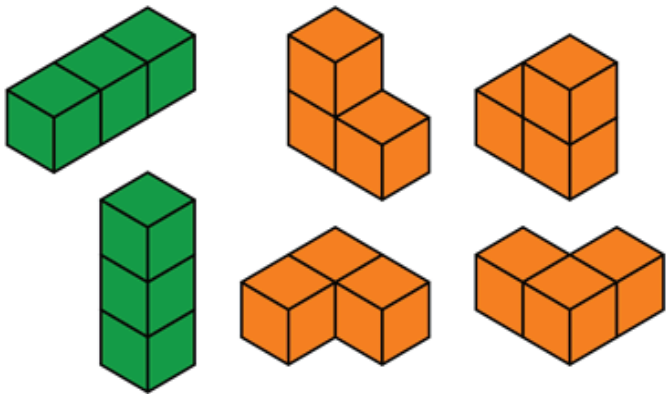
- 40 connecting cubes per child
- Connecting Cubes Activity Cards 2 and 5 to 12

Teacher's role:

The children are able to work on these cards independently of the teacher and can work individually or in pairs.

Each child will need no more than 40 connecting cubes and an Activity Card. In these activities, the children are not expected to build the structures using the same colour connecting cubes as in the picture.

When possible, the teacher should take the opportunity to observe how the children join the connecting cubes and informally assess how the children think about the objects.



It is important that the children start to recognise that holding a shape in a different position does not make it a different shape. The two green shapes are the same and all the orange shapes are the same.

In Activity Card 2, the children investigate how many different shapes they can make with 3, 4 and 5 connecting cubes.

In Activity Cards 5 to 10, the children are required to build shapes and analyse which shapes are the same. The children are also expected to consider the possibility that some blocks could be hidden in the 2-D representation.

In Activity Cards 11 and 12, the children are to consider what the 2-D representation of the 3-D arrangement will look like from different views. They are not yet expected to draw these representations. Ask the children what they notice about the opposite views. We would like them to start to notice that these views are the mirror reflections of each other.

What to expect from the children:

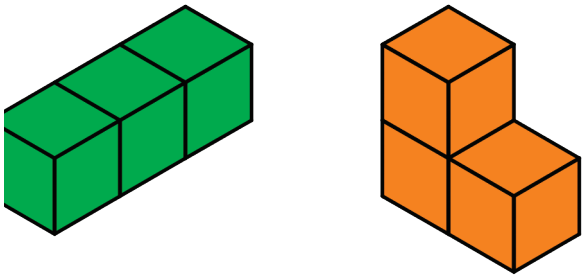
The main focus of these activities is for children to play with and gradually start to recognise the interconnectedness of a 3-D arrangement and its 2-D representation.

Children should become aware that some blocks may be hidden in the 2-D representation (depending on from what view it is represented from).

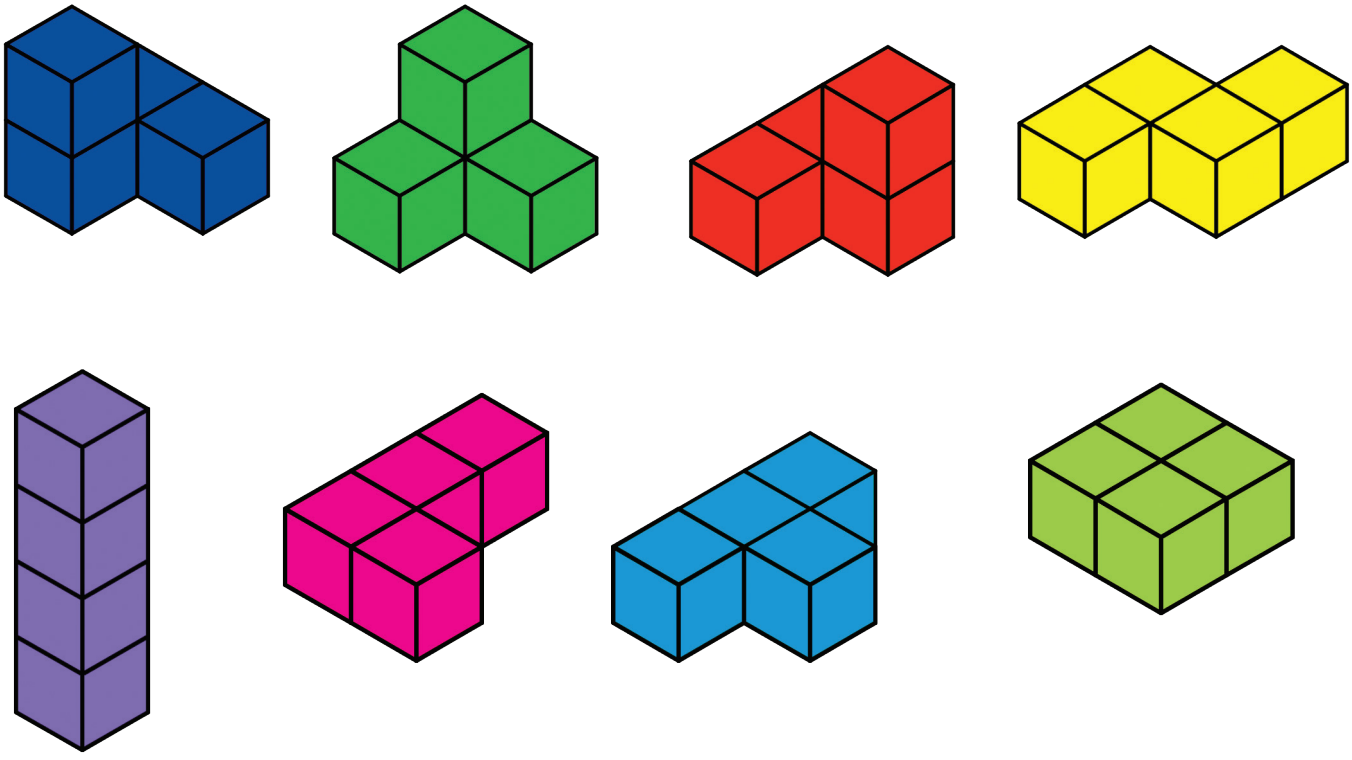
When children consider views, they often find it difficult to accept that the 2-D representation does not show any depth but only the outline of what we see.

Activity Card 2 solutions:

There are only two different ways to join 3 blocks.

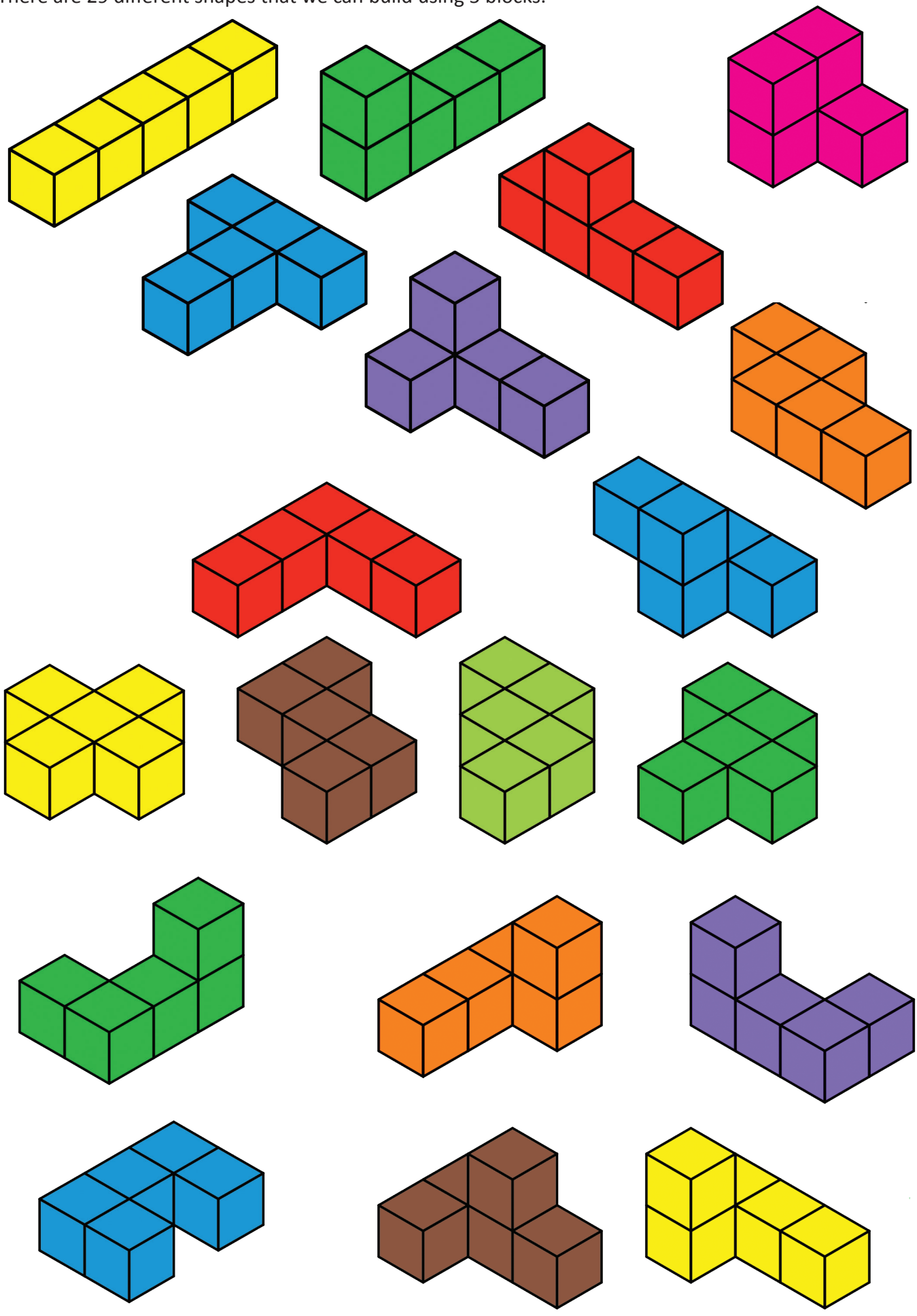


There are eight different shapes that can be built using 4 blocks.

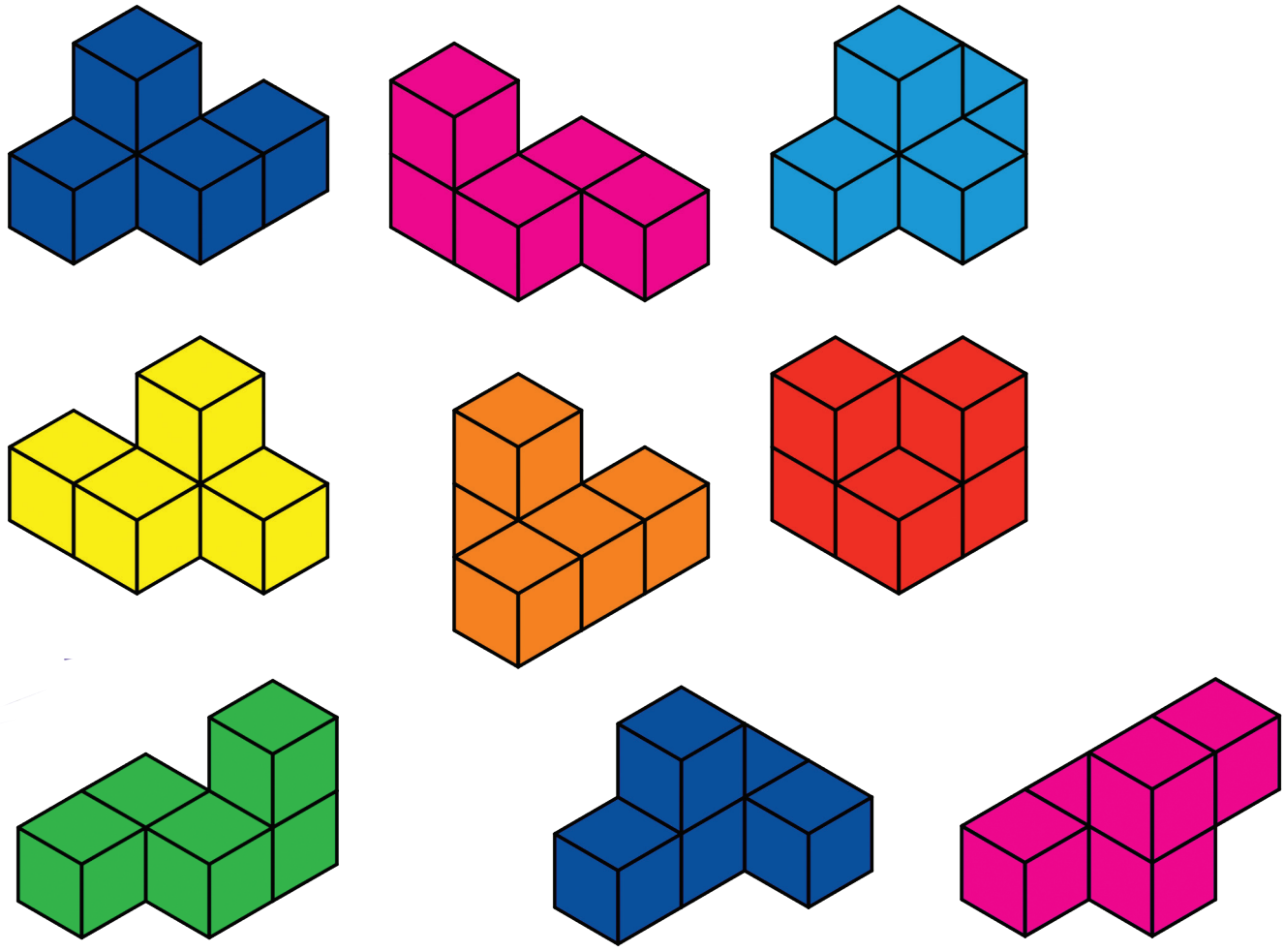


Activity Card 2 solutions continued:

There are 29 different shapes that we can build using 5 blocks.



Activity Card 2 solutions continued:

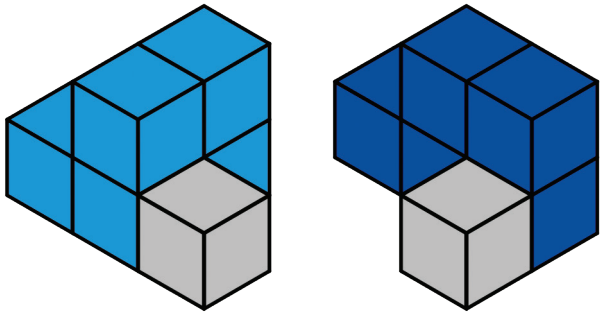


Activity Card 5 solutions:

None of the shapes are the same.

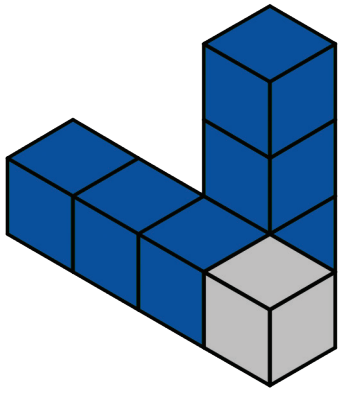
Activity Card 6 solutions:

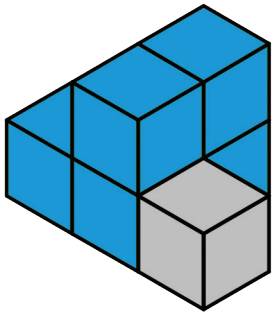
A and C are the same and B and D are the same. The others are different, however, there exists the possibility that there is a seventh block hidden behind A and a seventh block hidden behind B. The illustration below shows A and B from a different view where the possible seventh block is visible.



Activity Card 7 solutions:

A and B use only 6 blocks. C and D could use 6 or 7 blocks. The 7th block is hidden in the image of C and D that can be seen. The illustration below shows C and D from a different view where the possible 7th block is visible.





Activity Card 8 solutions:

A, B and C are not the same. It is possible to build A with a seventh cube that is hidden in the view given.

Activity Card 9 solutions:

The shapes are the same because they all have 5 connecting cubes joined to form an 'L-shape'. The position of the sixth cube, which is placed on top of the 'L', is what is different in each shape.

Activity Card 10 solutions:

A and C are the same. D is the mirror image of A and C, but they are not the same.

Activity Card 11 solutions:

6 blocks are used (presuming none are hidden).
Image 1 could be the view from D or from B.
Image 2 is the view from C and image 3 is the view from A.

Activity Card 12 solutions:

6 or 7 blocks can be used. If the children use seven blocks, image 2 is not possible from any of the four views so the children will need to revise their construction to use only 6 cubes.
Image 1 is the view from D. Image 2 is the view from both A and C. Image 3 is the view from B.

Measurement

INTRODUCTION

Human beings have always had, and continue to have, a fascination with and a need to compare, measure and quantify. In this section, we want children to experience measurement as part of our natural desire to compare and contrast, doing so with increasing sophistication as they move through the early years of development.

Measurement involves the comparison of an attribute of an object or situation with a unit that has the same attribute: length with centimetres or metres; mass with grams and kilograms and so on. This section has been grouped into a part that deals with time and another that deals with the attributes capacity, mass (or weight), length, area and volume.

The study of measurement in the activities of these teacher guides also provides a very useful context for collecting data which can be meaningfully analysed to draw conclusions, i.e. a link to Data Handling.

RESOURCES

See resources under separate Time and Capacity, Mass (Weight), Length and Area sections.

Measurement: Time

The main focus in the early years is to develop children's understanding of how the world is organised through time. This happens by providing children with a concrete experience of time on an everyday basis.

Children in Grade R and at the beginning of Grade 1, who have not yet been exposed to the structured school environment, would mostly have developed an understanding of social time at home – "I go to bed when mom says so" or "When I finish my drawing, I will have juice". At this age, children are in the pre-operational stage, according to Piaget, and they cannot engage in logical thought, separate ideas, make mental representations of ideas or reverse the sequences of events. This limits their understanding of time.

As children start attending school (5-7 years old), learning about time should be aimed at developing formalised ideas about time and the understanding that, culturally and socially, life is structured through time. The focus is on learning the language of time, and talking about time in the context of the routines at school. Learning time words: before, after, morning, afternoon, evening, tomorrow, yesterday, last week, early, late, longer and shorter is of particular importance. Sequencing events is another important part of learning about time that is supported by the learning of the language of time.

At this stage one can start to associate schedules with clock time: "Break is at 10 o' clock", "School starts at 8 o' clock", etc. Children at this age will have difficulty understanding elapsed time and time in the future. Awareness of when events occur is still limited. For instance, a child might not know today is their birthday unless someone tells them.

Children in Grade 2 and 3 (age 8 -9) are beginning to move towards the concrete operational stage. They have a better understanding of so-called physical time that is measured with clocks and watches. They are also ready to start keeping track of time using clocks and watches and to learn about units of time.

At first, telling the time using an analogue clock is very confusing for children. The numerals on an analogue clock have dual meanings. Not only do they refer to the hour, but also to multiples of five minutes. Having a clock on the classroom wall that the teacher points to regularly during the day and says "It is now eight o' clock" etc. plays an important role in the development of an understanding of time.

Although children are able to think more logically at this point, working with the time concept should still be concrete and related to their day-to-day experience of time. Children can be given hands on activities such as using stop watches to time the baking of a cake, how long it takes to eat lunch, etc. in order to develop the time concept and its measurement in a concrete way.

Time cards

It is with this background in mind, that we have developed a set of cards that can be used to facilitate the learning of time in the Foundation Phase. Teaching with the cards as a resource takes the approach that the learning of time is experiential with a strong focus on developing children's ability to sequence

events and on learning the language of time. It aims to develop children's understanding of time as a real world experience.

The ***NumberSense Event Cards*** are designed to offer tasks and games that develop children's ability to sequence events whereas the ***NumberSense Telling Time Cards*** are aimed at developing children's knowledge of physical time.

The time card tasks are intended for small group teaching on the mat. The complexity of the tasks and games increases as more cards are added. The ***NumberSense Event Cards*** illustrate events that generally form part of a child's daily routine. This provides for familiarity with the duration of events and for an everyday point of reference. The activities start by sequencing a small number of events and as more events are added, the activity becomes more interesting and complex. The tasks centre on sequencing, duration of events and sorting events according to the time of day. The cards, each depicting an event, come in four sets arranged by colours: red, blue, green and purple and represent increasingly complex situations. In total there are 28 event cards that can be used in the tasks and games suggested here.

The ***NumberSense Telling Time Cards*** add the dimension of physical time. The purpose of this set of cards is for children to learn to tell time using analogue and digital clocks in 12 hour time and to develop children's ability to associate hours of the day with events. Children progress from telling the time in hours, then half hours, quarter hours and finally, five minute intervals. They become familiar with the different time formats as they match the analogue clocks, digital clocks and time in word cards. They practise elapsed time by comparing the time on clock faces.

The ***NumberSense Telling Time Cards*** also come in four sets that represent increasingly complex measures of time. The sets are arranged by **col**our and each set of cards consists of a card with an analogue clock, a card with a matching digital clock face and one with the matching time given in words for each of the times in the set. There are a total of 52 cards in a pack.

The activities described in this guide should be repeated frequently, changing the cards and adding more cards as the children gain confidence with the different concepts associated with time.

RESOURCES

Resource	**Number required**	**Available from**
NumberSense Event Cards	1 pack per class	Brombacher & Associates
NumberSense Telling Time Cards	1 pack per class	Brombacher & Associates
Analogue wall clock	1 per classroom	
Digital wall clock	1 per classroom	
Analogue clock with moveable hands	1 per classroom	

ACTIVITY 1: SEQUENCING DAILY ROUTINES

In this activity we expect children to develop:

- Confidence in ordering recurring events in their daily lives
- The ability to discuss their daily routines using words such as before and after

For this activity you will need:

- The red and/or blue NumberSense Event Cards.

Teacher's role:

- Work with one group of children at a time on the mat. This activity can be included as a component in the daily mat routine once a week.
- Shuffle the cards and select 4 to 8 of the red and / or blue cards.
- Place the cards on the mat in no particular sequence. See the example below:

- Ask the children to describe what is happening in each card.
- Ask the children to arrange the cards according to the sequence in which the events on the cards occur during a typical day.
- Ask the children to explain why they placed the cards in the sequence that they did. You could ask questions such as:
    - What do you do first?
    - What happens before this picture? And after this one?
    - What time of the day does it happen?

- Do we all do things in the same order? Is there something you do differently to your friend?
- What else do you do in the day? When do you do it? Before or after which of these events?
- Which event(s) happen in the afternoon? And in the evening?

- Repeat the activity frequently, changing the cards and adding more cards as children gain confidence in sequencing the events on the cards.

When sequencing the events on the cards, bear in mind that children may not all have the same daily routine, or their routine might follow a different sequence, so allow for this variation when discussing their solutions.

What to expect from the children:

Sequencing is an essential aspect in the development of the time concept. Children in Grade R to Grade 2 have had little formal experience with the concept of time. The structured school environment is their first experience of daily life being organised by and around time. This activity is aimed at developing children's ability to sequence events and uses children's daily routines as a familiar starting point.

The focus here is not only to place events in the correct order, but to gradually learn "time words" such as: *before, after, in the day, at night, in the morning, in the afternoon*, *during the evening* and so on.

While children may be able to sequence the events in the order that they occur, based on their experience of what they do each day, they may not yet be able to link the time of day to each event.

Linking the events on the cards to the time of day is introduced in later activities and grades. For now, it is important that children are given frequent opportunities to describe and sequence the events on the cards and to use the "time words" (listed above) in their descriptions.

ACTIVITY 2: SEQUENCING ACCORDING TO MORNING, AFTERNOON AND EVENING

In this activity we expect children to develop:

- Fluency in ordering events according to morning, afternoon and evening
- Increased knowledge of vocabulary that expresses how they link their activities to the time of the day
- Greater awareness of how their actions are structured according to time

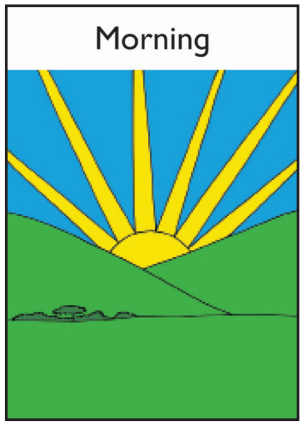
For these activities you will need:

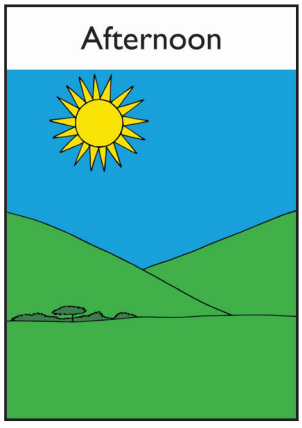
- The blue and/or green NumberSense Event Cards

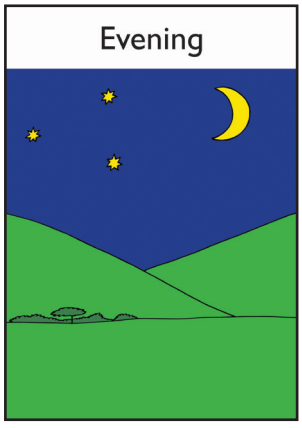
Teacher's role:

Part 1

- Work with one group of children at a time on the mat. This activity can be included as a component in the daily mat routine once a week.
- In the pack of NumberSense Event Cards, you will find three Time of Day Cards (*morning*, *afternoon* and *evening*) with a grey background. Place the *morning*, *afternoon* and *evening* cards on the mat.
- Shuffle the rest of the cards in the pack.
- Let the children take turns to draw a card from the pack.
- Ask the child to say whether the event occurs in the morning, in the afternoon or in the evening and let them put down their card under the appropriate "time of day" card (see the example below).







I eat breakfast.

I play sport.

I go to bed.

- Repeat until everyone has had at least one turn.
- Repeat the activity frequently, changing the cards and adding more cards as children gain confidence in classifying the events on the cards.

Part 2

- After completing the previous activity, the cards will be arranged according to morning, afternoon and evening. Let the children take turns to draw one card from the morning pile, one card from the afternoon pile and one card from the evening pile.
- Each child must tell a story with the three cards making reference to the times of the day. See the example below:

  "In the morning I get dressed for school. I watch TV in the afternoon and eat dinner with my family in the evening."

I get dressed for school.

I watch TV.

I eat dinner.

- Repeat the activity frequently, changing the cards and adding more cards as children gain confidence in classifying the events on the cards.

Part 3

Discuss the morning, afternoon and evening events by asking questions like:

o How do you know if it is morning, afternoon or evening?

o Tell me about some of the things that you do in the morning, in the afternoon and in the evening?

- Do you do the same things every day of the week?
- How are Saturdays, Sundays and school holidays different?

What to expect from the children:

In this activity children become increasingly aware of the different times of the day which is an important step towards learning about time.

By linking the events on these cards to the different times of the day (morning, afternoon and evening) children are increasing their “time” vocabulary.

Children are starting to orientate themselves in time. Children become aware of the notion of structuring their actions according to a certain point in time.

Continue to encourage children to use “time” words and to describe their actions using these words.

In sequencing the events, children might initially still sequence events without taking the time of day (morning, afternoon and evening) into account.

ACTIVITY 3: DURATION

In this activity we expect children to develop:

- Awareness of the duration of events
- The ability to compare the duration of two or more events
- Confidence in ordering events according to duration
- Vocabulary to describe the duration of events using words such as: faster, slower, longer and shorter

For these activities you will need:

- The red and/or blue NumberSense Event Cards

Teacher's role:

- Work with one group of children at a time on the mat. This activity can be included as a component in the daily mat routine once a week.
- Select either the red or blue NumberSense Event Cards.
- Shuffle the cards.
- Let the children take turns drawing two cards from the pack. Let them place the cards side by side. For example:
- Ask each child to say which of the two events on the cards takes longer. Let the child order the two cards according to duration.
- Ask children to explain how they know that the one event takes longer than the other.
- Encourage children to use time words such as slow, quick, short, fast and long as well as slower, faster, quicker and longer etc. to describe the duration of the events.
- When stating which activity takes longer, encourage them to do so using sentences such as "going home takes longer than eating dinner".
- Put the cards back in the pack, reshuffle and repeat the activity.
- Repeat the activity frequently, changing the cards, and as the children gain confidence in comparing the duration of the events on the cards, increase the number of cards in the set that you use.

I go to bed.

I go home.

What to expect from the children:

In this activity children develop awareness that events have duration. Understanding duration of events is an important part of learning about time and how life is organised around it. The focus is not just on learning about duration, but also on learning the vocabulary to describe duration. This includes words such as *fast*, *slow*, *longer* and *shorter*. Continue to encourage children to use these words.

Note that even if two events take almost the same time, this can form part of the discussion. For example, eating dinner and eating lunch might take the same amount of time for some children, but be different for others. You could ask questions like:

- Why does it take longer for your friend to eat lunch than it does for you?
- Why does dinner take longer than lunch at your house?
- It takes longer for your friend to walk home than it does for you to walk home. Why is that?
- Are there any events that take all of us the same time to complete?

When ordering the duration of the events on the cards, bear in mind that children may not all have the same daily routine, or that the events of their routines do not all take the same time. Allow for this variation when discussing their solutions.

ACTIVITY 4: MATCHING ANALOGUE CLOCKS, DIGITAL CLOCKS AND WRITTEN TIME

In this activity we expect children to develop:

- The ability to tell the time in hours, half hours, quarters of an hour and minutes on analogue and digital clocks
- An understanding of the different formats in which time is represented

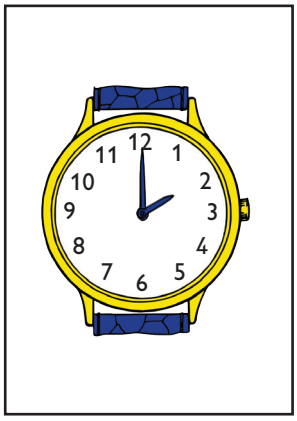
For this activity you will need:

- The red, blue and/or green NumberSense Telling Time Cards

Teacher's role:

Part 1 (Matching clock faces and written time)

- Work with one group of children at a time on the mat. This activity can be included as a component in the daily mat routine once a week.
- Select cards from the NumberSense Telling Time Cards. Make sure that you select cards that are matched to the confidence level of the group that you are working with. Children should first work with whole hour times, then time involving half hours, then quarters of an hour and finally minutes. Use only the cards with the analogue clock faces and the cards with the written time. Set the cards with the digital clock faces aside for now.
- Place the cards with the written time on the mat in no particular order.
- Shuffle the remaining cards with the analogue clock faces.
- Let the children take turns to draw a card from the pack of cards with the analogue clock faces. For example:



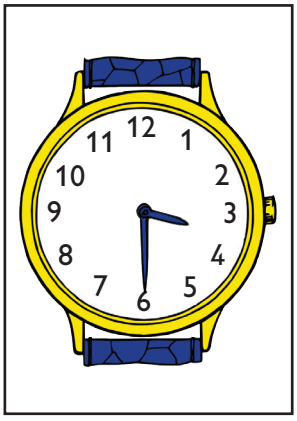
- Once they have drawn the card, ask them to tell the time on the clock (two o' clock).
- Ask the child to find the matching card with the written time that has been placed on the mat and place the clock face and corresponding time card on the mat. For example:

two o'clock

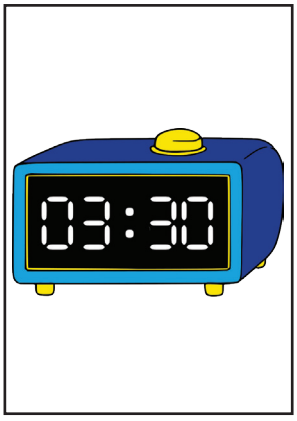
- The game can be repeated by using the cards with the digital clock faces instead of the analogue clock faces to match to the written time.

Part 2 (Matching analogue clock faces to digital clock faces)

- Select cards from the NumberSense Telling Time Cards. Make sure that you select cards that are matched to the confidence level of the group that you are working with. Children should first work with whole hour times, then time involving half hours, then quarters of an hour and finally minutes. Use only the cards with the analogue clock faces and the cards with the digital clock faces. Set the cards with the written time aside.
- Place the cards with the digital clock faces on the mat in no particular order.
- Shuffle the cards with the analogue clock faces.
- Let the children take turns to draw a card from the pack of cards with the analogue clock faces. For example:



- Once they have drawn the card, ask them to tell the time on the clock (half past three).
- Ask the child to find the matching card with the digital clock face that has been placed on the mat.
- The game can be played the other way around by placing the analogue clock faces on the mat and having the children match the cards with digital clock faces instead.



What to expect from the children:

Telling the time on a clock is very confusing at first. For this reason it is important that the children are used to their teacher pointing to the clock on the classroom wall and saying “It is two o’clock” etc. at regular intervals during the day. Only after they have experienced this for several weeks/months will they be ready for these activities. Ideally there will be a large analogue clock next to a large digital clock that the teacher can refer to.

This can be a challenging set of activities for children as they are converting between digital time, analogue time and written time. Because of the frequent references that the teacher has made to the clock on the wall in the class in the weeks before starting these activities, it is hoped that the children will gain confidence quickly.

ACTIVITY 5: TELLING THE TIME

In this activity we expect children to develop:

- An understanding of the link between events in their daily lives and clock time
- Confidence in telling time in analogue, digital and written format and to associate times of the day with events in their lives
- Awareness of the time of the day at which certain events typically happen

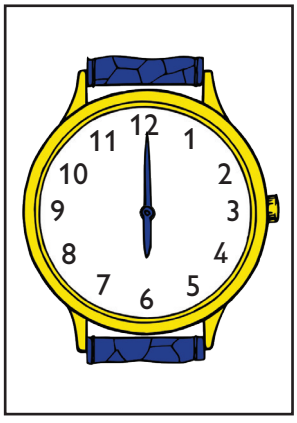
For these activities you will need:

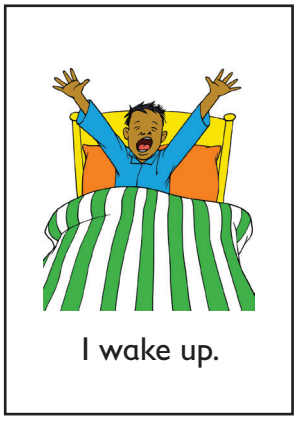
- The red and blue NumberSense Telling Time Cards and NumberSense Event Cards

Teacher's role:

Part 1

- Work with one group of children at a time on the mat. This activity can be included as a component in the daily mat routine once a week.
- Select cards from the NumberSense Telling Time Cards and the NumberSense Event Cards. Make sure that you select cards that are matched to the confidence level of the group that you are working with. Children should first work with whole hour times, then time involving half hours, then quarters of an hour and finally minutes.
- Select the Event Cards that you will use and place them on the mat. From the Telling Time Cards select either the Analogue Time Cards, the Digital Time Cards or the Written Time Cards. Put the remaining Telling Time Cards away.
- Let the children take turns to select an Event Card, to say at what time the event typically takes place and to select the corresponding Telling Time Card.
- For example, if the child selects the Event Card: "I wake up" they may say that it happens at six o' clock and select the corresponding Telling Time Card (analogue, digital or written time depending on what the teacher has selected) that shows six o' clock. The child then puts the two cards down next to each other on the mat.





Part 2

- Select cards from the NumberSense Telling Time Cards. Make sure that you select cards that are matched to the confidence level of the group that you are working with. Children should first work with whole hour times, then time involving half hours, then quarters of an hour and finally minutes.
- Use the cards with the analogue clock faces. Put the cards down on the mat in no particular order.
- Ask “At what time does ….?” type questions and let the children take turns to answer the question and select the corresponding Telling Time Card. Involve the rest of the group in a discussion on whether or not the child’s answer is reasonable. Possible questions include:
    - At what time do you eat breakfast?
    - What time of the day do you go to bed?
    - At what time does school close?
    - At what time is break?
    - At what time will you go to bed this evening etc.?
- The game can be repeated using the Digital Time Cards and Written Time Cards.
- As an extension to the activity, ask children to give the time of the event in more than one format. Use two types (for example, the cards with the analogue clock and digital clock faces) or all three types of cards (analogue clocks, digital clocks and time in words) to play the game this way.

Part 3

- Select cards from the NumberSense Telling Time Cards. Make sure that you select cards that are matched to the confidence level of the group that you are working with. Children should first work with whole hour times, then time involving half hours, then quarters of an hour and finally minutes.
- Use analogue clock faces. Put the cards down on the mat in no particular order.
- Let the children take turns to select a card (or work with the card that you provide to them). Each child must read the time on the card out loud and think of an activity that they do at this time of the day. Involve the rest of the group in a discussion on whether or not the child’s answer is reasonable.
    - For example, you can ask, “What happens at nine o’ clock?” Encourage the child to respond using a full sentence. For example, "At nine o’ clock I like to have a snack".

- The game can be repeated using the Digital Clock Cards and Written Time Cards.
- As an extension to the activity, use two types (for example, the cards with the analogue clock and digital clock faces) or all three types of cards (analogue clocks, digital clocks and written time). Or, ask the children to draw a card (for example, an analogue clock face) and its matching Digital Time Card or Written Time Card and to state what they do at that time.

What to expect from the children:

Children might not yet be aware of, or be able to connect the time of day and events that occur. Before attempting this activity, make sure children are confident in telling the time using digital and analogue clocks (Activity 4). Ideally, there should be a large analogue clock next to a large digital clock on the wall of the classroom that the teacher refers to frequently. The teacher should regularly point to both clocks on the wall, ask children what time it is and to describe what they are doing. Ask questions like:

- What time is it now? What are we doing now?
- Can you remember what time you came to school?
- What time do we go home?
- It is now 10 o' clock. What do we usually do now?
- What happens at two o' clock?

Through these discussions children begin to understand how events in life can be described in terms of the time at which they occur. They also come to realise that, generally, life is organised by time. Eventually they will develop the ability to manage their lives in terms of time.

When children say the time at which events occur, lead a discussion about how they know. They could respond by saying, for example, that their mothers tell them, or that they look at the clock to know. If they look at the clock, ask them to describe the clock face at that time.

It is an important developmental step for children to link events to the time of day. They should be given frequent opportunities to experience and describe the times of the day at which events typically take place and also to list events that typically take place at different times of the day.

Measurement: Capacity, Mass (Weight), Length and Area

The development of an understanding of measurement follows a similar progression irrespective of the attribute (capacity, volume, mass, length or area) being measured.

1. First, children must develop an **awareness of the attribute**. This is achieved through **comparing, ordering and matching** different objects with the attribute.
2. Next, children must learn to **quantify the attribute** accurately, using units which develop from non-standard and informal units to more formal units.
3. Finally, the children come to **use standard units and perform calculations** in measurement contexts.

Developing an awareness of attributes

To support children in developing an awareness of the different measurable and comparable attributes that an object has, the early activities in this guide focus on children comparing objects by filling them in order to develop an awareness of volume/capacity, using a balance to compare objects in terms of their weight, and comparing the lengths of objects by both direct comparison and using informal length units.

Quantifying attributes

Objects can often be compared in terms of one or other attribute by means of direct comparison; for example by holding them next to each other, or picking them up to feel which is heavier and which is lighter. As the difference in the attribute being compared becomes smaller, so it becomes harder to compare the objects by direct comparison and it helps to be able to quantify the attribute. Initially this is done using informal units.

Quantifying the attribute also helps to answer questions such as: How much more does the larger object hold? How much heavier is the larger object? How much longer is the larger object? In the early activities in this guide, children quantify (measure) attributes using non-standard, but familiar units such as cups, paper clips, unifix cubes, beans, marbles and toothpicks. The activities are carefully structured to help children develop an awareness of how the choice of measuring units can impact on both the efficiency (ease) with which the attribute is measured and the precision of the measure.

Throughout the activities, children should be encouraged to estimate before measuring. Initially these estimates may be no more than guesses. Estimating involves the children in developing a sense of the "muchness" of the unit. Children should also reflect on the appropriateness of the units used to measure an attribute. For example, using a cup to determine the volume of a bucket is probably more sensible than using a tablespoon.

The activities also support the development of the awareness that using non-standard units (e.g. hand spans, arm lengths and paces for length) creates difficulties and that there is value in using standardised units.

Using standard units and calculations

The value of using standardised units often follows from the experiences of different people using different informal and non-standard units to measure and compare the attributes of objects. That said, children should also realise that the choice of standard unit is for the most part arbitrary and the metric system, as we know it, is no more than a widely accepted convention to use specific units to measure certain attributes.

The activities in this guide provide the practical experience and opportunity for children to develop an understanding of measurement in a meaningful way. The progression of the activities has been deliberately planned so that, with the appropriate facilitation and guidance of the teacher, the activities reveal the mathematics in a meaningful way.

RESOURCES

About the resources, you will need:

- An assortment of objects /containers that can be filled, weighed, and whose length(s) can be measured. The container assortment should include containers that are similar in some regards, but different in others – for example similar in height, but different in capacity. We want the children to compare objects in terms of their different attributes. If the objects are too obviously different then the measurement activity becomes unimportant and children lose interest. The table on the following page has a list of suggested objects/containers.

- A range of informal non-standard units of measurement. These should include objects (units) that are different in size, weight and shape so that the children gain experience in filling, weighing and measuring large objects with different (smaller and larger) units. We want children to develop awareness that while a smaller unit may result in a more accurate measurement, measuring the attribute with the small unit is also more time-consuming. By contrast, the larger the measuring unit the less accurate the measurement, even if measuring the attribute was more time-efficient. The table on the following page has a list of suggested measuring units**.**

- A balance scale. If you do not have a balance scale, it is easy to make.

Resource	Number required
Assortment of objects /containers that can be filled, weighed, and whose length(s) can be measured.	
Plastic containers: 250ml, 500ml, 1L and 2L etc.	Enough for each group to work independently.
Plastic cooldrink bottles: 250ml, 500ml, 1L and 2L etc.	
Glass cooldrink bottles: 250ml, 500ml, 1L and 2L etc.	
Glass containers: e.g. jam jars, peanut butter jars and chutney bottles etc.	
Cardboard boxes: e.g. milk cartons, packaging boxes etc.	
A range of informal, non-standard units of measurement.	
Water, rice, sand – these can be used with spoons, cups, scoops (such as a small yoghurt cup), zip lock bags filled, small bottles filled	Enough for each group to work independently, and enough to fill the largest container, balance the heaviest container and measure the tallest container.
Beans, marbles, unifix or connecting cubes etc.	
Toothpicks, paper clips, ice cream sticks etc.	
Other	
Tablespoons	Enough for each group to work independently.
Teaspoons	
Cup measures	
Balance scale	Enough for one per group (see illustration of a balance scale that you can make yourself).

OVERVIEW OF THE UNIT

In this unit we only describe the activity once. However, the same activity is repeated many times for length, for volume and for mass (weight). Typically we expect that children will do up to two activities with length, volume and mass (weight) each term. A number of different suggestions are made for different combinations of objects and units. Teachers should adapt these for their classes and according to the resources that they have available.

LENGTH, MASS AND CAPACITY ACTIVITIES

In these activities we expect children to develop:

- Confidence in estimating, measuring, comparing and ordering objects in terms of capacity, mass and length using non-standard measures (e.g. spoons, cups, bricks, sandbags, hand spans, footsteps etc.)

For this activity you will need:

- Resources from the resources list as appropriate to each activity
- A recording table for each activity

Teacher's role:

It is vital that the children actively participate in the filling, weighing and measuring experiences with a range of containers and measuring units. Furthermore, they should have many opportunities to do this throughout the year.

Managing these activities:

- Select the objects that the children will work with.
- Determine the attribute (capacity, mass [weight] and length) that the children will measure and the unit that they will use to do the measuring.
- Develop a recording table for the children to record their results on. Ask the children to estimate and record this in the table before they record their actual findings (so each block will have an estimation and a recorded value). Below you will find a number of examples with some notes on each one. Each of these suggestions should be treated as a separate activity completed on a different day. You should adapt these examples to the objects to be measured and the units that are available in your class.
- Make sure that the children know what to do and let them complete the table.
- NOTE: Children should complete each measurement to the nearest whole number of the measuring unit. At this stage we don't want children worrying about parts of the measuring unit.
- Lead a reflective discussion with the children after they have completed the activity. Suggested questions to guide the reflection include:
    - Which container holds/weighs the most? Which container is the tallest?

- Which holds/weighs the least? Which container is the shortest?
- Did you know these answers before you completed the table? How could you have known?
- Did you all get the same results? If not, why not?
- Can you explain any irregularities that you observed?
- Discuss the advantages/disadvantages of the different units.

What to expect from the children:

This activity allows for repeated practical experiences with filling, weighing and measuring various containers, using a range of units.

The focus here is for the children to gain experience and confidence in filling, weighing and measuring a variety of containers/objects, using a variety of units. Through this practical activity the children will experience measuring larger containers with smaller units, as well as measuring smaller containers with larger units. For each activity children will fill, weigh and measure the same containers using two different units. This brings in the discussion around the suitability of the various units in measuring the specific attribute.

They should develop an awareness of the different measurable and comparable attributes (capacity/volume, weight/mass and length) that an object can have. And, develop an awareness of the suitability of the unit – larger units are quicker, but less accurate and not as suitable for smaller containers. However smaller units are more time-consuming (especially as the size of the container increases) but more accurate. Using two different units for measuring the same attribute, in the same activity, allows for this to be made more obvious.

In making comparisons, the children should develop the awareness of the attribute that is being measured and that the taller container may not necessarily hold or weigh the most, or similarly, the heaviest container may not be the tallest or hold the most.

It is important that the children actively It is important that the children actively experience filling, weighing and measuring activities and that they have many opportunities to do so throughout the year. They should also be encouraged to participate in any group discussion that arises pertaining to accuracy, consistency and observation.

Suggested capacity activities

1. How many cups of water and marbles fill each container?

Fill	2L cooldrink bottle	chutney jar	$\frac{1}{2}$L cooldrink bottle
cups of water			
marbles			

Teacher notes on capacity example 1:

The different units should start to make children aware that more of the smaller units are needed to fill a container when compared with the larger units. Also, since we instruct children to record their results to the nearest whole number of the measuring unit, they should start to become aware that the smaller unit provides a more accurate value.

2. How many beans and cubes fill each container?

Fill	peanut butter jar	yoghurt tub	ice cream tub
beans			
cubes			

Teacher notes on capacity example 2:

Because the units in this example are more similar in size than the units in example 1, children should notice that the difference in the number of units needed to fill the containers is less different than was the case in example 1.

3. How many tablespoons of water and cubes fill each container?

Fill	chutney jar	1L milk carton	peanut butter jar
tablespoons of water			
cubes			

Teacher notes on capacity example 3:

All three of the containers are similar in capacity. The reflective discussion should start to reveal the need for a measuring unit to determine which container holds the most/least – we can no longer rely on just looking at the container.

Using tablespoons to fill large containers should help children to realise that using a very small unit for a large container is really inefficient even if it is more accurate. We expect that some children will quickly attempt to stop using the tablespoon and may switch to first filling a cup with tablespoons of water, then filling the containers with cups of water and topping up with tablespoons of water, and finally calculating: number of tablespoons = number of cups x number of tablespoons per cup + number of tablespoons to fill up the container. Don't force this approach, just look out for it.

Suggested mass/weighing activities

1. How many marbles and beans balance each container?

Weight	**2L cooldrink bottle**	**chutney jar**	**$\frac{1}{2}$L cooldrink bottle**
marbles			
beans			

Teacher notes on mass (weighing) example 1:

The different units should start to make children aware that more of the lighter units are needed to balance a container when compared with the heavier units. Also, since we instruct children to record their results to the nearest whole number of the measuring unit, they should start to become aware that the lighter unit provides a more accurate value.

2. How many cubes and sandbags balance each container?

Weight	**peanut butter jar**	**yoghurt tub**	**ice cream tub**
cubes			
sandbags			

Teacher notes on mass (weighing) example 2:

As with example 1, the different units should start to make children aware that more of the lighter units are needed to balance a container when compared with the heavier units. Also, they should start to

become aware that the lighter unit provides a more accurate value, even if it means more work than the heavier unit does.

3. How many cubes and marbles balance each container?

Weight	chutney jar	1L milk carton	peanut butter jar
cubes			
marbles			

Teacher notes on mass (weighing) example 3:

Because two of the three containers appear to be similar in terms of weight. The reflective discussion should start to reveal the need for a measuring unit to determine which container weighs the most/least – we can no longer rely on just picking up the containers and "feeling" which is heavier.

Suggested length activities

1. How many toothpicks and cubes arranged end to end are the same length as each container?

Length	peanut butter jar	yoghurt tub	ice-cream tub
toothpicks			
cubes			

Teacher notes on length example 1:

The different units should start to make children aware that more of the shorter units are needed to measure a container's height when compared with the taller units.

2. How many paper clips and cubes arranged end to end are the same length as each container?

Measure	2L cooldrink bottle	chutney jar	$\frac{1}{2}$L cooldrink bottle
paper clips			
cubes			

Teacher notes on length example 2:

Children should be able to guess/estimate which is the longest/shortest without doing any measuring. However, there may be some doubt about the chutney jar and the $\frac{1}{2}$L cooldrink bottle which are similar in length (height). This highlights the value of actually measuring the lengths of the containers to avoid doubt. Using the cubes as the unit of length, the children may not be able to discriminate between the lengths (heights) of the chutney jar and the $\frac{1}{2}$L cooldrink bottle because the unit is not small enough. This raises awareness of the role of the choice of measuring units.

Because the units in this example are more similar in length than the units in example 1, children should notice that the difference in the number of units needed to fill the containers is less different than was the case in example 1.

3. How many toothpicks and paper clips arranged end to end are the same length as each container?

Length	**chutney jar**	**1L milk carton**	**peanut butter jar**
toothpicks			
paper clips			

Teacher notes on length example 3:

As with example 2, using the toothpicks as the unit of length, the children may not be able discriminate between the lengths (heights) of the containers because the toothpicks are too long.

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