Proportions

Topic	Geometry
Learning objectives	Understand the concept of proportions Solve proportion problems using ratios
Age group	10-14 years
Estimated duration	2 hours
Activities	Applying proportions to real-life situations
Related visits	Agrinio, Athens, Tourcoing/Roubaix, Warsaw

Previous knowledge required

Basic understanding of ratios

Unit conversion

Step by step: the sequence in the classroom

Step 1: Introducing the topic

Exploring Proportions in the World

Proportions are a fundamental mathematical concept found in various aspects of our lives, from art and architecture to cooking. Imagine this: you're designing a masterpiece, be it a towering monument or a mouthwatering recipe. What secret ingredient ensures every part fits perfectly, creating a symphony of proportion? That's where mathematics steps in.

Proportions are the threads connecting mathematics to our world. Think of them as the architects of balance, guiding us in crafting aesthetical designs and logical solutions.

Whether you are recreating historical monuments or resizing recipes, you will need proportions. They enable you to shrink or expand while maintaining the essence of the

original. Therefore, proportions are a crucial skill in our everyday life, art and even science, among others.

Studying proportions isn't just about numbers; it's about understanding the relationships that shape our surroundings.

Proportions aren't just lines on paper – they're the key to unlocking the secrets of balance and beauty all around us.

As you will discover in the following exercises, proportions can also be linked with many other mathematical subjects, such as unit conversion for example.

Step 2: Class activities

Recreating Historical Monument

Imagine you're an architect tasked with recreating the Eiffel Tower on a smaller scale.

Here is a table of the Tower dimensions:

Current height	330 meters
Height without the antennas	312 meters
Total width	125 meters (on the ground)
Width of a pillar	25 meters (on the ground)
First floor	57 meters, 4415 m2
Second floor	115 meters, 1430 m2
Third floor	276 meters, 250 m2
Pillars	The 4 pillars form a 120 m2 sideways

Calculate the dimensions for a scaled-down version, maintaining the same proportions as the original.

Determine the height and other measurements corresponding to your chosen scale (for example, 1:50).

Once you calculated the dimensions, **recreate the Eiffel Tower in a 3D version with those dimensions**.

Use all the material you want to recreate it. Compare your creation with your classmates.

Travel Planning

You and your cousin are planning a dream vacation with a budget of €1300.

You researched the prices for accommodations, transportation, activities and food.

Based on your findings, here is the provisional budget you created with your cousin:

🛏 Accommodations	629 €
🚐 Transportation	178€
🏄 Activities	153€
🍽 Food	340€

Great news! You discussed your holiday plans with your grandparents, who agreed to give you some money. Your new budget is now 2000€.

Adjust your travel plans proportionally, keeping the same ratio of expenses as in the original budget.

How does the increased budget impact your vacation plans?

Step 3: Homework and development ideas

Small scale room

Use paper or craft materials to create a small-scale model of your bedroom (or any room in your home).

Follow the steps to create it:

1. **Choose Your Room**

Select a room in your home that you'd like to recreate in a small-scale model. It could be your bedroom, living room, or any interesting space.

2. Determine the Scale

Decide on the scale you want to use for your model. For example, you could choose a scale of 1:10, where every 1 unit in your model represents 10 units in real life.

3. Gather Materials

Collect craft materials such as paper, cardboard, scissors, glue, markers, and any other decorative items you'd like to use.

4. Measure and Draw

Measure the dimensions of the real room using a ruler.

Then, using the scale you've chosen, calculate the dimensions for your model.

For instance, if your room is 4 meters long in real life and you're using a 1:10 scale, your model should be 40 centimetres long.

5. Create the Layout

Cut out pieces of paper or cardboard to represent the room's walls, furniture, and other elements. Assemble them to create the layout of your scaled-down room. You can also draw furniture and decorations on paper and cut them out.

6. Assemble Your Model

Use glue to assemble the pieces of your room together. Place furniture and decorations in their appropriate spots within the model.

Be creative and pay attention to the proportions to maintain an accurate representation.

When your small-scall 3D room is ready, bring it to class to share it with your classmates.

Chocolate Chip Cookies

Put your proportional skills to the test while creating a delicious dish!

For this activity, you will scale and cook a recipe in real life.

Here is the recipe of chocolate chip cookies for 4 people:

- 225g butter
- 150g sugar
- 150g brown sugar
- 2 eggs
- 280g flour
- 1 teaspoon baking soda
- 1/2 teaspoon salt
- 350g chocolate chips

How many servings do you want to make: 1 person, your family, your friends, the entire class, etc. ?

Using proportions, scale the quantities of the ingredients to match the desired number of servings.

Now, cook the recipe at home using the scaled ingredient quantities.

What is the result? Are the cookies good? Did you calculate the proportions right?

References:

Eiffel Tower key stats: The Tower in numbers. (2017, October 30). La Tour Eiffel.

https://www.toureiffel.paris/en/the-monument/key-figures