CAD SKILLS

CAD Tutorial : Shipping Container Ground Floor

Level of Difficulty

★ ★ ☆ ☆ ☆

Time
Approximately 10–30 minutes

CAD TUTORIAL 10: FERRY BOAT

By the end of this tutorial you will be able to...

- Link basic shapes
- Use the Arc tool
- Use the Follow Me tool to produce a rounded edge
- Use construction lines/points
- Produce an architectural ground floor design of a house made from shipping containers to scale……

Skills to be used in this project...

Basic Skills	New and Higher Skills
Zoom tool	Construction lines and points
Orbit tool	Tape Measure tool
Pan tool	Arc tool
Line tool	Follow Me tool
Rectangle tool	Loading new toolbars
Circle tool	Paint Bucket tool
Eraser tool	
Push/Pull tool	

Basic skills are those required to do very basic drawings and are detailed as part of this presentation.

New and higher skills may be new to the novice and are the focus for learning in this presentation.

Learning Styles

Visual : *Presentation*

Auditory: *Video*

Kinaesthetic: *Demonstration*

Sketchup Help Guide:

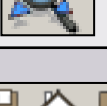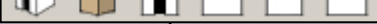| Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 1. **Pencil tool**		used to draw lines in X, Y and Z direction. Can draw simple or complex shapes very quickly.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct 3D objects faster than traditional hand drawings*
Modifying Tool 2. **Trim tool**		. allows the user to remove overlapping elements.	*Advantages:* *Allows user to erase overlapping lines and edges to draw complex 3D shapes very quickly.*
Modifying Tool 3. **Push/pull**		tool used to turn solid objects into 3D objects instantaneously. Typing a size allows a user to extrude or pull an object to a certain size or height	*Advantages:* *Allows user to draw or modify 3D shapes very quickly faster than traditional hand drawings. You can click on a face (plane) and adjust. Can be used to extrude shapes on 3D objects already drawn.*
Modifying Tool 4. **Move Tool**		used to move entire shapes or pull lines on a drawing.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct unusual 3D shapes quickly*
Modifying Tool 5. **Dimensions tool**		used to show sizes and radius of drawn objects	*Advantages:* *Allows user to draw or modify 3D shapes very quickly faster than traditional hand drawings to correct size if drawn incorrectly. Drawing can be transferred onto the CNC machines directly*
Modifying Tool 6 **Extrusion Tool (follow me)**		allows the user to highlight a path that turns blue. A chosen shape will then follow the chosen path	*Advantages:* *Allows user to draw profiles of shapes and follow the path to draw complex 3D shapes very quickly.*
Modifying Tool 7. **Arch tool**		*You can use the **arch** tool to draw a radius from two given points.* Can be used to draw corners etc..	*Advantages:* *Allows user to rotate and position shapes quickly to draw complex 3D shapes very quickly.*
Modifying Tool 8. **Circle tool**		allows the user to draw different sized radius circles and chamfered corners	*Advantages:* *Allows user to draw profiles of shapes and follow the path to draw complex 3D shapes very quickly.*
Modifying Tool 9. **Orbit tool**		*You can use the **Orbit** tool to change the angle that you are viewing your design from. You can do the same by pressing the middle wheel of your mouse*	*Advantages:* *Allows user to rotate and see all angles of their design quickly*
Modifying Tool 10. **Tape measure tool**		allows the user to draw guide lines to given sizes and mark out radius etc.	*Advantages:* *Allows user to draw guides of shapes and draw complex 3D shapes very quickly.*

Sketchup Help Guide:

Computer Aided Engineering: 15. Drawing and Modification Commands

Drawing and Modification Tools	image	Description	Advantages
Modifying Tool 11. **Square tool**		used to draw squares and rectangles.	*Advantages:* *Allows user to draw guides of shapes and draw complex 3D shapes very quickly.*
Modifying Tool 12. **Offset tool**		. *You can use the **contour** tool to draw parallel lines or lines within lines.*	*Advantages:* *Allows user to draw duplicate lines and position them within shapes quickly to draw complex 3D shapes very quickly.*
Modifying Tool 14. **Rotate Tool**		used to move rotate parts of a shape or entire shapes on x, y and Z co-ordinates.	*Advantages:* *Allows user to draw or modify shapes very quickly and can be used to construct unusual 3D shapes quickly*
Modifying Tool 15 **Scale Tool**		allows the user to select an object or part of an object and increase its sixe from the base point.	*Advantages:* *Allows user to quickly resize objects to draw complex 3D shapes very quickly.*
Modifying Tool 16 **Paint Bucket Tool**		allows the user to select a colour or materials to produce photo-realistic drawing of their object. Shadows etc. can be added.	*Advantages:* *Allows user to quickly draw objects life like using materials, textures etc...*
Modifying Tool 17 **Pan Tool**		*You can use the **Pan** tool to grab and move your object around the screen. Alternatively, you can pan by pressing the **Shift** key **and** holding down the mouse's middle wheel.*	*Advantages:* *Allows user to move and position their object quickly*
Modifying Tool 18 **Text Tool**		*You can use the **text** tool to add text to your object.*	*Advantages:* *Allows user to add 3D text by clicking on the extrude button or 2D text*
Modifying Tool 19 **Zoom Extents Tool**		*You can use this tool to automatically zoom into your entire project.*	*Advantages:* *Allows user to quickly navigate to the entire drawing if they get lost.*
Modifying Tool 20 **View Tool**		*You can use the **view** tool to quickly look at front side and top views as well as 3D views*	*Advantages:* *Allows user to complete working drawings quickly as well as enabling them to show a top view for exporting onto the laser cutter.*
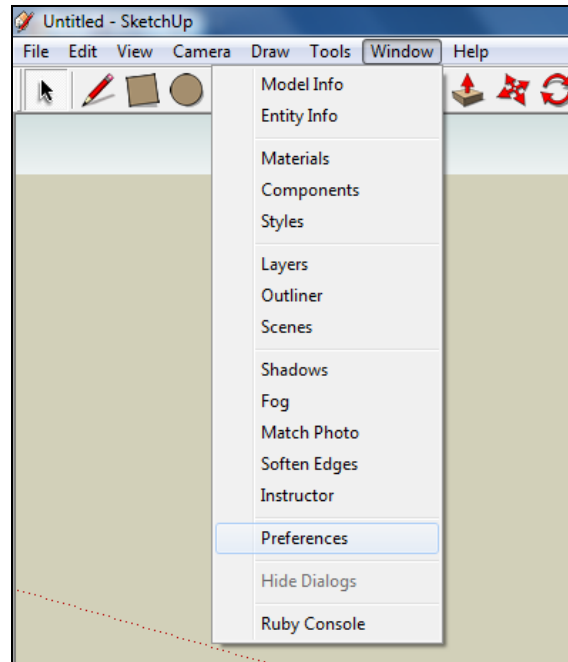
1. Open Library /Designoutthebox.com/ CAD Skills/ Lesson 10 / Toy Boat

Open the sketch up drawing. Once you have opened SketchUp, go to **Window** and select **Model Info**
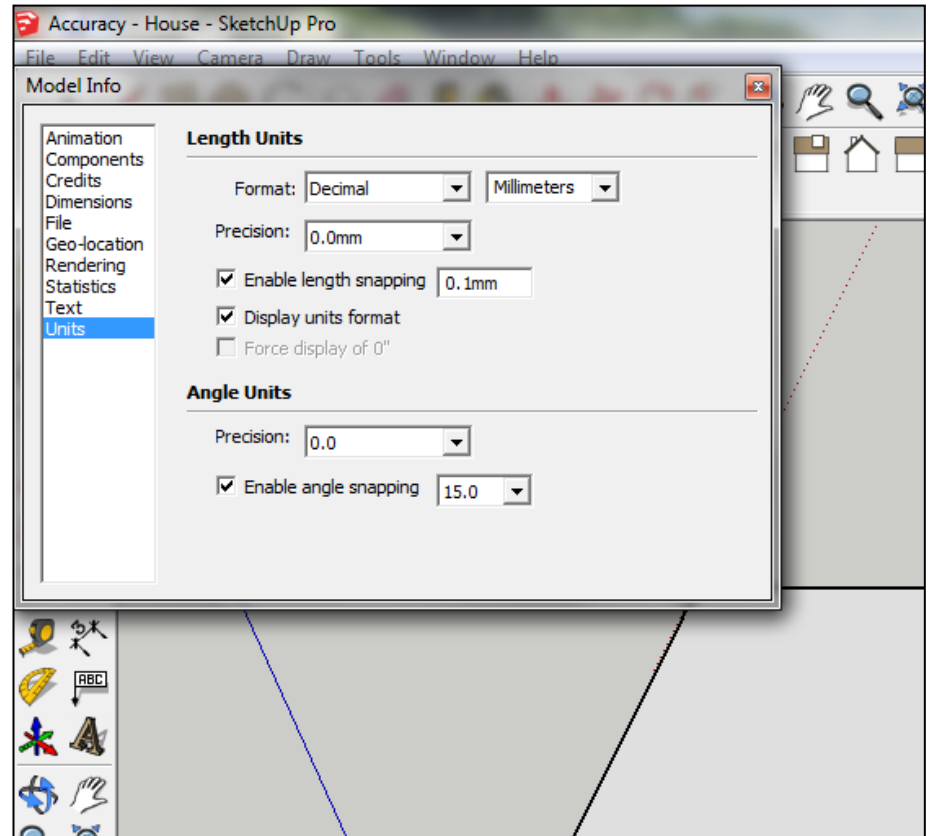
2. Select **Units** and choose **Decimal Millimetres**. We are using this template because we are doing a product design.

*Note: It is often necessary to start a new file to use the new template. Go to **File** then **New**.*

3. Now select the **View** then **toolbars** and ensure **Getting Started** and **Large Tool Set** are ticked
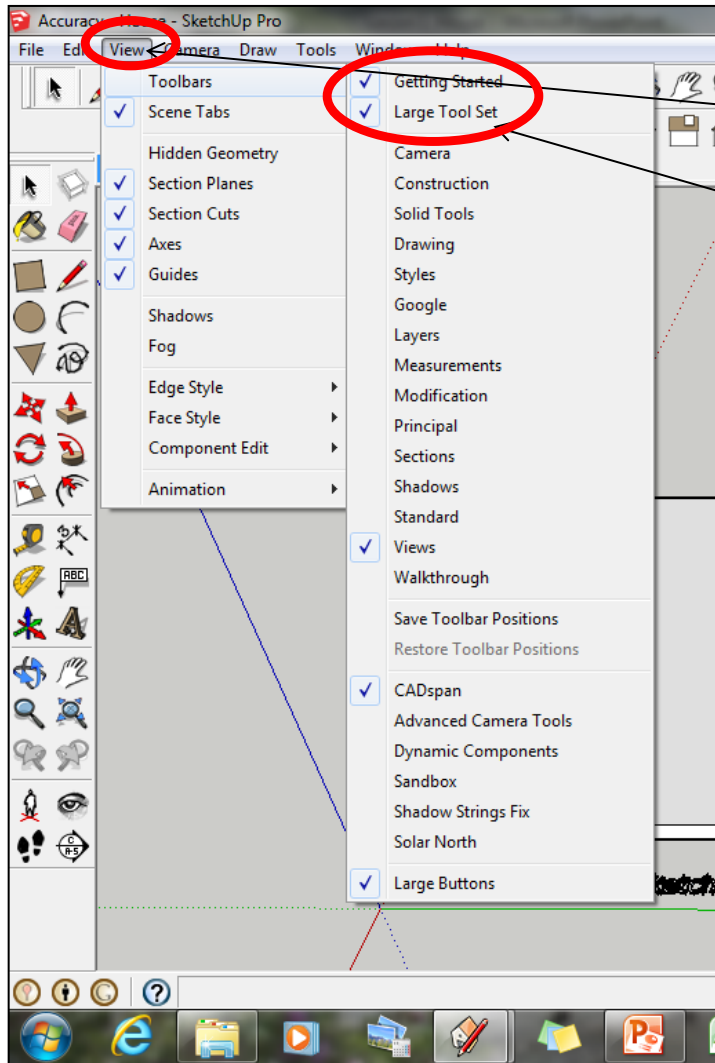
3a Select **View**

3b Tick Getting Started
3c Tick Large Tool Set

Note: this will place a tool bar across the top (getting started) and the side (Large Tool Set)

1. Open the file sketch up file *1. Final Blank Container.*

2. These two containers are the **originals.** You will need to **copy** and **paste** them to draw your ground floor. Use the *select tool* and drag it over one of the containers. The container is made of 3 parts: **roof, sides and floor**. All three should be highlighted
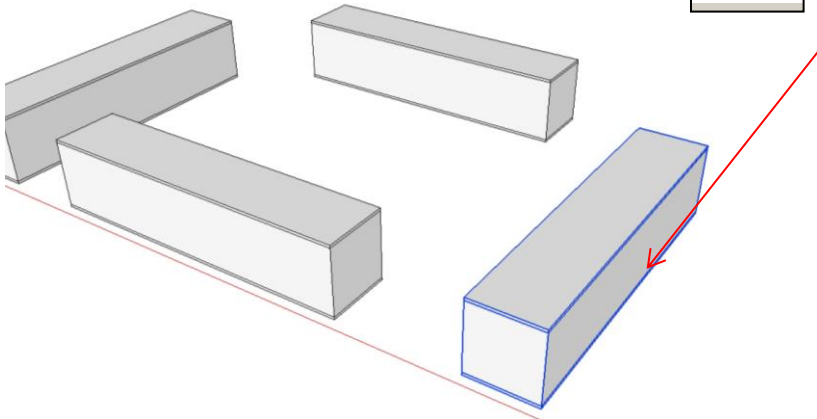
3. Select edit from the top tool bar and then copy. Select edit again and paste.
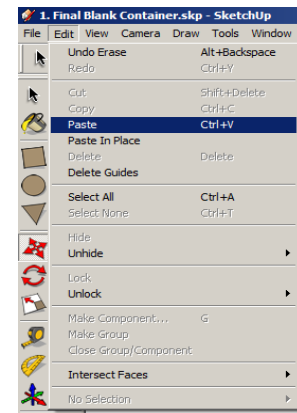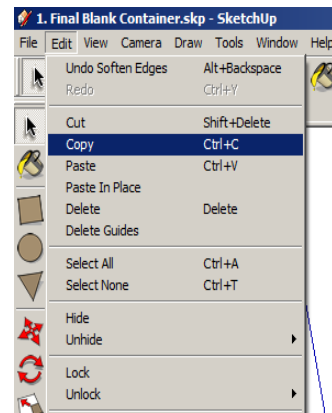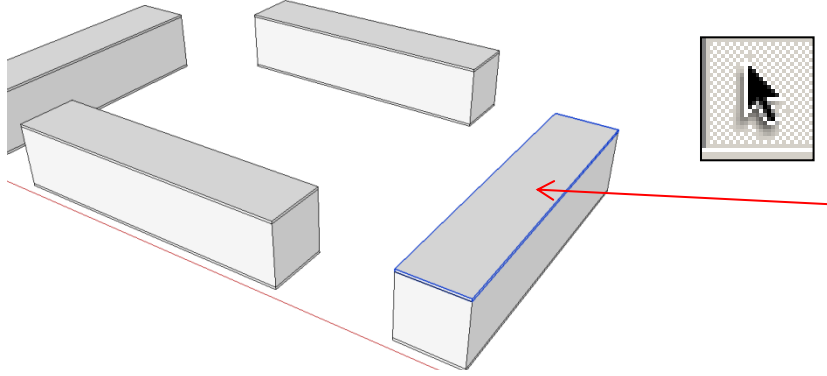
4. Another way to select each part of the container is to click on the **select tool**. Click on the roof.
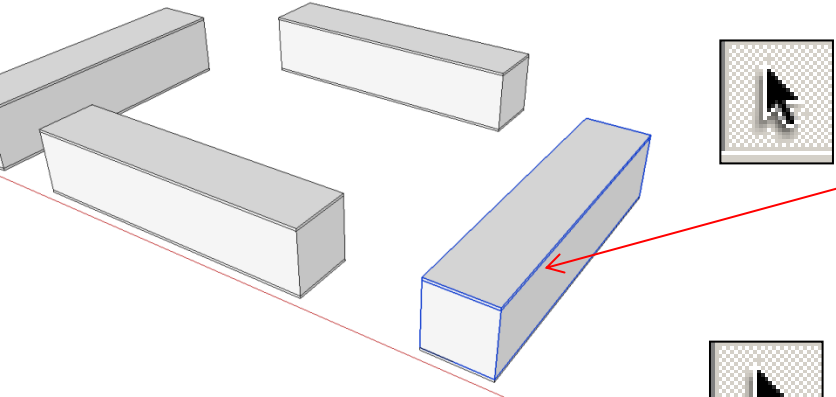
5. Hold the **Ctrl button down** and using the **select tool** click on the walls

6. Hold the **Ctrl button down** and using the **select tool** click on the base.

Use **Ctrl C** to copy and then **Ctrl P** to paste. Copy as many containers as you want for the ground floor. You can use a **maximum of 6** for both floors!
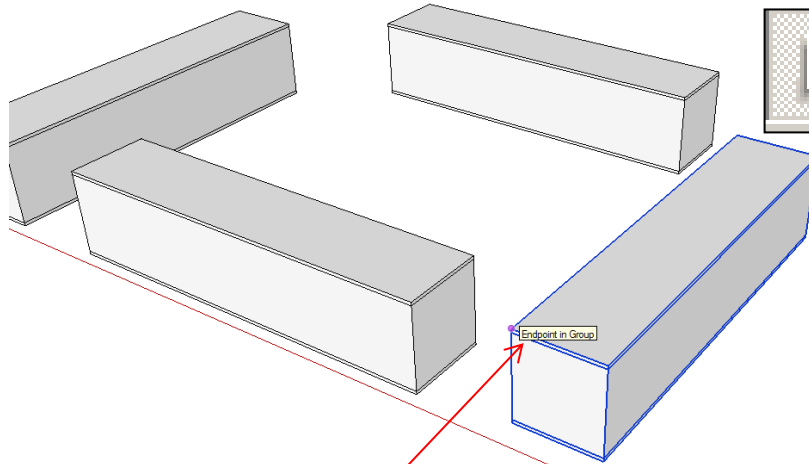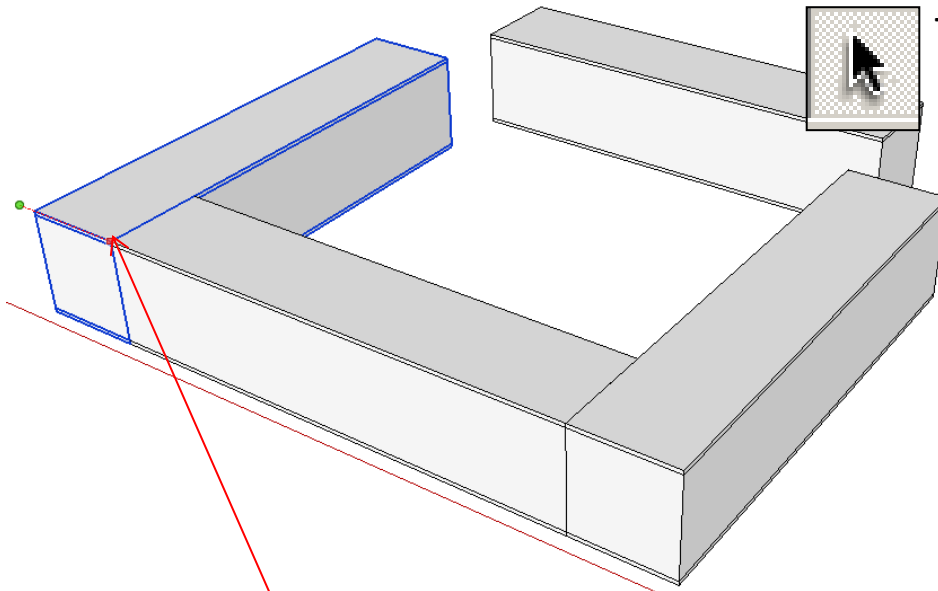
7. Using the *select tool* highlight the container you wish to move using the techniques shown to select the base, walls and roof.

8. Using the *move tool* grab the highlighted container in the top or bottom corner. Match it to the same corner of the corresponding container you wish to move it next too.
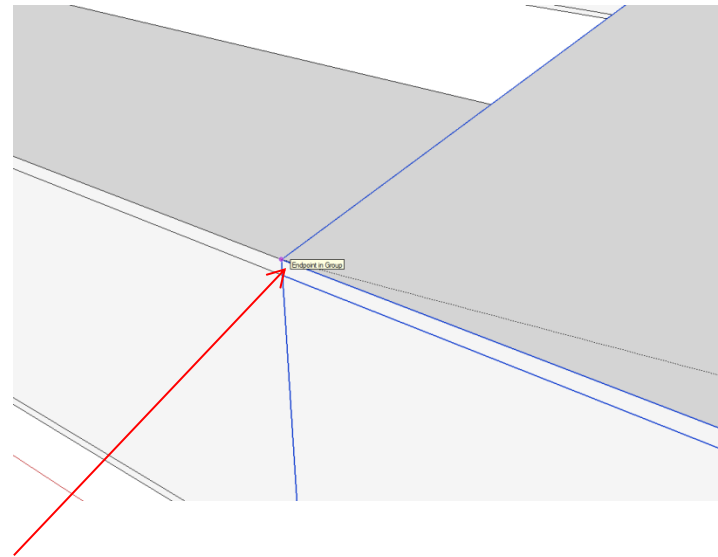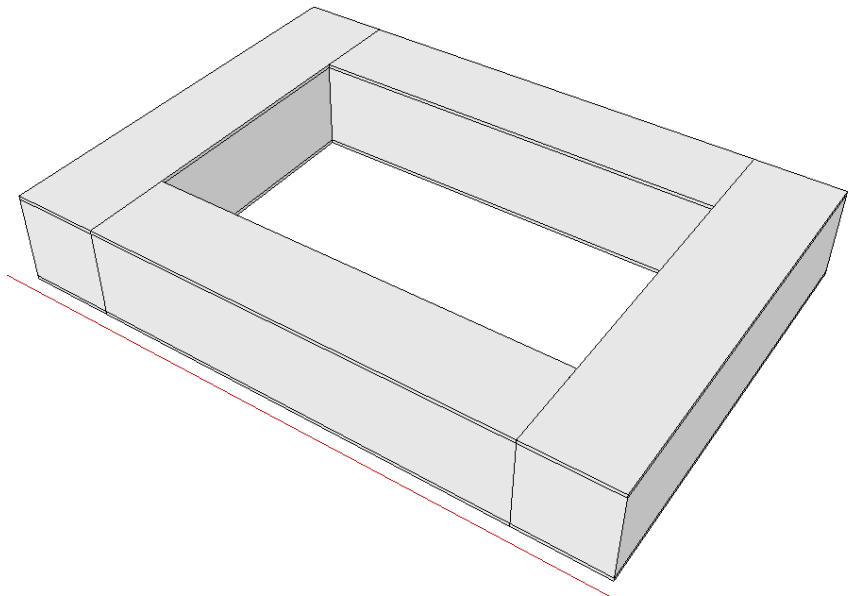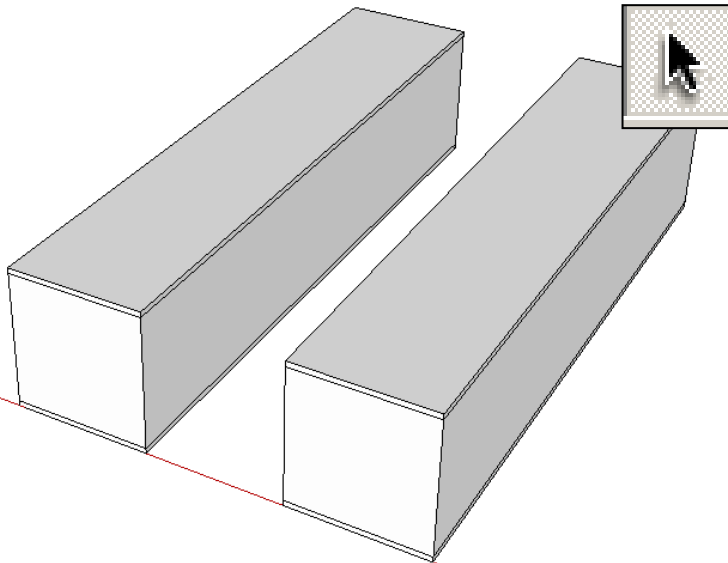
7. Using the *select tool* highlight the container you wish to move using the techniques shown to select the base, walls and roof.

10. Using the *move tool* grab the highlighted container in the top or bottom corner. Match it to the same corner of the corresponding container you wish to move it next too. *Complete your ground floor design.*

STAGE 2: Adding a glass room / partition

1. Using the *select tool* highlight the containers you wish to copy and paste using the techniques shown in steps 2, 3, 4,5 and 6

2. Using the *move tool* grab the highlighted container in the top or bottom corner. Match it to the same corner of the corresponding container you wish to move it next too. If you wish to space them out move the container along the red axis
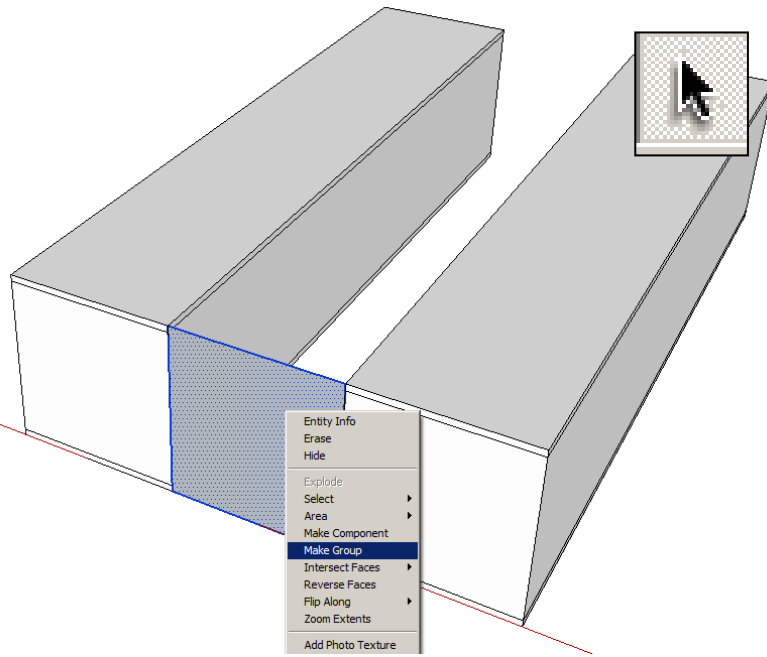
Endpoint in Group
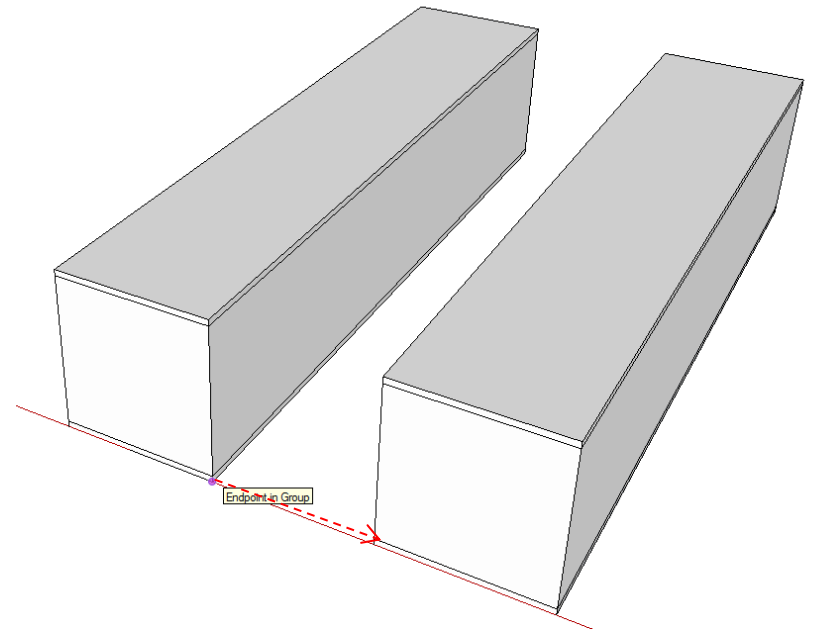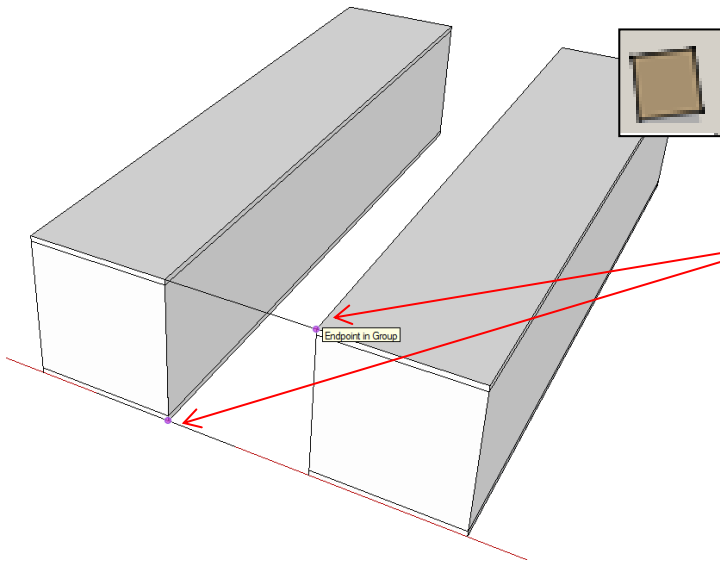
3. Using the *square tool* start in the bottom left hand corner and move the square tool to the top right hand corner as shown.

Endpoint in Group

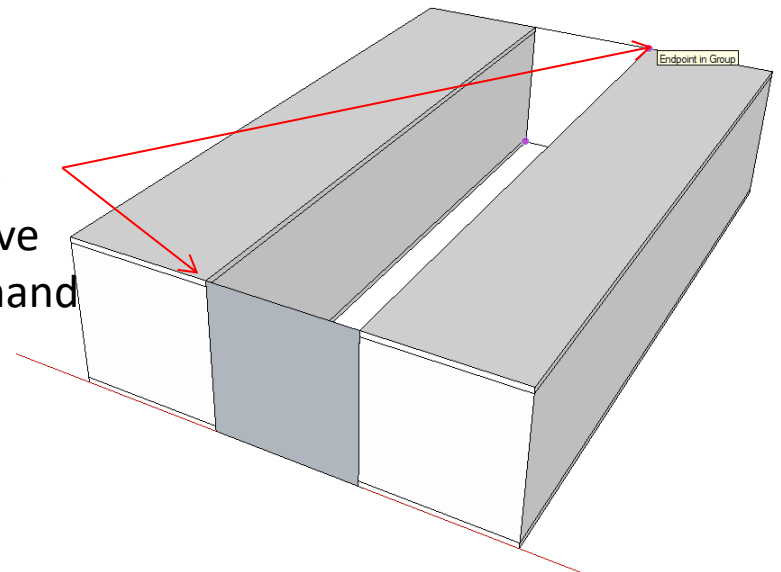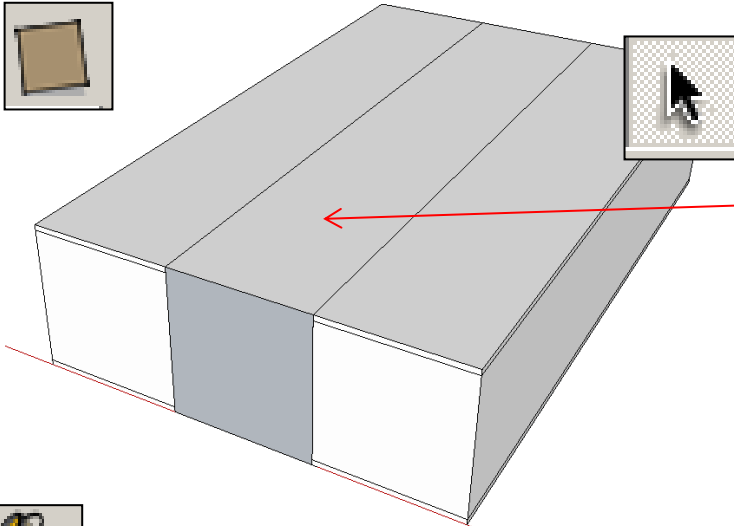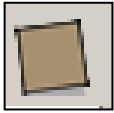4. Provided the containers are level the square should fill in grey as shown opposite.
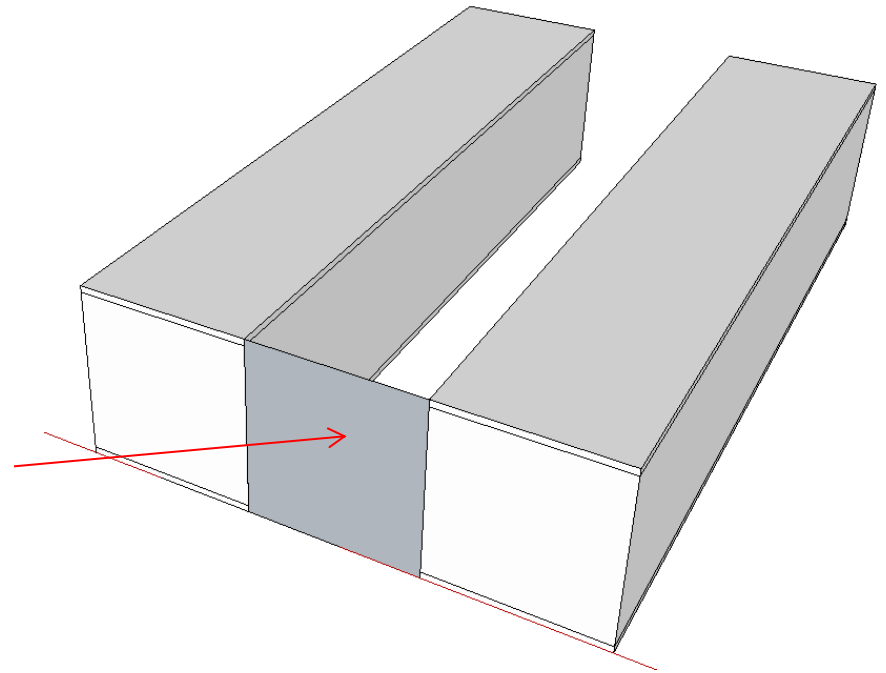
5. Using the *select tool* keep clicking on the square you have just drawn until it is all highlighted.

Right click on the mouse button and *make group*......

Entity Info
Erase
Hide

Explode
Select   ▶
Area   ▶
Make Component
Make Group
Intersect Faces ▶
Reverse Faces
Flip Along   ▶
Zoom Extents

Add Photo Texture

Endpoint in Group

6. Using the *square tool* start in the bottom left hand corner and move the square tool to the top right hand corner as shown.

7. Using the **select tool** keep clicking on the square you have just drawn until it is all highlighted.

Right click on the mouse button and **make group**……

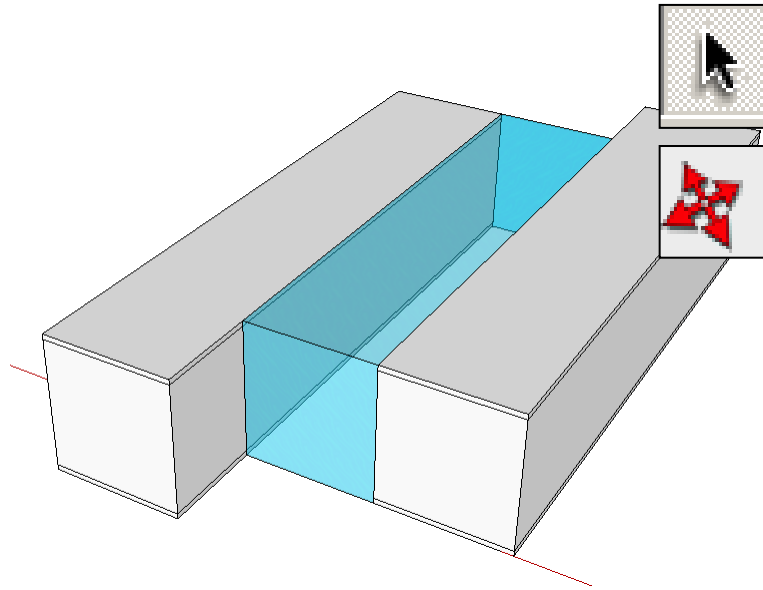8. Select the **bucket tool.** Use the drop down menu to select the **translucent material.**

Materials

Water_Sparkling

Select | Edit

Translucent
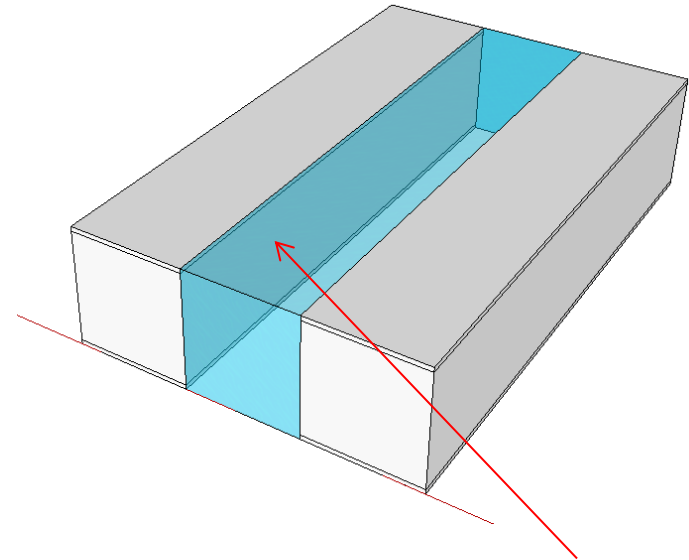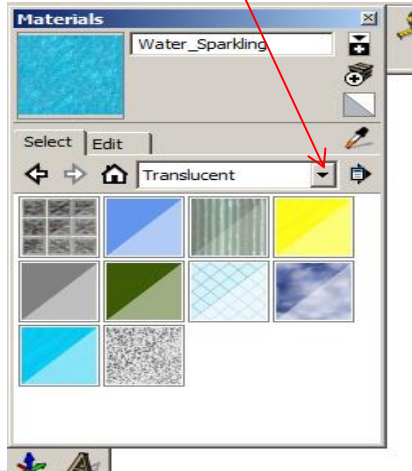
9. Colour in your **glass partition.**
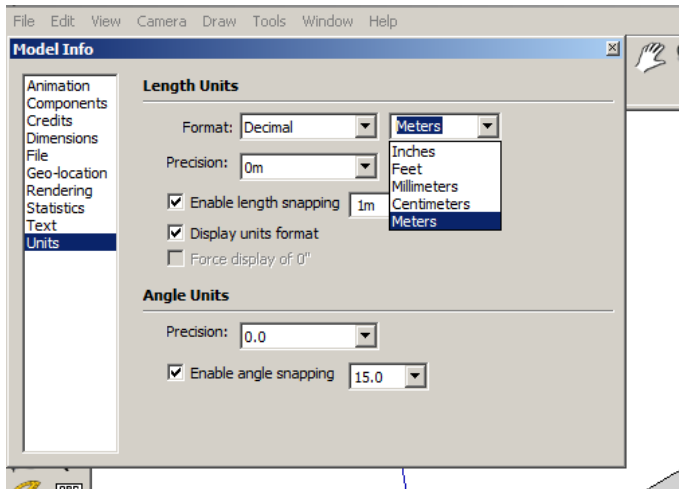
STAGE 3: Adding sizes.

1. Using the *select tool* highlight the containers you wish to copy and paste using the techniques shown in steps 2, 3, 4,5 and 6

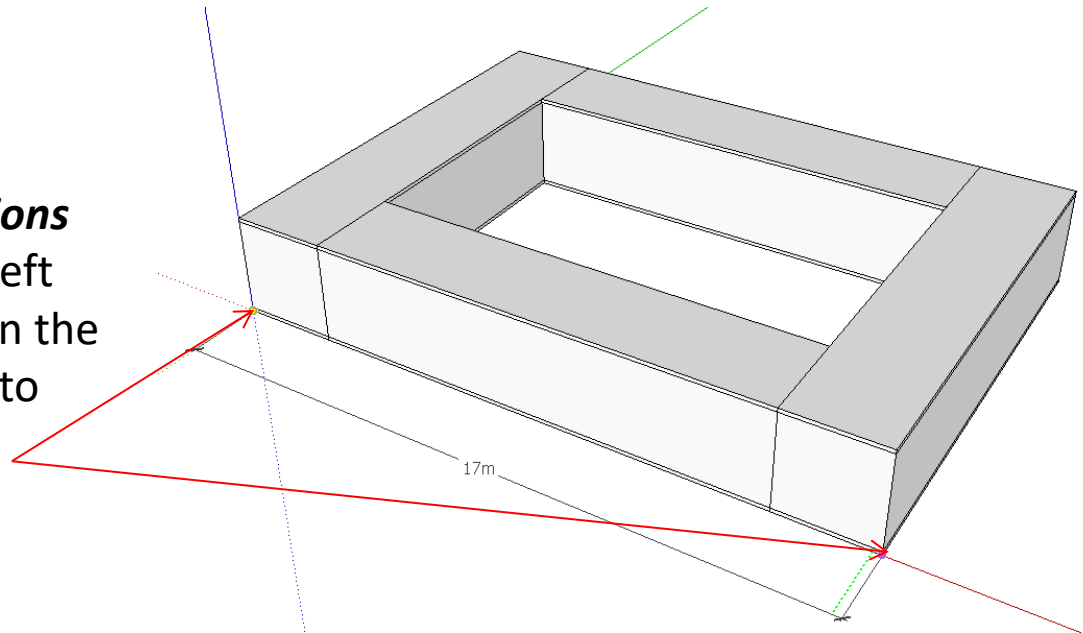2. Select the window tab on the top tool bar and the go down to model info.
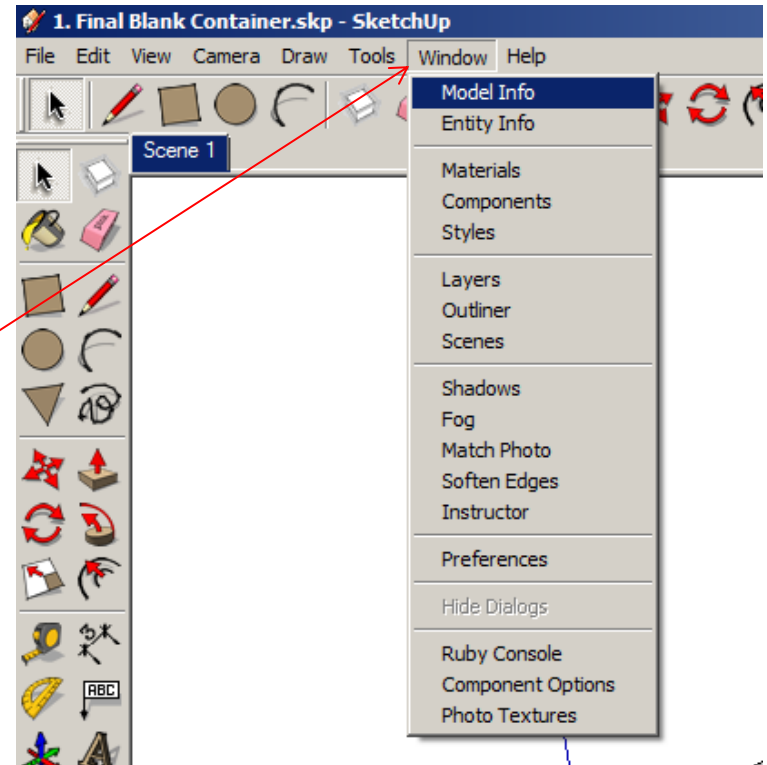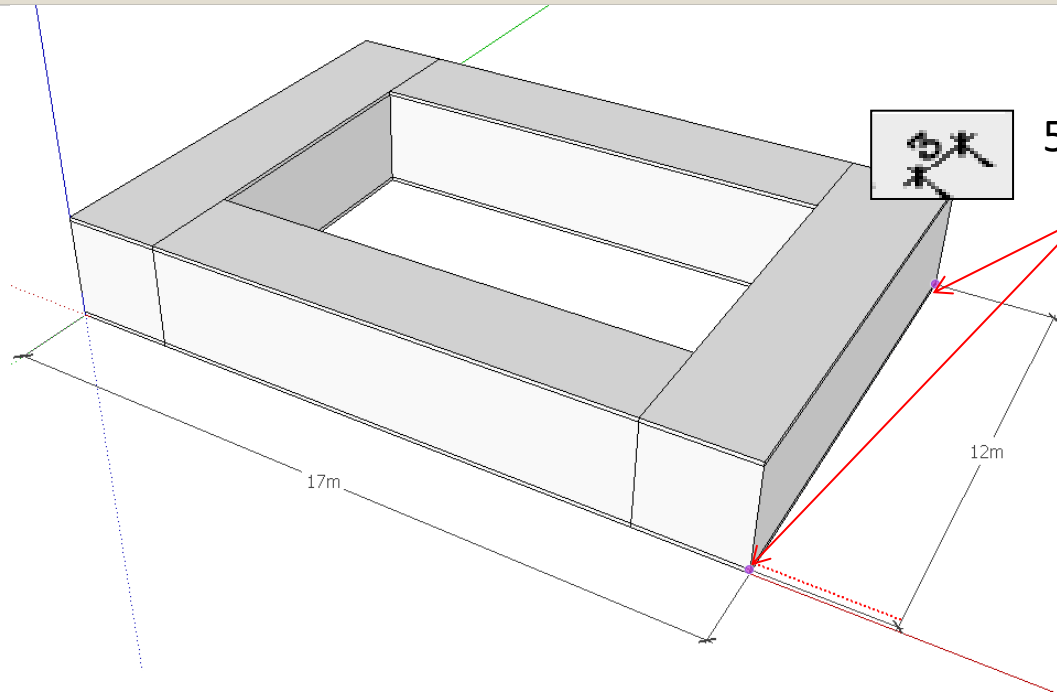
3. Select the **units tab** on the left hand side and click on **format** decimal and ***change to metres.***
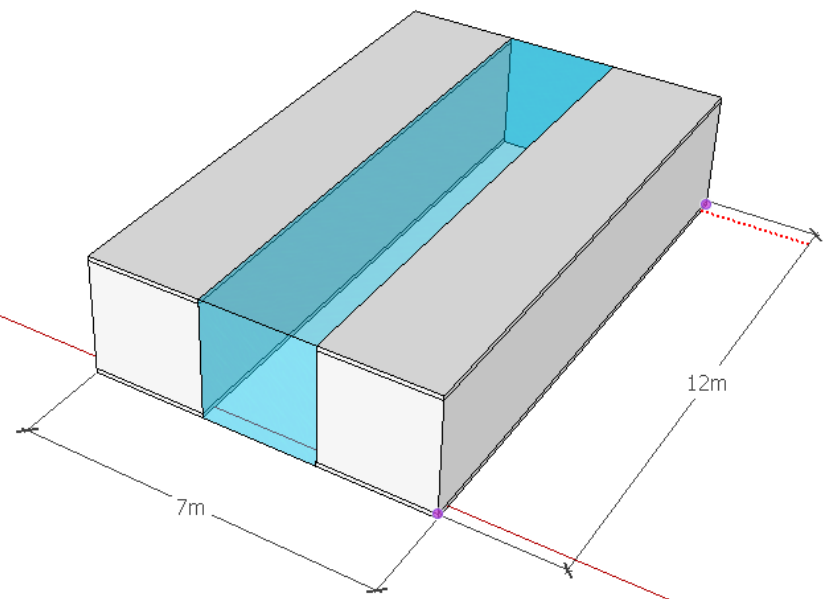
4. Select the **dimensions tool.** Click on the left corner and then on the right hand corner to show the size.

17m

5. Select the **dimensions tool.** Click on the left corner and then on the right hand corner to show the size.
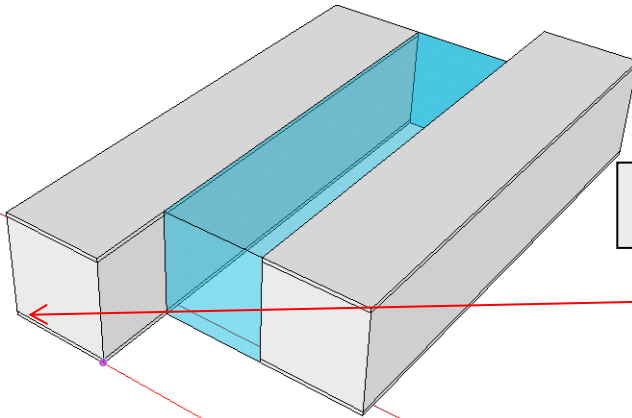
You have now produced the **length** and **width** of the building. This will allow you to work out the *area*.

17m

12m

12m

7m

5. Select the **dimensions tool.** Add the length and width dimensions onto your own building.

STAGE 4: Adding sizes to an awkward shape.

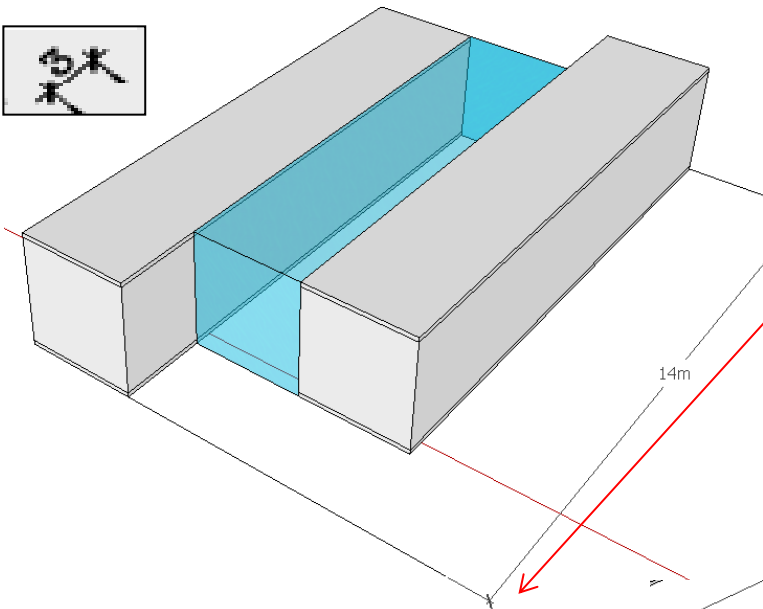1. We are going to add the length and width to an awkward shaped building.

Select the *pencil tool.* Click on the furthest forward left hand corner and then pull the pencil out on the *red axis.*

On Red Axis

2. Select the *pencil tool.* Click on the furthest back right hand corner and then pull the pencil out on the *red axis.* When it is level with the front line a *green inferencing* line will appear.
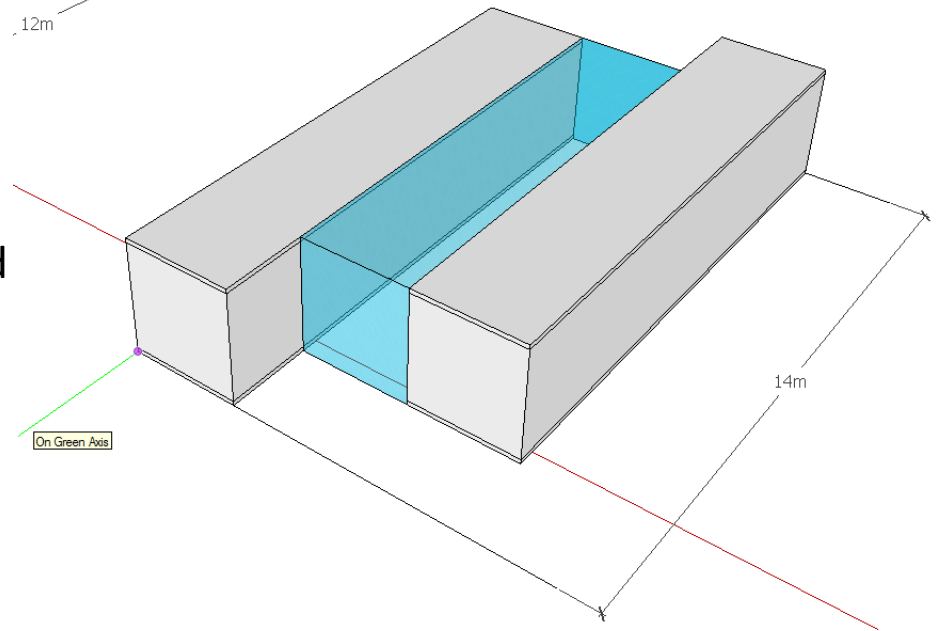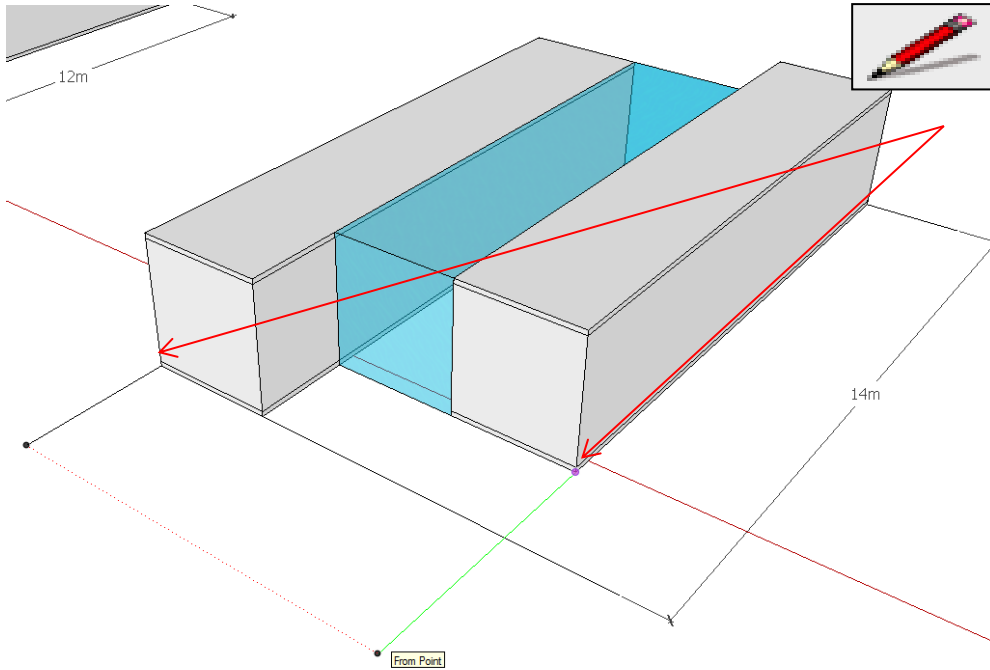
From Point
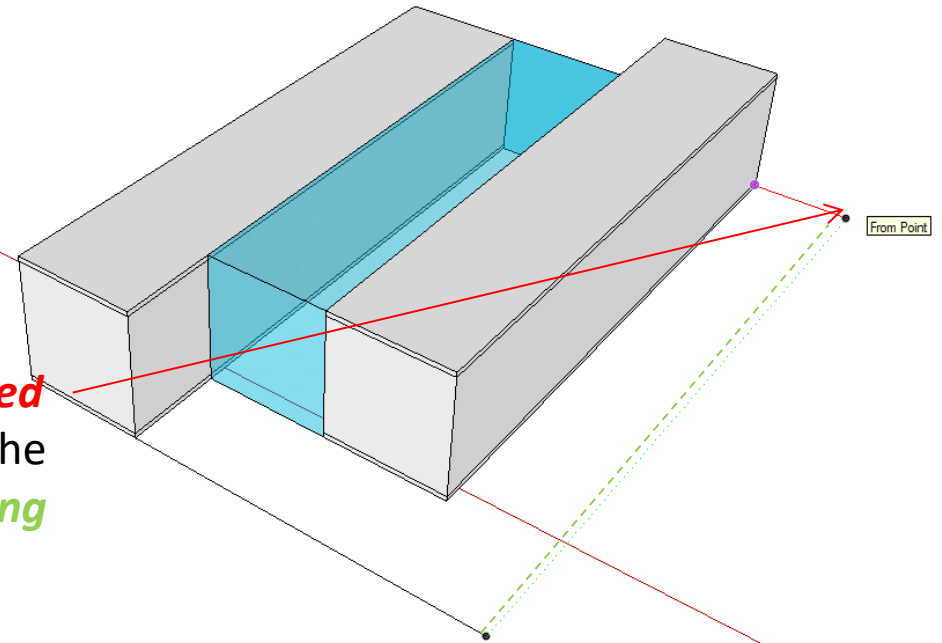
3. Select the **dimensions tool.** Click on the top right corner and then on the bottom right hand corner to show the overall **length**.

14m

12m

4. Select the **pencil tool.** Click on the furthest forward left hand corner and then pull the pencil out on the *green axis.*
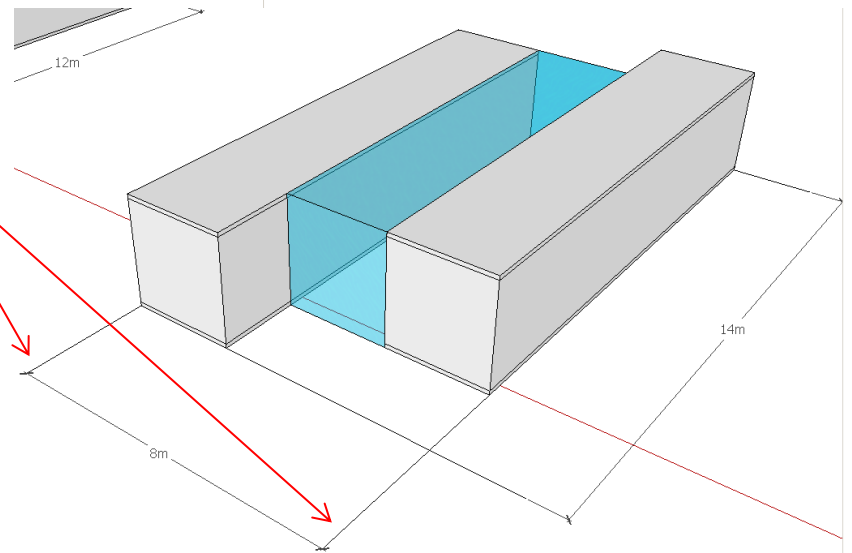
On Green Axis

14m

5. Select the **pencil tool.** Click on the furthest back right hand corner and then pull the pencil out on the **_green axis_**. When it is level with the front line a **_red inferencing_** line will appear.
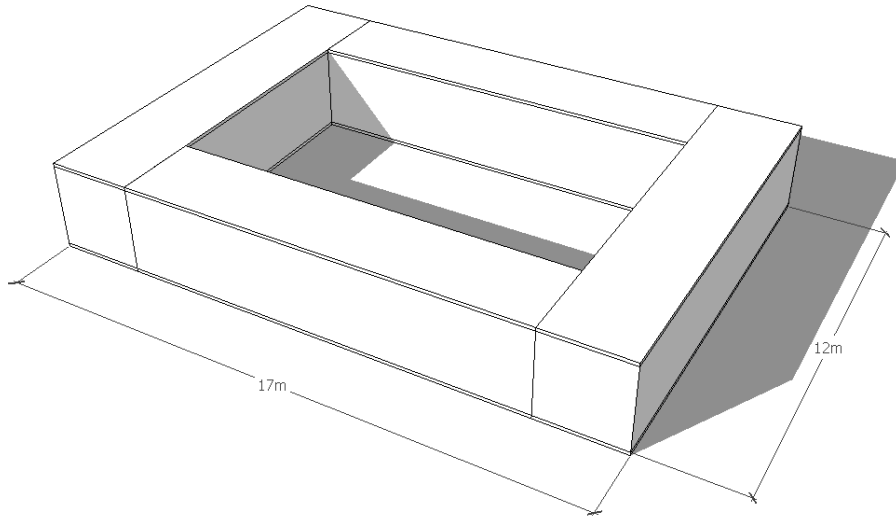
6. Select the **dimensions tool.** Click on the top left hand corner and then on the top right hand corner to show the overall **width**.

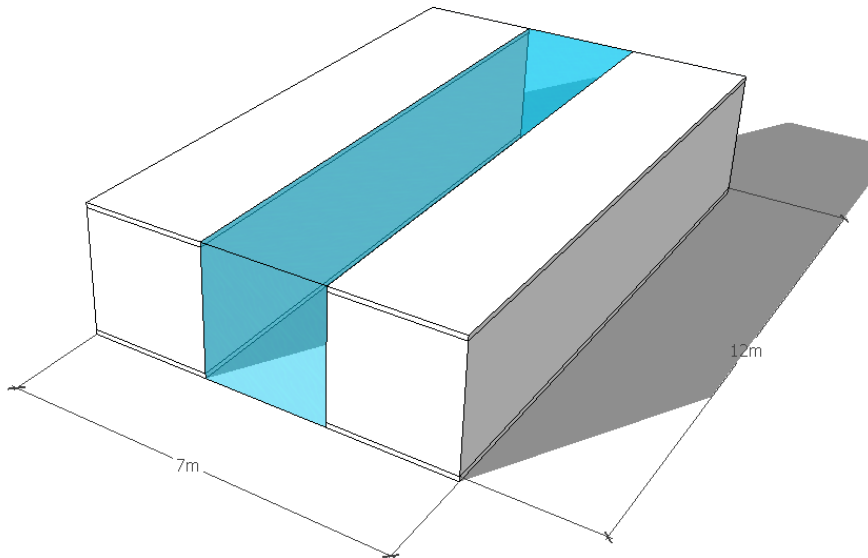# STAGE 5: Working out the Area.

AREA OF HOUSE
(*hint convert mm into m*)

Area =(Length x Width) .

Length 17m x Width 12m

= *Area 204m2*

AREA OF HOUSE
(*hint convert mm into m*)

Area =(Length x Width) .

Length 7m x Width 12m

= *Area 84m2*
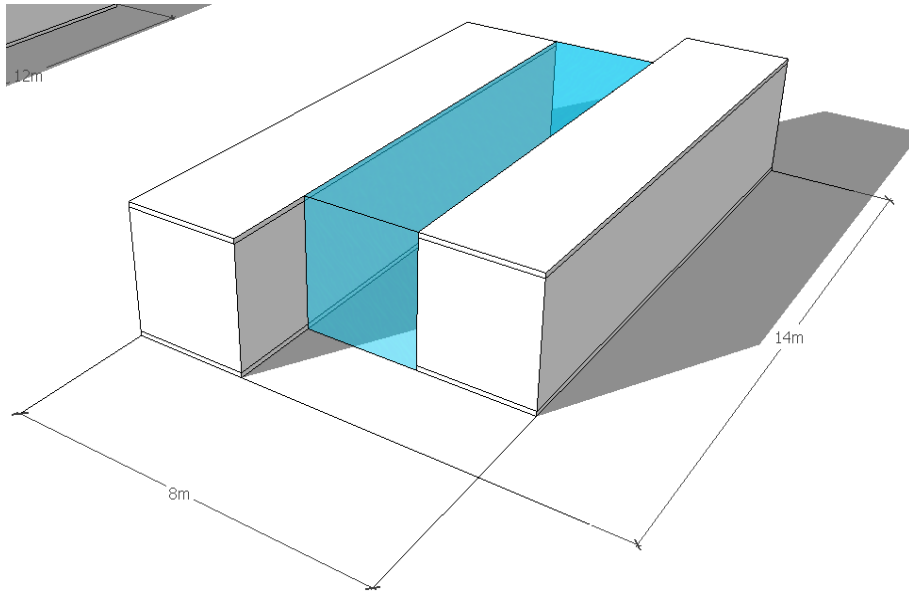
12m

8m

14m

STAGE 6: Working out Cost.
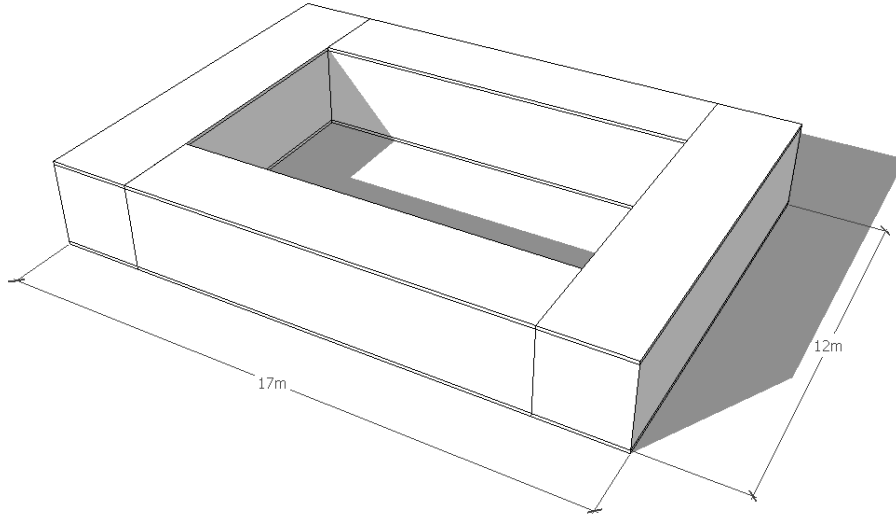
Cost to Build = (Area x £1200)
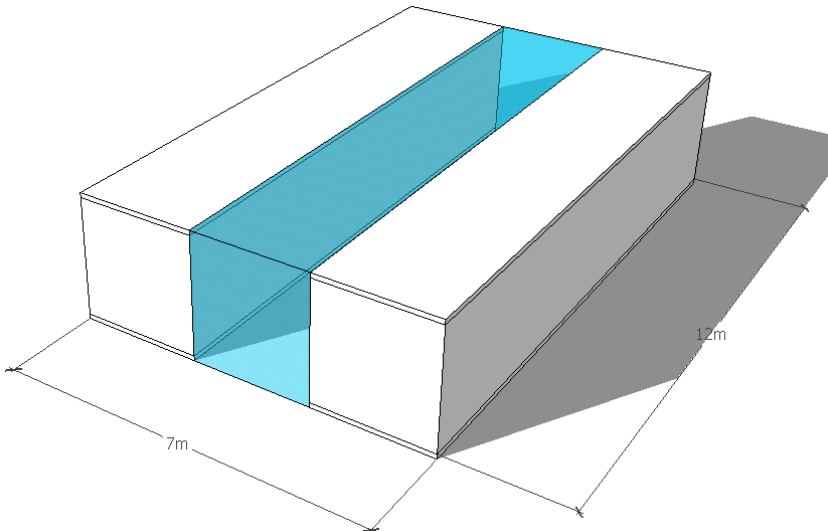
Area 204m2 x £1200 = Cost to Build £244,800

Shipping Container reduction (50%)

Cost to Build / 2 = Reduced price £122,400

Built off site (50%)

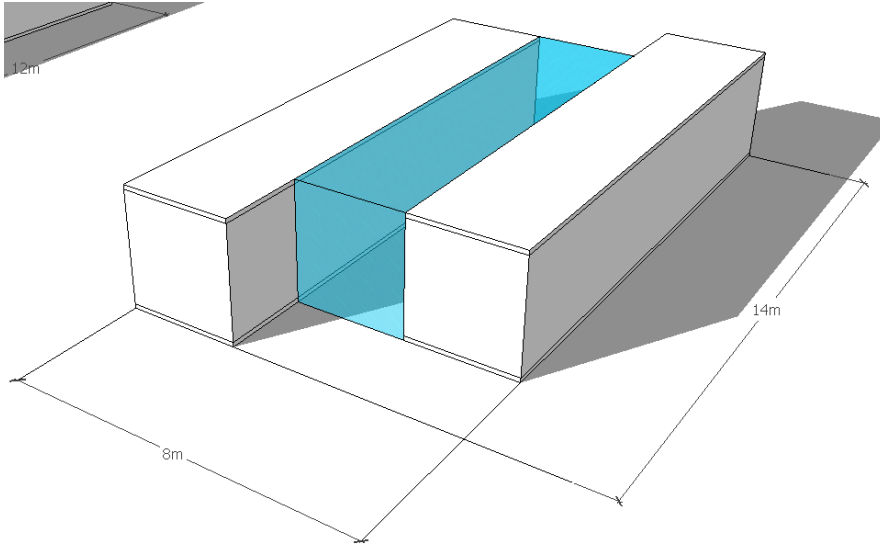*Reduced price £122,400 / 2 = £61,200*

Cost to Build = (Area x £1200)

Area 84m2 x £1200 = Cost to Build £100,800

Shipping Container reduction (50%)

Cost to Build / 2 = Reduced price £50,400

Built off site (50%)

Reduced price £50,400 / 2 = £25,200

Cost to Build = (Area x £1200)

*Area **112**m2 x £**1200** = Cost to Build £**134,400***

Shipping Container reduction (50%)

*Cost to Build / 2 = Reduced price £**67,200***

Built off site (50%)

*Reduced price £**67,200** / 2 = £**33,600***

xtension

- Can you improve the design of the first floor taking into consideration:

  - Consumer needs
  - Cost
  - Size
  - Aesthetics