Build your dream house (All Ages)

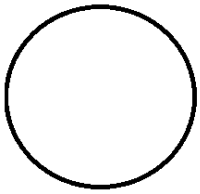
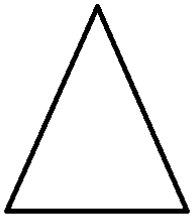
Ages 4 to 7 (Level 1)

Description:	Learners will create a model of their dream house or room and learn about geometry and operations!
Leading question:	How can we use shapes to build our dream house?
Age group:	4-7
Subjects:	Math (geometry and operations), engineering
Total time required:	~ 3.5 hours in total over 4 days
Self-guided / Supervised activity:	High supervision
Resources required:	Paper/cardboard, ruler/measuring tape, color pens, scissors, glue/tape/stapler
Learning outcomes:	- Understanding 2 dimensional shapes and their properties - Able to do addition within 10
Required previous learning:	Numbers 1-10
Topics/concepts covered and skills developed	● 2 Dimensional (2D) shapes ● Construction ● Vocabulary – 2D shapes, sides, corners ● Addition within 10 ● Drawing and design skills ● Creativity skills ● Presentation and communication skills

Day	Time	Activity and Description
1	10 minutes	Introduction: we are going to learn how to create a model of our dream house and practice some math! First, let's learn about some shapes that we can use to build our house. The learner will complete the following activities to better understand 2D shapes and their properties (Alternatively, learners can complete the "Beauty in Shapes" project in the IFERB resource page). **Activity 1: Exploring 2 Dimensional (2D) shapes** In this activity, learners will be introduced to the concept of shapes of objects. Start by helping the learner understand the concepts of shape and 2D shapes. Present these examples to the learners, naming in each case the shape that each object has. :

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

	20 minutes	

Object	Shape
 Pizza	 Cirle
 Road sign	 Triangle

Base, on the examples, ask the learners to think what a shape is:

Input*:

- A shape is the boundary or outline of an object
- A a shape is the surface we see
- A shape and does not depend on the size or the colour of the object

Learners will draw shapes of different objects in their homes. For example, they can draw the shape of a phone, cup, door, window, house roof, tree, etc.

Learners will share the drawing with the family members who will ask questions (based on the input*) to check whether the learners have understood the concept of shapes of objects.

Activity 2: Properties of 2D shapes

In this activity, learners will identify the number of sides and the number of vertices or corners of some basic 2D shapes

Tell the learners that 2 dimensional (2D) shapes are shapes that are completely flat.

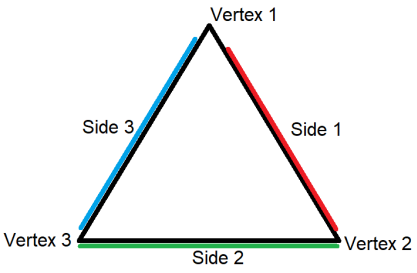
Ask the learners to share examples of things that are flat and things that are not flat.

Tell the learners:

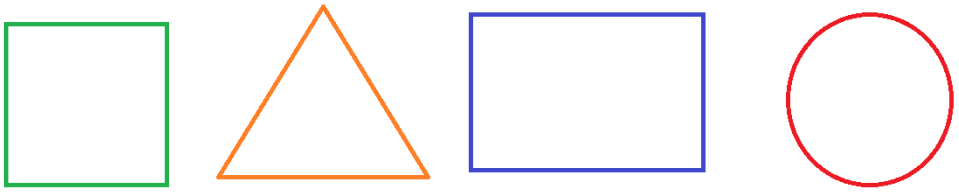
- Basic 2D shapes include the Circle, the Triangle, the Square and the Rectangle.

- All 2D shapes have sides and vertices (corners) except for a circle, which is made up of a curved line with no corners.
- Sides are the straight lines that form the shape.
- Vertices are the corners that the two lines make.

Present the following example to the learners:

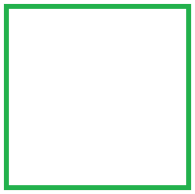
	A triangle has 3 sides and 3 vertices or corners

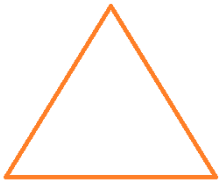
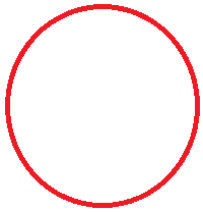
Draw the 2D shapes below



Ask the learners to count the number of sides and corners each shape
Ask the learner to name the 2D shapes
Ask the learner to give 3 examples in each case of objects having the shape

Learners should draw and complete the table below:

Shape	Number of sides	Number of corners	Name of shape	Example of objects with that shape
				

					
					
	0	0	Circle	Pizza, wheel, coin	

Wrap up Activity 2 with

- A triangle is a 2D shape with three sides and three corners.
- A square is a 2D shape with four sides and four corners. The four sides all have equal length. A rectangle is a 2D shape with four sides and four corners. Opposite sides are of equal length.
- A circle is a 2D round shape. A circle has 0 sides but 1 curved line. All its points are of equal distance from the Center point.

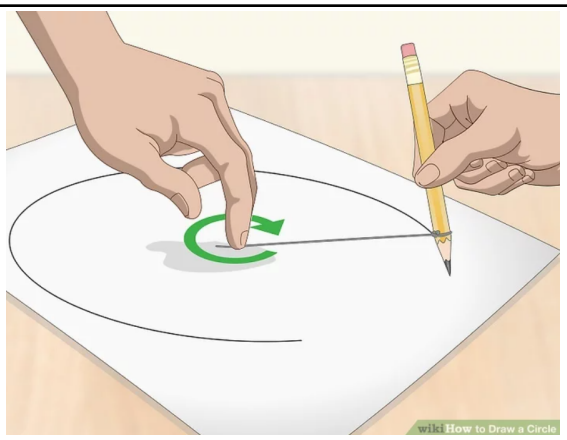
20 min

Activity 3: Drawing 2 Dimensional Shapes

Learners will draw some basic two dimensional shapes; the **Circle**, the **Triangle**, the **Square** and the **Rectangle**

Let's draw each shape! Bring out your paper, pen or pencil and a ruler or any flat object with a straight side like a phone/bookmark/cardboard or fortified paper:

- Use a ruler to draw a square with 4 equal sides and right angles, and a rectangle with equal opposite sides and right angles. Use the corner of a mobile phone or a notebook to make sure your angle is right.
- Plot three points that are **not on a straight** line and join each point to the next one to draw a triangle
- Use a thread tied to a needle on one end and a pencil on the other. Fix the needle in one spot on a paper and move the pencil away, stretching the thread. Rotate the pencil while holding the needle in the same spot to draw a circle. You can also use a finger to pin down one end of the thread instead of a needle as shown below



Source: https://www.wikihow.com/Draw-a-Circle

Literacy Extension

Activity 4 : 2D Shapes Song

Compose a song about sides and vertices (corners) of a 2D shape of their choice.

Example

	Square, square, square That is name, that's what am called Look at me, look at me Count my sides They are four, they are four Count my vertices They are four, they are four I am special, am special My sides are all the same, my sides all have the same length

Present the song to the family members and train them how to sing the song

Reflection

Learners will reflect on the project activities they have done so far
What are the three things you have learned from the project activities ?
What questions or wonders do you still have?

2		Learners will think about how they will design their dream house. First, they will understand how their own house or apartment was designed.

<table>
<tr>
<td></td>
<td>15 minutes

20 minutes

30 minutes</td>
<td>
Activity 5: Exploring 2D shapes in our house

The learner will walk around the house and try to identify basic 2D shapes in ceilings, walls, and in different objects around the house.

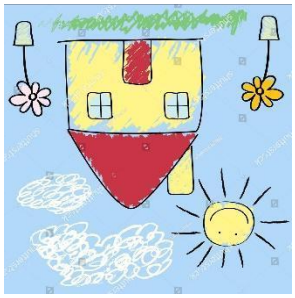
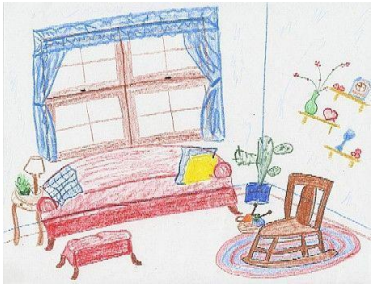
The learner will list the shapes and objects in their notebook as follows:

Living room: squared wall, rectangular table, rectangular couch, etc.
My bedroom: squared wall, rectangular ceiling, round window, etc.

The learner will do a tally count of the total number of shapes in each room and complete the table below in her or his notebook

<table>
<tr><td>Room</td><td>Square</td><td>Circle</td><td>Rectangle</td><td>Triangle</td></tr>
<tr><td>e.g. living room</td><td>II</td><td>I</td><td>IIII</td><td></td></tr>
<tr><td>e.g. kitchen</td><td>I</td><td>III</td><td>II</td><td>I</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Total</td><td>3</td><td>4</td><td>7</td><td>1</td></tr>
</table>
Reflection questions:

What shape is most common in our house?

The learner will draw the design of the house on a piece of paper.
The learner can draw the wall of one or more rooms or spaces on separate pieces of paper/pages of his or her notebook.
Some examples:



Learners will share their drawing with family members
</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>
Today, the learner will come up with ideas for their house or room blueprint.

Activity 6: Designing own Dream house

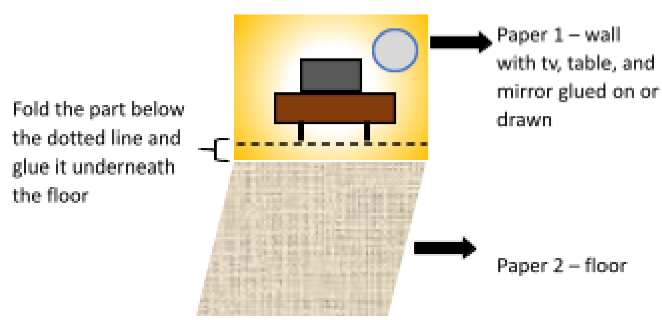
Prompts:
</td>
</tr>
</table>

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

<table>
<tr><td></td><td>20 minutes</td><td>

How do I want my house or room to look? Will the walls be square or rectangular? Can they be triangular?
What other objects do you want there that you can draw?
How many square, circle, rectangle, and triangle shaped objects have we listed?

</td></tr>
<tr><td></td><td>10 minutes</td><td>The learner will recreate the tally table from day 2 in their notebook or piece of paper and count the total for each shape</td></tr>
<tr><td></td><td>30 minutes</td><td>The learner will draw and color all the shapes according to the total shown in the table. E.g. 4 rectangles of different sizes, two circles, one triangle etc. Each shape will represent part of the room – one rectangle is the wall; a circle can be glued on to the wall to represent a mirror. Another rectangle can be glued to represent a photo frame etc.</td></tr>
<tr><td>4</td><td>30-60 minutes</td><td>Today, the learner will continue decorating different walls, cutting out shapes and gluing objects onto walls, and, finally, putting the different parts together. An adult will help with gluing the different parts together. The wall and floor can be glued as follows:



Tips:

The learner should color walls and floors before gluing or stapling them together
The bottom part of the wall can be folded by an adult to go under the floor
The learner can also, with the help of an adult, draw different objects onto walls instead of gluing and pasting them

Optional: Learners can make several rooms and arrange them side by side to create a house.</td></tr>
<tr><td></td><td>10 minutes</td><td>The learner will present the finished house to his or her family and describe how she or he designed each wall and the shapes of different objects and what they represent.

Family will provide feedback to the learner. The feedback will include:

What do they love about the dream house?
Any questions they have for the learner

</td></tr>
</table>

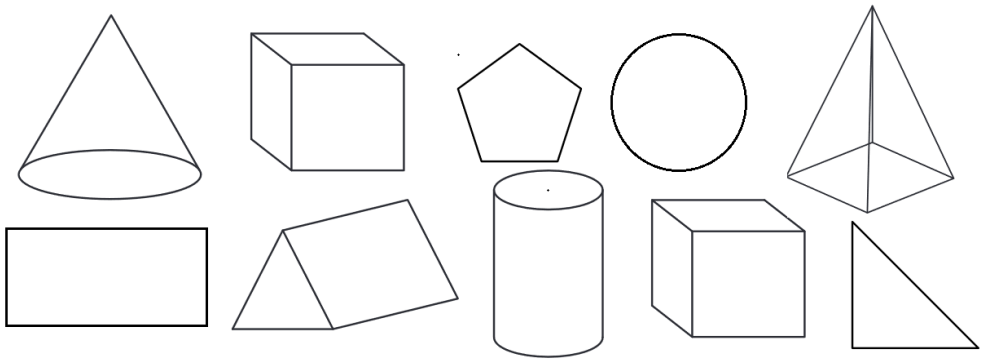
		Final Reflection Learners will reflect on their learning and experience in the project ● What are the two most important things I learned from the project? ● What were my roadblocks/challenges in the project? Who or what helped me to overcome them?
Assessment Criteria:		Completed Dream house or room with walls and floors comprised of 2D shapes

Ages 8 to 10 (Level 2)

Description:	Learners will create a model of their dream house or room and learn about geometry and operations!
Leading question:	How can we use shapes to build our dream house?
Age group:	8-10
Subjects:	Math (geometry and operations), engineering
Total time required:	~ 4.5 hours in total over 5 days
Self-guided / Supervised activity:	Medium supervision
Resources required:	Paper/cardboard, ruler/measuring tape, color pens, scissors, glue/tape/stapler
Learning outcomes:	Understanding 3D shapes and their properties
Required previous learning:	- Addition within 10 - Some knowledge of 2D shapes - Draw and Calculate Like an Architect project to get an introduction to scaling models.
Topics/concepts covered and skills developed	● 3D shapes and their properties ● Vocabulary – 3D shapes, faces, edges, vertices, corners ● Creativity, drawing and design skills ● Presentation and communication skills

Day	Time	Activity and Description
1	20 minutes	**Suggestion: it is recommended that the learner completes the Draw and Calculate Like an Architect project project prior to starting this project to get an introduction to scaling models.** Introduction: Learners will learn how to create a model of their dream house and practice some math! First, let's learn about some shapes that we can use to build our house. **Activity 1: Checking required previous learning** In this activity, learners will keenly observe each geometrical shape and decide which of the shapes are 2D shapes. Decide which shapes in the diagram below are 2D or flat shapes and shade them. You can use colour for your shading.

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7



20 minutes

3D shapes vocabulary

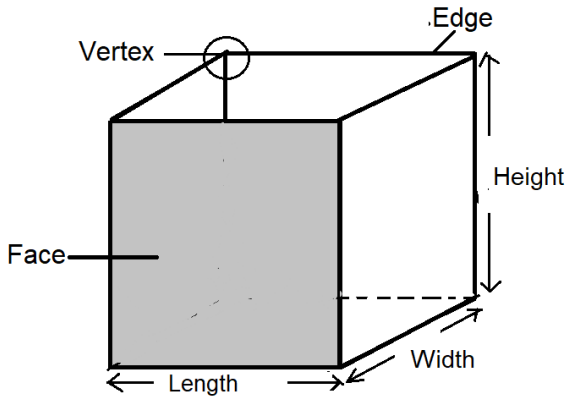
In this activity, learners will identify the number of faces, edges and vertices of some basic 3D shapes

3D shapes are solid shapes that have three dimensions (which are length, width and height).

3D shapes have faces, edges and vertices or corners.

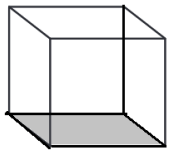
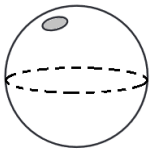
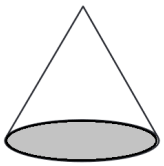
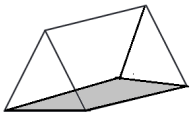
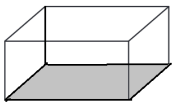
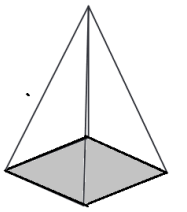
- The flat surfaces of a 3D shape are called faces. Curved surfaces are not called faces because faces must be flat.
- The edge of a 3D shape is the line where two faces meet
- The corner of a 3D shape is where two or more edges meet. The corner is also called the vertex. The plural for vertex is vertices

Example



Activity 2: Properties of 3D shapes

Draw the 3D shapes below and ask the learners to count the number of faces, edges and vertices (corners) and to name the 3D shapes

3D shape	Number of faces	Number of edges	Number of corners (vertices)	Name of shape
				
				
				
				
				
				

Prompt: do these shapes look familiar? What 2-dimensional shape does each one look like? (e.g. a cube looks like a square, a pyramid looks like a triangle etc.)

Wrap up the activity with:

- A cone has 1 flat face, 1 curved surface, 1 edge, and 0 vertex.
- A sphere has 0 faces, 1 curved surface, 0 edges, and 0 vertices. All points on its surface are the same length from the center
- A cylinder has 2 faces, 1 curved surface, 2 edges, and 0 vertices.
- A cube has 6 faces that are identical, 12 edges, and 8 vertices. The edges are of equal length and faces are of equal size. The faces are square in shape
- A rectangular prism or cuboid has 6 faces, 12 edges, and 8 vertices.
- All the faces are rectangles. The opposite faces are always the same size
- A triangular prism has 5 faces, 9 edges and 6 corners. The triangular prism has 2 faces which are triangles and 3 faces which are rectangles. The two triangle faces are always the same size
- A square-based pyramid has 5 faces, 8 edges, and 5 vertices. The faces are the flat sides and square base. There are other types of pyramids such as the triangular-based pyramid.

Activity 3: Drawing 3D shapes

In this activity, learners will draw some basic 3D shapes

Let's draw each shape! Bring out your paper, pen or pencil and a ruler or any flat object with a straight side like a phone/bookmark/cardboard or fortified paper and start drawing:

- Drawing a cube or rectangular prism: to get a cube, draw overlapping squares, then join the vertices (corners) using straight lines as shown in figure A to get the shape in figure B. If you start with overlapping rectangles and join the vertices, you will get a rectangular prism.

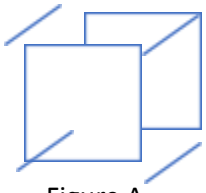


Figure A

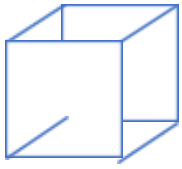


Figure B

The learner will draw a cube and a rectangular prism (cuboid)

- Drawing a cone: since a cone has a circular base, start with a flat circle as shown in figure A, then draw two lines connecting at the top to get figure B. Another way would be to draw a triangle, then draw two half circles above and below the base.

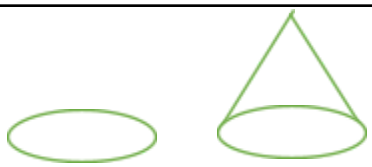


Figure A Figure B

The learner will draw a cone

- Drawing a cylinder: since a cylinder has two circular parts, start with two circles stacked on top of each other with some distance in between, then join the from both sides as shown below

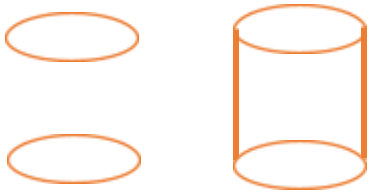


Figure A Figure B

The learner will draw a cylinder

- Drawing a pyramid: since a square-based pyramid has a square base, start with a flat square (that looks like a diamond) as shown in figure A, then join all the vertices at the top to get figure B as shown below:

Figure A Figure B

The learner will draw a rectangle-based pyramid

- Drawing a sphere: start with a circle, then draw two curved lines across the middle part to show that a sphere is not flat like a circle

Figure A Figure B

<table>
<tr>
<td></td>
<td></td>
<td>
The learner will draw a sphere

Literacy Extension

Activity 4 : 3D Shapes song

Learners will composes a song on faces , edges and vertices (corners) of 3D Shapes

Learners will present the song to the family members and train them how to sing the song

Reflection
Learners will reflect on the project activities they have done so far
What are the three things you have learned from the project activities ?
What two things have you found interesting ?
What one thing do you still have questions about ?
</td>
</tr>
<tr>
<td>2</td>
<td>10 minutes

20 minutes</td>
<td>
Introduction: today, learners will think about how they can design their house. First, learners will understand how their own house or apartment was designed.

Activity 5: Understanding house design considerations

The learner will walk around the house and try to identify basic 3 dimensional geometric shapes in ceilings, walls, and different objects around the house.

Learners will list the shapes and objects in their notebook as follows:

Living room: a rectangular prism with squared walls, cubed table, rectangular TV screen, etc.
Bedroom: a cubed room with a rectangular window, round mirror, etc.

The learner will do a tally count of the total number of shapes in each room and complete the table below in her or his notebook. The learner can mix 2D and 3D shapes as shown below

<table>
<tr><td>Room</td><td>Cube</td><td>Rectangular prism</td><td>Rectangle</td><td>Triangle</td></tr>
<tr><td>e.g. living room</td><td>II</td><td>I</td><td>~~IIII~~</td><td></td></tr>
<tr><td>e.g. kitchen</td><td>I</td><td>III</td><td>II</td><td>I</td></tr>
<tr><td>Total</td><td>3</td><td>4</td><td>7</td><td>1</td></tr>
</table>

Reflection questions:

What 2D shape is most common?
What 3D shape is most common?

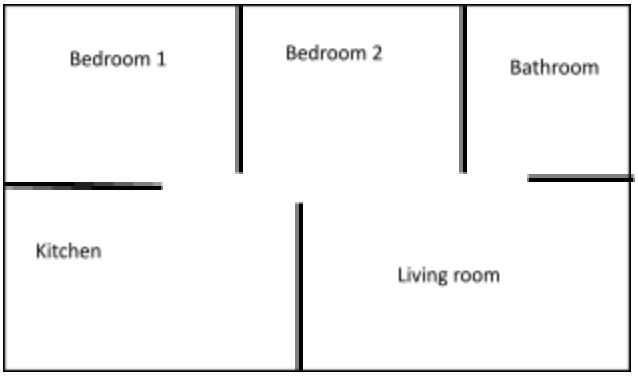
</td>
</tr>
</table>

	30-40 minutes	The learner will try to draw the design of the house on a piece of paper to create a floor plan for his or her current home: Let's start with your bedroom. Think of what your bedroom would look like if we could remove the ceiling and look at it from the top. Example of rooms with a top view:  Source link Tip: if this is too difficult, instead of a top view, the learner can draw the walls of one or more rooms or spaces on separate pieces of paper/pages of his or her notebook with the help of an adult if needed. The learners will draw a plan for their current home, apartment, or room: ● Draw the entire space first either from a top view or side/cross-section ● Section the different rooms or spaces with lines representing walls. Where will you place the kitchen? Bathroom? ● Draw the beds, tables, rugs etc. that you find in each space. Learners will share the drawing of their current home with family members
3	10 minutes 20 minutes	Today, the learner will come up with the ideas and design for their dream house or room floor plan. **Activity 6: Designing own Dream house** Prompts: ● How do you want your house or room to look? Will the walls be square or rectangular? Can they be triangular? ● What other objects do you want there that you can draw or make?

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

<table>
<tr>
<td></td>
<td>30 minutes</td>
<td>
The learner will recreate and complete this table in his or her notebook:
<table>
<tr><td>Room</td><td>Object 1</td><td>Shape 1</td><td>Object 2</td><td>Shape 2</td><td>Object 3</td><td>Shape 3</td><td>Object 4</td><td>Shape 4</td></tr>
<tr><td>Bedroom</td><td>Wall</td><td>Square</td><td>Bed</td><td>Rectangular prism</td><td>Table</td><td>Cube</td><td>Pillow</td><td>Rectangle</td></tr>
<tr><td>Living room</td><td>Wall</td><td>Square</td><td>Couch</td><td>Rectangular prism + rectangle</td><td>Table</td><td>Cube</td><td></td><td></td></tr>
</table>
The learner will draw a plan for his or her dream home, apartment, or room based on the table above:

Draw the entire space first either from a top view or side/cross-section
Section the different rooms or spaces with lines representing walls. Where will you place the kitchen? Bathroom?
Draw the beds, tables, rugs etc. that you want in each space
Decorate and color your floor plan

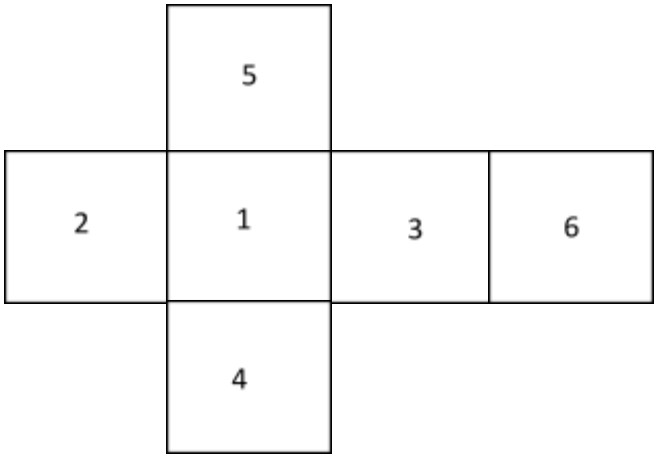
The plan can be basic following the plan the learner made yesterday or the template below, but it must contain all the items the learner wants in each room


Tip: allow the learner to be creative, but make sure that the designs are realistic and can be done with minimal resources and supervision
</td>
</tr>
<tr>
<td>4</td>
<td>40-60 minutes</td>
<td>
Today, the learner will create the shapes from the table he or she completed yesterday and finalize the design of the house.

Activity 7: Producing pre-fabricated 3D shapes for the Dream house

The learner will make all the shapes using paper. The learner will draw 2D shapes on paper and cut them out using scissors. For 3D shapes, paper will be cut in the following ways:
</td>
</tr>
</table>

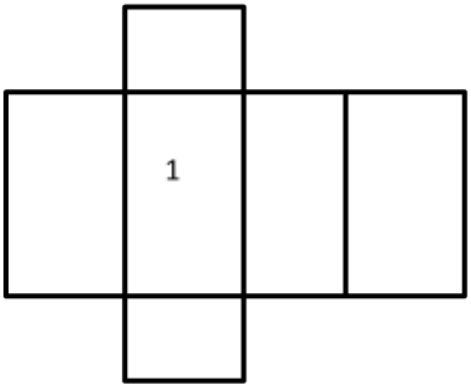
1. To make a cube: we know that a cube has equal or square sides. First, draw six squares in this shape on a piece of paper then cut out the entire shape:



Instructions:

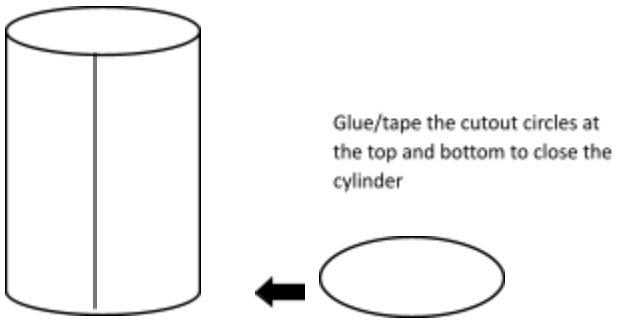
- Keep square 1 down and bring up squares 2, 3, 4, and 5
- Tape or glue all of them together to create an open cube
- Bring up square 6 to close the cube. You can cut out square 6 if you want an open cube for your house.
- You can use this cube as a table or other object to place in your rooms!

2. To make a rectangular prism: we know that a rectangular prism has rectangular sides. First, draw six rectangles in the shape shown below and cut out the entire shape. Then repeat the instructions from the cube, keeping rectangle 1 down and raising the other sides:



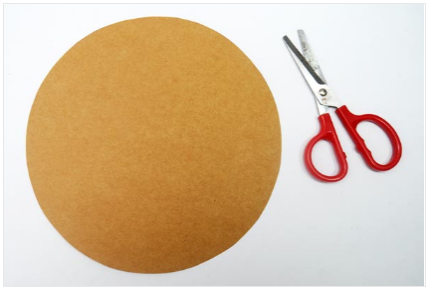
3. To make a cylinder:

- Cut out the piece of paper you want to use to make a cylinder for your furniture
- Roll the paper so both ends meet as shown below:

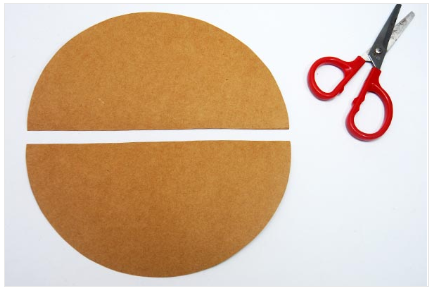


- Tape the line where both ends meet to make a cylinder
- If you want to close the cylinder, you can take the shape you have made and draw two circles on a separate piece of paper using one of its ends. Cut out the circles and tape or glue them on to the top and bottom parts of the cylinder (the faces of the cylinder)

4. To make a cone: we know that a cone has a circular base, so first, draw a circle, then follow the instructions below:

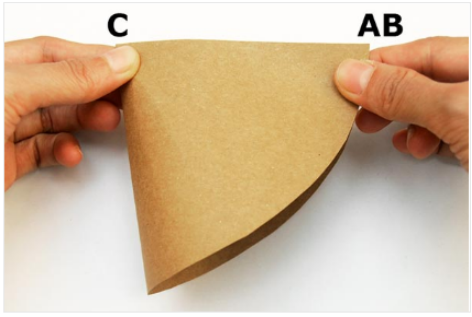


1. Cut out a circle



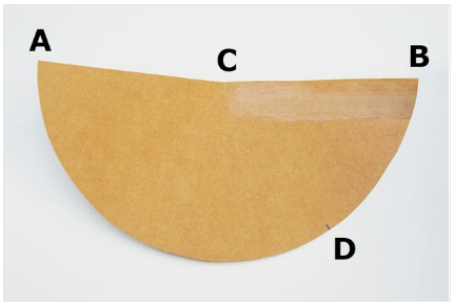
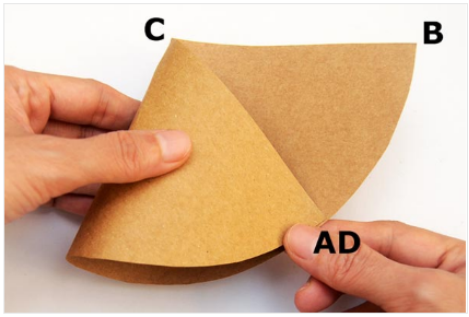
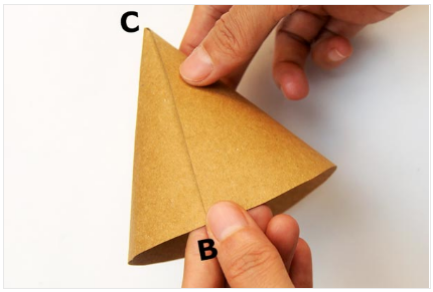
2. Cut it in half

3. take one half-circle



4. Join both ends and mark the vertex C

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

		 5. Apply glue and mark point D at the bottom  6. Bring one tip to the bottom, mark that point AD  7. bring point B down to the curved edge to make a cone! Tip: make sure you color the papers before you make the shapes!
5	 30 minutes 20 minutes 10 minutes	Today, learners will finalize the design of their dream house and present it to their family! **Activity 8: Assembling own Dream house** First, the learner will create a big cube or rectangular prism for his or her dream house, room, or apartment. Make sure the shape is big enough to fit all the objects you created yesterday! The learner will assemble all the objects inside the larger rectangular prism and finalize the design of the house. He or she can draw any additional decoration such as mirrors, paintings, photo frames etc. if he or she does not want to create more shapes The learner will present the finalized design to the family and describe: ● How she or he decided on the shape of the house and rooms ● How she or he created the objects and the shapes used ● Overall thoughts about the process Family will provide feedback to the learner. The feedback will include: ● What do they love about the dream house? ● Any questions they have for the learner

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

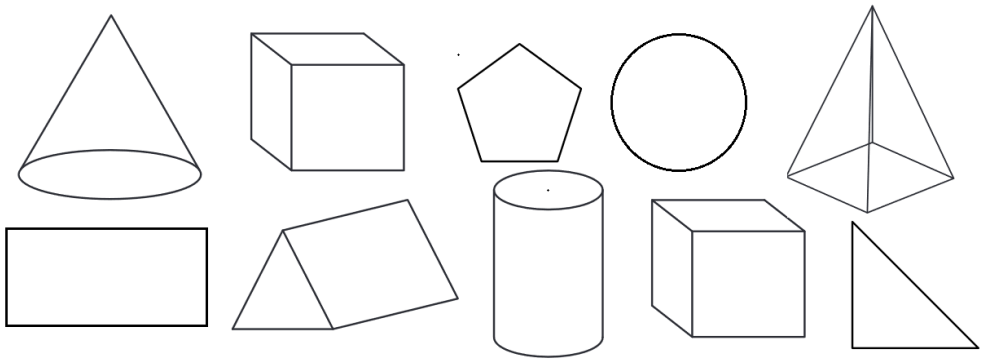
	5 min	**Final Reflection** Learners will reflect on their learning and experience in the project ● What are the two most important things I learned from the project? ● What were my roadblocks/challenges in the project? Who helped me to overcome them? ● What would I do differently next time I do another project?
Assessment Criteria:		- Completed house or room with walls, floors, and furniture objects comprised of 2D and 3D shapes - Final presentation of design process

Additional enrichment activities:	The learner can journal his or her process of designing the house and provide the dimensions of the rooms and spaces, calculate the perimeter (sum of sides or diameter in 2D shapes)

Ages 11 to 14 (Level 3)

Description:	Learners will create a model of their dream house or room and learn about geometry and operations!
Leading question:	How can we use shapes to build our dream house?
Age group:	11-14
Subjects:	Math (geometry and operations), engineering
Total time required:	~ 6 hours in total over 5 days
Self-guided / Supervised activity:	Medium supervision
Resources required:	Paper/cardboard, ruler/measuring tape, color pens, scissors, glue/tape/stapler
Learning outcomes:	● Understanding 2D shapes and 3D shapes and their properties ● Calculate areas and perimeters ● Write a project report
Required previous learning:	● Multiplication within 20
Topics/concepts covered and skills developed	● Names and properties of 3D shapes ● Vocabulary – 3D shapes, faces, edges, corners, vertices, area, surface area and perimeter ● Calculating area, surface area and perimeter ● Drawing 3D shapes ● Applications of 2D and 3D geometrical shapes in housing construction ● Drawing and design skills ● Creativity, presentation and communication skills ● Report writing

Day	Time	Activity and Description
1	20 minutes	Introduction: Learners will learn how to create a model of their dream house and practice some math! First, let's learn about some shapes that we can use to build our house. **Activity 1: Checking required previous learning** In this activity, learners will keenly observe each geometrical shape and decide which of the shapes are 2D shapes. Decide which shapes in the diagram below are 2D shapes and shade them. You can use colour for your shading

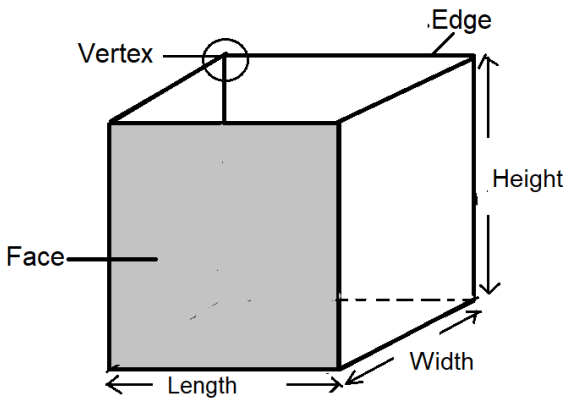


3D shapes vocabulary

3D shapes are solid shapes that have three dimensions (which are length, width and height).
3D shapes have faces, edges and vertices or corners.

- The flat surfaces of a 3D shape are called faces. Curved surfaces are not called faces because faces must be flat.
- The edge of a 3D shape is the line where two faces meet
- The corner of a 3D shape is where two or more edges meet. The corner is also called the vertex. The plural for vertex is vertices

Example

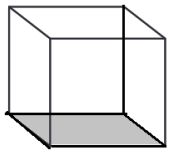
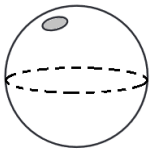
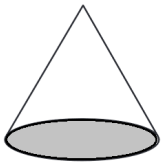
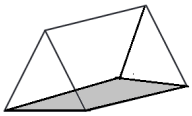
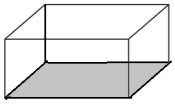
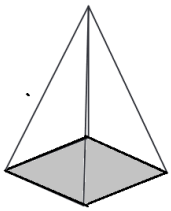


20 minutes

Activity 2: Properties of 3D shapes

In this activity, learners will identify the number of faces, edges and vertices of some basic 3D shapes

Draw the 3D shapes below and ask the learners to count the number of faces, edges and vertices (corners) and to name the 3D shapes

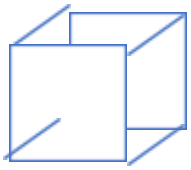
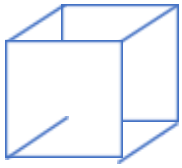
3D shape	Number of faces	Number of edges	Number of corners (vertices)	Name of shape
				
				
				
				
				
				

Prompt:

- Do these shapes look familiar?
- What 2-dimensional shape does each one look like? (e.g. a cube looks like a square, a pyramid looks like a triangle etc.)

Wrap up the activity by reviewing some properties of 3-dimensional shapes:

- A cone has 1 flat face, 1 curved surface, 1 edge, and 0 vertex..

		• A sphere has 0 faces, 1 curved surface, 0 edges, and 0 vertices. All points on its surface are the same length from the center • A cylinder has 2 faces, 1 curved surface, 2 edges, and 0 vertices. • A cube has 6 faces that are identical, 12 edges, and 8 vertices. The edges are of equal length and faces are of equal size. The faces are square in shape • A rectangular prism or cuboid has 6 faces, 12 edges, and 8 vertices. All the faces are rectangles. The opposite faces are always the same size A triangular prism has 5 faces, 9 edges and 6 corners. The triangular prism has 2 faces which are triangles and 3 faces which are rectangles. The two triangle faces are always the same size • A square-based pyramid has 5 faces, 8 edges, and 5 vertices. The faces are the flat sides and square base. There are other types of pyramids such as the triangular-based pyramid. **Activity 3: Drawing 3D shapes**
	20 minutes	In this activity, learners will draw a cube, a rectangular prism (cuboid), a cone, a cylinder, a square-based pyramid and a circle Let's draw each shape! Bring out your paper, pen or pencil and a ruler or any flat object with a straight side like a phone/bookmark/cardboard or fortified paper and start drawing: • Drawing a cube or rectangular prism: to get a cube, draw overlapping squares, then join the vertices (corners) using straight lines as shown in figure A to get the shape in figure B. if you start with overlapping rectangles and join the vertices, you will get a rectangular prism.   Figure A Figure B The learner will draw a cube and a rectangular prism • Drawing a cone: since a cone has a circular base, start with a flat circle as shown in figure A, then draw two lines connecting at the top to get figure B.
	10 minutes	  Figure A Figure B

The learner will draw a cone

- Drawing a cylinder: since a cylinder has two circular parts, start with two circles stacked on top of each other with some distance in between, then join the circles from both sides with two straight lines as shown below

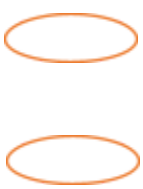


Figure A

Figure B

The learner will draw a cylinder

- Drawing a square-based pyramid: since a square-based pyramid has a square base, start with a flat square (that looks like a diamond) as shown in figure A, then join all the vertices at the top to get figure B as shown below:

Figure A

Figure B

The learner will draw a square-based pyramid

- Drawing a sphere: start with a circle, then draw two curved lines across the middle part to show that a sphere is not flat like a circle

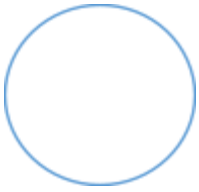


Figure A

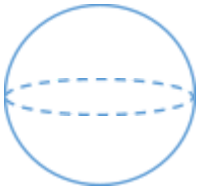
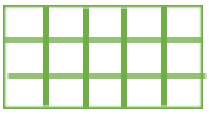


Figure B

The learner will draw a sphere

	10-20 minutes	**Activity 4: Calculating surface area of 3D shapes** In this activity, learners will calculate the surface area of the 3D shapes they drew in Activity 3. Learners will calculate the area of a square and surface area of a cube that they have drawn: ● Explain that the area of a shape is the total space covered by that shape ● Draw a rectangle with length 5cm and width 3cm. how many 1cm squares can you fit in the rectangle? You should be able to fit 15 such squares as shown below. This is the area of the rectangle, which we also get by multiplying the length by the width or 5 x 3 = 15. 5cm 3cm  ● Remind the learner that a square is a type of rectangle, but the only difference is that all of its sides are the same length ● Draw a square with 4cm sides. Since the square is a rectangle, it has similar properties. The formula for area of a square is side x side or side^2 instead of length x width because all sides are the same length. You can visually see how many 1cm squares you can fit into the larger 4cm square and count them to find the area. ● Now, let's see how we can figure out the area of a cube. We know that a cube has 6 faces. Since each face of a cube is a square, the area for each face is side^2. To get the total surface area of the cube, we multiply 6 x side^2. The learners will use the method explained above to calculate the total surface area of the cube they drew in activity 3. Explain to the learners how to calculate the surface area of different 3D shapes. What measurements to make and what formulae to use. Work out some examples. Now let's learn about the areas of these shapes. Look at the formulas below:

2D Shape	Area	Terms
Circle	$\pi \times r^2$	r = radius of the circle
Triangle	½ × b × h	b = base h = height
Square	a^2	a = length of side
Rectangle	l × w	l = length

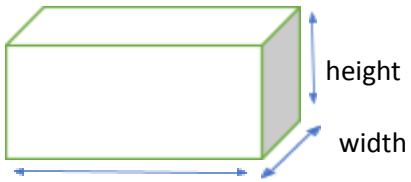
		w = width

3D Shape	Area	Terms
Cube	$6a^2$	a = length of the edge
Rectangular prism	2 w l + 2 h l + 2 h w	l = length w = width h = height
Cylinder	$2 \pi r^2 + 2 \pi r h$	r = radius of circular base h = height of the cylinder
Cone	$\pi r l + \pi r^2$	r = radius of circular base l = slant height
Sphere	$4 \pi r^2$	r = radius of sphere

Source: https://byjus.com/maths/area-of-shapes/

We know that:

- $\pi = 3.14$
- The radius is the distance from the midpoint of the circle or sphere to any point on the surface
- The base and height of a triangle can be found by drawing a straight line from the top vertex to the opposite side. The base is the side at the bottom where the height line forms a 90-degree angle. The height is the length of the line drawn from the top vertex to the base
- The lengths of a rectangle are the two long sides and the widths are the shorter sides
- The slant of a cone is the length from the edge of the circle to the tip of the cone
- The height of a cylinder is its length (distance from top surface to the bottom)
- The length, width and height of a rectangular prism are represented below



Learners will make the necessary measurements and use the relevant formulae to calculate the surface areas of the 3D shapes they drew in activity 3.

2	10 minutes	Introduction: today, Learners will think about how they can design their dream house by first understanding how their current home was designed.

Activity 5: Understanding house design considerations

20 minutes

The learner will walk around the house and try to identify basic and 3-dimensional geometric shapes in ceilings, walls, and different objects around the house.

The learner will list the shapes and objects in their notebook as follows:

- Living room: a rectangular prism with squared walls, cubed table, rectangular TV screen etc.
- Bedroom: a cubed room with rectangular window, round mirror etc.

The learner will count the total number of shapes in each room and complete the table below in her or his notebook. The learner can mix 2D and 3D shapes as shown below

Room	Cube	Rectangular prism	Rectangle	Triangle
e.g. living room	2	1	5	
e.g. kitchen	1	3	2	1
Total	3	4	7	1

30-40 minutes

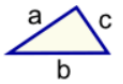
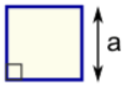
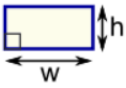
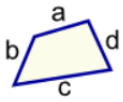
Reflection questions:

- What 2D shape is most common?
- What 3D shape is most common?

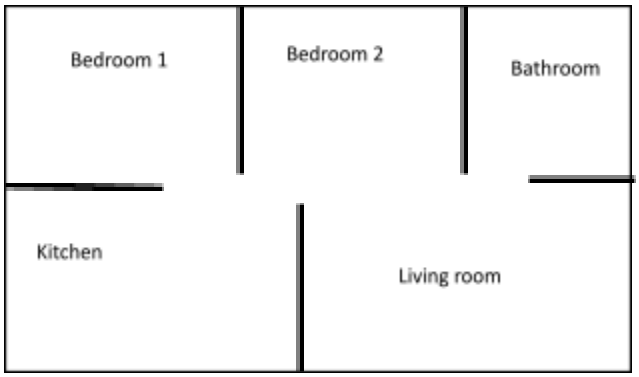
Learners will draw the design of their current house on a piece of paper to create a floor plan for his or her current home:

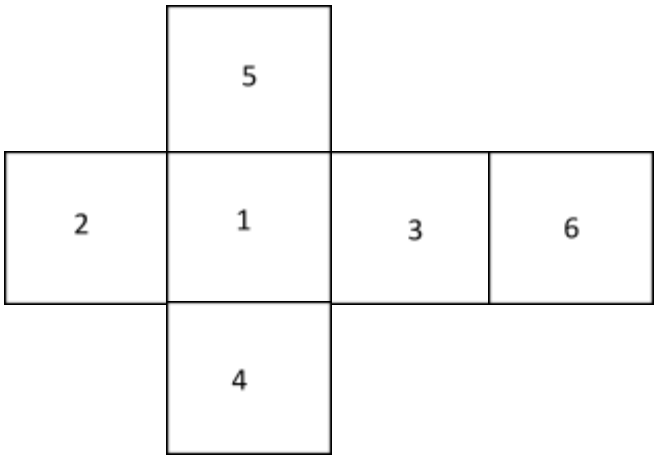
Let's start with your bedroom. Think of what your bedroom would look like if we could remove the ceiling and look at it from the top. Example of rooms with a top view:

	10-20 minutes	 Source link Tip: if this is too difficult, instead of a top view, the learner can draw the walls of one or more rooms or spaces on separate pieces of paper/pages of his or her notebook if needed. The learner will draw a plan for his or her current home, apartment, or room: ● Draw the entire space first either from a top view or side/cross-section ● Section the different rooms or spaces with lines representing walls. Where will you place the kitchen? Bathroom? ● Draw the beds, tables, rugs etc. that you find in each space The learner will calculate the perimeter of the 2D shapes. The perimeter is the distance around 2D shapes. Calculate the perimeter of the shapes he or she just drew using the formulas below:

		 Triangle Perimeter = a + b + c  Square Perimeter = 4 × a a = length of side  Rectangle Perimeter = 2 × (w + h) w = width h = height  Quadrilateral Perimeter = a + b + c + d  Circle Circumference = 2πr r = radius Source: https://www.mathsisfun.com/geometry/perimeter.html Learners will share the plan of their current house, apartment or room with family members. Learners will ask family members any additional information they need to help them in the design of their dream house. **Reflection** Learners will reflect on their personal learning and experience in doing the project so far. What are the three most important things I have learned so far ? What challenges have I encountered so far ? What additional support do I need to successfully complete the project ? Who can provide me that support ?
3	10 minutes 20 minutes	Today, learners will come up with the ideas and design for their dream house or room floor plan. **Activity 6: Designing the Dream house** Prompts: ● How do you want your house or room to look? Will the walls be square or rectangular? Can they be triangular? ● What other objects do you want there that you can draw or make? The learner will recreate and complete this table in his or her notebook:

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

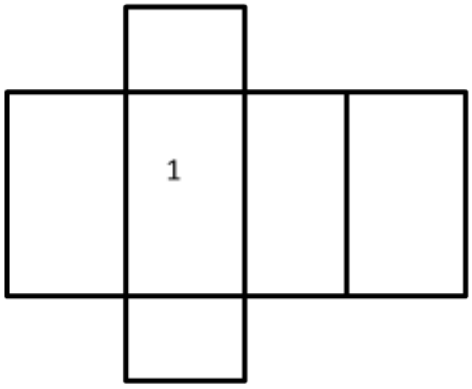
	30 minutes	<table><tr><td>Room</td><td>Object 1</td><td>Shape 1</td><td>Object 2</td><td>Shape 2</td><td>Object 3</td><td>Shape 3</td><td>Object 4</td><td>Shape 4</td></tr><tr><td>Bedroom</td><td>Wall</td><td>Square</td><td>Bed</td><td>Rectangular prism</td><td>Table</td><td>Cube</td><td>Pillow</td><td>Rectangle</td></tr><tr><td>Living room</td><td>Wall</td><td>Square</td><td>Couch</td><td>Rectangular prism + rectangle</td><td>Table</td><td>Cube</td><td></td><td></td></tr></table> The learner will draw a plan for his or her dream home, apartment, or room based on the table above: ● Draw the entire space first either from a top view or side/cross-section ● Section the different rooms or spaces with lines representing walls. Where will you place the kitchen? Bathroom? ● Draw the beds, tables, rugs etc. that you want in each space ● Decorate and color your floor plan The plan can be basic following the plan the learner made yesterday or the template below, but it must contain all the items the learner wants in each room 
4	40-60 minutes	Today, learners will create the shapes from the table he or she completed yesterday and finalize the design of the house. **Activity 7: Producing pre-fabricated materials for the Dream house** The learner will make all the shapes using paper. The learner will draw 2D shapes on paper and cut them out using scissors. For 3D shapes, paper will be cut in the following ways: 5. To make a cube: we know that a cube has equal or square sides. First, draw six squares in this shape on a piece of paper then cut out the entire shape. Before cutting the shape, measure and record the length of each side to verify that this is a cube (with equal sides):



Instructions:

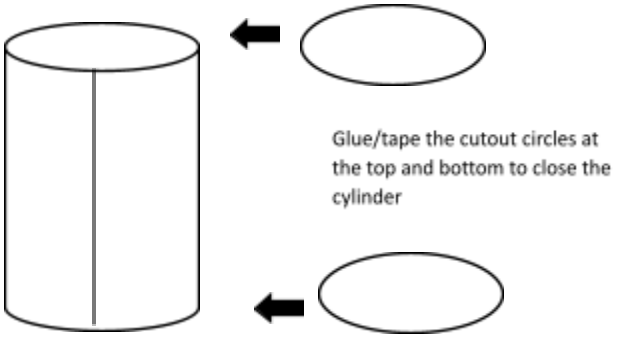
- Keep square 1 down and bring up squares 2, 3, 4, and 5
- Tape or glue all of them together to create an open cube
- Bring up square 6 to close the cube. You can cut out square 6 if you want an open cube for your house.
- You can use this cube as a table or other object to place in your rooms!

6. To make a rectangular prism: we know that a rectangular prism has rectangular sides. First, draw six rectangles in the shape shown below and cut out the entire shape. Measure and record the length and width of each rectangle. Then repeat the instructions from the cube, keeping rectangle 1 down and raising the other sides:



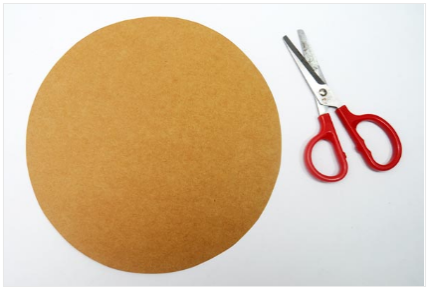
7. To make a cylinder:
   - Cut out the piece of paper you want to use to make a cylinder for your furniture
   - Measure and record the length and width of the paper.

- Roll the paper so both ends meet as shown below:

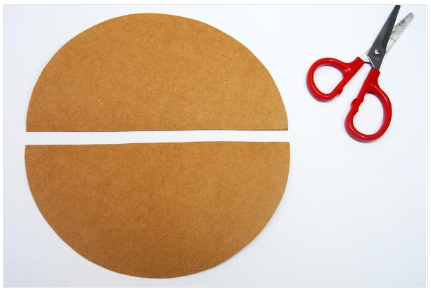


- Tape the line where both ends meet to make a cylinder
- If you want to close the cylinder, you can take the shape you have made and draw two circles on a separate piece of paper using one of its ends. Measure and record the radius of the circles. Cut out the circles and tape or glue them on to the top and bottom parts of the cylinder (the faces of the cylinder).

8. To make a cone: we know that a cone has a circular base, so first, draw a circle, then follow the instructions below:

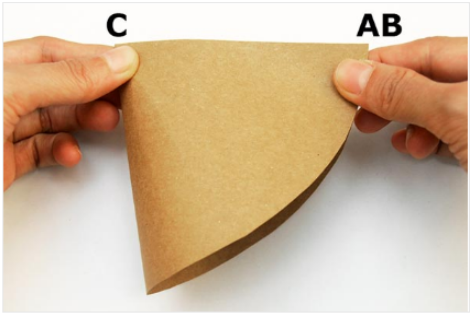


1. Cut out a circle

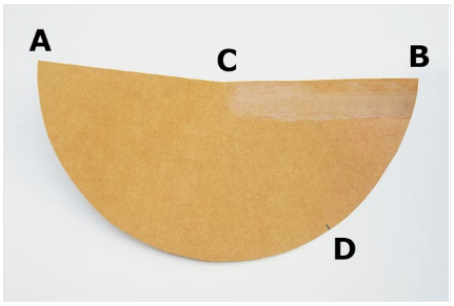
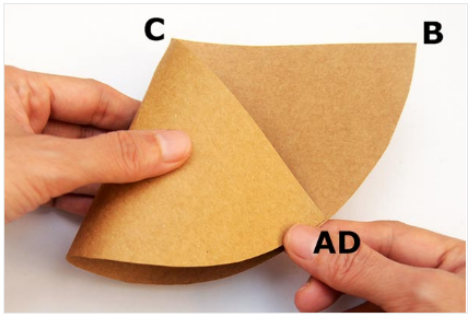
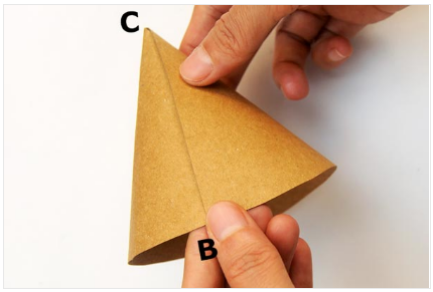


2. Cut it in half

3. take one half-circle



4. Join both ends and mark the vertex C

	30 minutes	 5. Apply glue and mark point D at the bottom  6. Bring one tip to the bottom, mark that point AD  7. Bring point B down to the curved edge to make a cone! Measure the length of the slant and the radius of the bottom circular opening Tip: make sure you color the papers before you make the shapes! **Activity 8: Project report writing** The learner will write a short report on the design process in his or her notebook or a piece of paper and provide the dimensions and areas for his or her house and objects constructed. The report must contain the following sections: ● Title of project: My dream house/room/apartment ● Process of design: what was the first step in designing the house? How did you decide on the shapes used? How did you construct the different parts? ● Dimensions and areas: o What are the dimensions of each 2D shape? i.e. length and breadth of rectangles, radius of circles, length, breadth, and width of rectangular prisms etc. o What are the areas of all 2D shapes used? o What are the surface areas of all 3D shapes used? ● Reflection: what went really well? What could you have done better? ● Attachment of floor plan (the learner can attach the floor plan she or he designed using glue, tape, stapler etc.)
5	30 minutes	Today, learners will finalize the design of his or her house and present it to the family! **Activity 9: Assembling the own Dream house**

EAA welcomes feedback on its projects in order to improve, please use this link: https://forms.gle/LGAP9k17fMyJrKJN7

	20 minutes 15 minutes	First, the learner will create a big cube or rectangular prism for his or her dream house, room, or apartment. Make sure the shape is big enough to fit all the objects you created yesterday! The learner will assemble all the objects inside the larger rectangular prism and finalize the design of the house. He or she can draw any additional decoration such as mirrors, paintings, photo frames etc. if he or she does not want to create more shapes **Activity 10: Project final product presentation** The learner will present the finalized design to the family and describe: ● How she or he decided on the shape of the house and rooms ● How she or he created the objects and the shapes used ● The areas and surface areas of all shapes ● Overall thoughts about the process and how they can improve their design
Assessment Criteria:		- Completed house or room with walls, floors, and furniture objects comprised of 2D and 3D shapes - Final presentation of design process - Final report on design process

Additional enrichment activities:	- More complex 3D shapes can be added to the activity such as pyramid and prism variations - Learners can be asked to find the volumes of 3D shapes