

**Design Your Own Tiny House**

Screen Capture Image, Rectangle, Chart, Text

Auto-generated description

# Learning objectives

This assignment is a collaborative project between science **and mathematics**. The learner can do this project alone or with a group of two or three people.   
If you want to work in a group of three, the group can make **two** Tiny houses models at the same time.  
Think carefully about who you will be working with in a group. **Please note:** Everyone fills in their own booklet and completes the assignments described in this booklet before moving towards making a 3D model of their own Tiny house.

Mathematics Learning Objectives, the learner will be able to:

* Know what an enlargement is
* Know what a magnification factor is.
* Calculate the factor at a magnification.
* Understand the concepts of original and image.
* Calculate the missing sizes with the factor.
* Calculate the circumference of a magnification.
* Calculate the area of an enlargement.
* Understand the concept: scale.
* Calculate the factor on the scale
* Calculate the scale.

Learning objectives science, learner will able to:

* Work with someone and hand in a joint end product.
* Turn a 2D drawing into a 3D model.
* Make a logical layout of a house
* Work efficiently with cardboard and paper.
* Make connections between different materials.
* Understand the housing shortage within our society and that Tiny houses are a possible solution for the future.
* Understand the concept: scale.
* Calculate the factor on the scale.
* Calculate the scale.

B&T dimensions and types covered.

**Dimension**

* **Interest in New Technology.** The activity introduces students to basic 3D progresses simultaneously as they look at a possible live project.
* **Appreciation and Respect**: Understanding and respecting for natural elements of space, land and usefulness.
* **Social Responsibility**: Promoting inclusivity and empathy through researching the possibilities of using the houses
* **Practical orientation:** Students actively build and model their own Tiny house

Type:

* **Explorer**: Through the exercise the student get to manually work with tools that they are perhaps not use to and explore how to put together an item.
* **Does**: The lesson entails that the students have a hands on activity. Hand-on activity that combines following instructions and making the item.

# Teacher Prerequisite Knowledge

The teacher(s) for this lesson need a strong base in applied mathematics. Specifically, they need to be able to teach all the mathematics objectives listed above. Ideally, they have some understanding of architecture to help connect this lesson to real-life design.



Grade Level

* Middle school / junior high school (grades 5/6/7–8/9) from 11 to 15 years old.
* High school / Senior high school (grades 9/10–12) from 15 to 17/18 years old.
* High School / College Level / Girls, Women 16 -30 Art, Design, Human tech.

Subjects

* **Natural Sciences:** material properties.
* **Technology:** 3D design and construction.
* **Art:** Modelling with 3D model.
* **Mathematics:** Measuring and classifying materials based on conductivity.

Materials

* Cardboard
* Sticker
* Wallpaper
* Glue
* Siccors
* Paint
* 3d prints
* Fabrics
* Foam paper.
* Pencils
* Paintbrushes
* Paper (sketching)
* A3 Sheet with squares
* [www.floorplanner.com](https://www.floorplanner.com) free program (or other like it, everyone needs to make an account)

Duration

Several days, could be implemented in lessons of 2 hours. Maximum 8 hours in total

Lesson Plan

Introduction

Tiny houses are currently the solution to quickly place homes somewhere. Too few houses have been built in the Netherlands in recent years. At the same time, environmental requirements have become stricter and make it increasingly difficult to build quickly. Think of nitrogen problems and the protective measures for all kinds of plants and animals. Municipalities in the Netherlands are increasingly switching to the installation of temporary container homes to meet the need for more living space.  
  
Tiny houses are small houses that have between 15 m2 and 50 m2 of living space, where you can live in. The houses are often made from shipping containers. These are relatively inexpensive to purchase and easy to stack. A container can easily be converted into a home in a large factory.  
The construction time of a Tiny house is very short. The energy and water consumption are lower than ordinary homes and the homes take up much less space. All this contributes to a better environment and solves part of the housing shortage.



step-by-step development

**Research**   
You are now going to do research on the internet about Tiny Houses.

Answer the following questions:  
  
What is the definition of a Tiny House?  
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Why did people come up with Tiny houses?  
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Why are there they using container homes?  
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What function did the shell of the temporary homes in your place have in the past? What do they use as a basis to make the temporary home?  
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What are the dimensions of the temporary homes that are currently being placed in your place?  
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Name four advantages of living in a container home?  
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**Calculating the surface area of the container house**

Afbeelding met schets, diagram, lijn, Rechthoek

Automatisch gegenereerde beschrijving

* Above you can see a long inner wall of your Tiny house. In connection with paint that must be applied to this wall, we want to know how large the surface is.  
  Calculate the area **A** of this wall in **m2**. (write down your calculation)  
  First, write down the **word formula** for this calculation.  
  Please note that all sizes given are in cm.  
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Afbeelding met diagram, tekst, schets, Technische tekening

Automatisch gegenereerde beschrijving

* You can see the back of your Tiny house above. In connection with paint that has to be applied to this wall, we want to know how large the surface is.  
  You don't have to paint where the window is.

Calculate the area **B** of this wall in **m2**. (write down your calculation)  
First, write down the **word formula** for this calculation.  
Please note that all sizes given are in cm.  
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Afbeelding met diagram, tekst, schets, Technische tekening

Automatisch gegenereerde beschrijving

You can see the front of your Tiny house on the right. In connection with the paint that has to be put on this wall, we want to know how large the surface of this wall is. You don't have to paint where the door is. Calculate the area of this wall in **m2**. (write down your calculation)  
First, write down the **word formula** for this calculation. Please note that all sizes given are in cm.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Afbeelding met diagram, tekst, schets, Technische tekening

Automatisch gegenereerde beschrijving

You can see the ceiling of a Tiny house above. A resident wants to apply these round figures to the ceiling.  
Calculate the area of figure **G** in **m2**. (write down your calculation)  
First, write down the **word formula** for this calculation.  
Please note that all sizes given are in cm.  
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\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_Calculate the area of figure **H (previous page)** in **m2**. (write down your calculation)  
First, write down the **word formula** for this calculation.  
Please note that all sizes given are in cm.  
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Afbeelding met diagram, tekst, schets, Technische tekening

Automatisch gegenereerde beschrijving

You can see the floor of your Tiny house above. This floor is covered with different types of floor covering.   
Calculate the area **E** of this part of the floor in **m2** (write down your calculation).  
First, write down the **word formula** for this calculation.

Please note that all sizes given are in cm.

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You can see the floor of your Tiny house above. This floor is covered with different types of floor covering.   
Calculate the area **D** and **F** of this part of the floor in **m2** (write down your calculation). First, write down the **word formula** for this calculation.  
Please note that all sizes given are in cm.

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Now calculate the circumference of figures **D** and **E in meters**. (write down your calculation)   
Please note: all given sizes are in cm.  
Outline **figure D** : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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Circumference **figure E** : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
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# **Cost overview**

On the previous pages you have calculated the surfaces of the walls and the floor. You will need this to calculate how much paint and carpeting you need. Go to a hardware store on the internet and find the materials you need in the right quantities.

|  |  |  |  |
| --- | --- | --- | --- |
| Material type | Surface Area in **m2** | Rounded quantity | Cost in EUR's |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Total (last column) |  |  |  |

We are now going to start making a 3D model. The dimensions of the sea containers that have been used as temporary homes in some cities have a size of 6m x 2.5m x 2.5m (l\*w\*h).

**Convert these dimensions to centimeters.** \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  
  
We are now going to start making a 3D model. Here you can see a picture of your temporary home. In technology, predetermined scales are used.  
Here you can see your home on a scale of **1:100, 1:50, 1:25 and 1:20**  
Image with text, screenshot, diagram, line

Auto-generated description

You are now going to calculate how big your model will be in cm if we are going to use one of these scales for your model.  
 **Fill in the table and do the math**

|  |  |  |  |
| --- | --- | --- | --- |
| Dimensions in  real life | Scale | Scale factor | My scale model will then be |
| 600x250x250 | 1:100 | 0,01 | 600x0.01=6cm, 250x0.01=2.5cm |
| 600x250x250 | 1:50 |  |  |
| 600x250x250 | 1:25 |  |  |
| 600x250x250 | 1:20 |  |  |

Ask your teacher for an A3 sheet with squares. **Now draw the 4 rectangular shapes of the 600x250 container on the 4 different scales**. Please use the table above.

**Create a layout on your computer.**  
Before you start making a drawing to scale, you will use an online free program to make a layout of your Tiny house.  
You can do this on the website [www.floorplanner.com](http://www.floorplanner.com)With this program you can make a quick layout of your Tiny house very quickly and precisely. Sign up on this site and create a free account.  
  
Screen Capture Image, Rectangle, Chart, Text

Auto-generated description  
  
Your home should have a number of basic amenities.  
The following items must be present:  
-bed, sofa, dining table, chairs, television-shower-toilet-kitchenette  
  
Once you're done, discuss your design with your teacher. They check whether the design is satisfactory.

**Create a layout on paper**  
In preparation for creating the 3D model, you will make a scale drawing of your design. You ask for an A3 paper layout with boxes from your teacher. Now draw your design on a scale **of 1:20** on this A3 paper.

**Create a 3D model of your home.**

Design your “dream” tiny house for your own living

**Create a 3D model of your drawing**

You will receive the outside of your model as a building-kit in cardboard.  
Recreate your 3D model in your scale model as much as possible.

**3D print your model Tiny House.**

3d print the Tiny house and materials like chairs, bed, toilets etc int the right scale.

Print the Surfaces like fabrics, paintings, flooring with wallpaper or stickers

wrap- up & reflection

**Review and Showcase (15 minutes)**

* Have students share their finished house design with the group.
* Discuss the process and any challenges faced.

**Cleanup (10 minutes)**

* Ensure all materials and tools are properly cleaned and stored.
* Make sure the workspace is tidy.

Extension activities

Possible to make this as big (extent) as you want, add lighting, roofing, in and outside decoration, plateau’s, veranda’s etc.

Additional Resources

[**www.floorplanner.com**](http://www.floorplanner.com)