



Miniature Masterpiece: Design A Scale Model

 Math •  30 min •  Ages 12-15 • Grade 8

In this hands-on challenge, you'll apply proportional reasoning to design and build a miniature scale model of a piece of furniture from your home. You'll practice careful measurement and problem-solving to create a perfectly proportioned small-scale replica.

Our goal is for your child to Apply proportional reasoning to scale down real-world objects., Accurately measure dimensions and choose an appropriate scale., Construct a 3D model based on scaled measurements..

What You Need

Ruler • Pencil • Cardboard • Scissors



Scan To Tailor

Every child learns differently, and this is just the baseline. Scan to jump into the app and easily tailor this lesson to match your child's exact learning level and see how Mai will guide this lesson.



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Lesson Blueprint

A simple, hands-on lesson that guides your child through curiosity, exploration, and reflection.



Mai's Tips

1. **Encourage the child to teach YOU how they calculated their scaled dimensions:** This reinforces their understanding.
 2. **If the child struggles with precise cuts or assembly, remind them that building models often involves trial and error, and patience is key:** Focus on the learning process, not just a perfect end product.
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Prep Before Session

1. Gather the materials and choose a safe, comfortable place for the activity.
2. Read through the lesson once so you know where the child will make predictions, test ideas, and reflect.



1 Introduction 5 Min

1. Welcome the child to the challenge. Explain that a scale model is a miniature or enlarged copy of a real object, like a toy car or an architect's building model, where all parts are kept in perfect proportion. This helps us visualize and plan things that are too big or too small to interact with directly. Ask:
2. "What do you think a 'scale model' means?"
3. "Why might it be useful to make a smaller version of something big?"
4. "Have you encountered any models before, like toy cars, maps, or even in video games?"
5. Introduce the term scale: This is the ratio that tells you how much smaller or larger the model is compared to the real thing. For example, a 1:10 scale means the model is one-tenth the size of the real object. Ask: "In your own words, what does 'scale' mean to you?"
6. Done looks like: The child engages with the questions and shows a basic understanding of scale models and their purpose.



Done when: Student engages with the concept of scale models and understands their purpose.



2 Explore & Plan 8 Min

1. Have the child choose one piece of furniture in their home—like a chair, a table, or a shelf—that they want to turn into a miniature model. Guide them to select something that has clear, measurable dimensions and isn't overly complex. Ask:
2. "How would you go about making a smaller version of it that still looks exactly right?"
3. "What important measurements do you think you'll need to take from the real furniture?"
4. "Why is it important to measure height, width, and depth?" (if they don't mention these).
5. Introduce ratio in simple terms: A ratio compares two numbers, like how many parts of one thing there are compared to another (e.g., 2:1). When we scale, we keep these ratios consistent to ensure the model looks correct.
6. Done looks like: The child has chosen a piece of furniture and can explain which dimensions (height, width, depth) they will need to measure.

 **Done when:** Student has chosen a piece of furniture and articulated a plan for measuring it and understanding a 'scale' concept.



3 Discussion 6 Min

1. Have the child explain their chosen furniture and their initial thoughts on how they will measure it. Introduce scale factor: This is the number you multiply or divide by to change the size of an object while keeping its proportions correct. For example, to make something 10 times smaller, your scale factor is $1/10$ (you divide by 10).
2. Present the example: "If your real furniture is 100 centimeters tall, and you want your model to be 10 centimeters tall, what's the relationship between those numbers?" Guide them to understand this is a 1:10 ratio or dividing by 10. Ask:
3. "How will knowing this scale factor help you with all the **other** measurements of your furniture?"
4. "If you wanted to make it half the size, what number would you divide by?"
5. "Why is it important to use the same scale factor for **all** measurements (height, width, depth)?"
6. Done looks like: The child can explain how to choose a consistent scale (e.g., 1:10) and apply it to all dimensions of their model.

 **Done when:** Student can explain how to choose and apply a consistent scale (e.g., 1:10) to all dimensions.



4 **Activity** 9 Min

1. Gather the necessary materials: a Ruler, Pencil, Cardboard (a few sheets, sturdy enough to build with, like a cereal box or file folder), and Scissors. Supervise the child while using scissors for safety. Guide the child through building their miniature furniture:
2. 1. "Using your scaled dimensions, carefully measure and mark your cardboard."
3. 2. "Cut out the pieces for your miniature furniture. Think about how the real furniture is constructed and try to replicate that."
4. 3. "Assemble your pieces using tape or glue (if available) to create your 3D scale model." Encourage independent problem-solving if pieces don't fit perfectly; remind them that model building often involves trial and error.
5. 4. "Once assembled, compare your model to the real furniture. How well did you do?"
6. Ask: "What do you think was the trickiest part of constructing your tiny furniture?"
7. Done looks like: The child has completed the physical construction of their scale model.



Done when: Student has completed the physical activity of building their scale model.



5 Summary 2 Min

1. Start by praising the child's effort and their completed miniature model. Ask guiding questions to reflect on the process and their learning:
2. "How do you feel about the process of designing and building your scale model?"
3. "What did you learn today about measuring and scaling?"
4. "What was the trickiest part, and how did you overcome it?"
5. "Where else in the real world do you think understanding scale and proportion is super important?" (Help them connect this to professions like architecture, engineering, or even art and design).
6. Done looks like: The child shares at least one key takeaway from the lesson and can connect the concepts of scale and proportion to real-world applications.



Done when: Student shares one key takeaway from the lesson and connects it to real-world applications.

Beyond The Lesson

Fuel their curiosity beyond the lesson with bonus sparks.



Table Talk

Architects, engineers, and city planners use scale models to visualize and test designs before building full-size structures.



Did You Know?

Everyday objects can reveal surprising science when we slow down and observe them.



Challenge

Create a second piece of furniture for your miniature room, but this time use a different scale (e.g., if you used 1:10 before, try 1:5 or 1:20) and observe how the different scales affect the model's size.

★ Quick Recap Quiz 4 Min

Check what your young scientist remembers. Each question includes a Parent Tip to help them find the answer without giving it away.

1. If A Real Car Is 4 Meters Long, And A Toy Car Is A 1:10 Scale Model, How Long Is The Toy Car?

- ☐ 10 centimeters
- ☒ 40 centimeters

 Hint: 1 meter = 100 centimeters. Divide the real length by the scale factor.

2. What Does A 1:5 Scale Mean?

- ☐ The model is 1 unit smaller than 5 units of the real object.
- ☒ The model is 5 times smaller than the real object.

 Hint: Think of the colon as 'to' – 1 unit of the model 'to' 5 units of the real.

3. Why Is It Important To Use The Same Scale (E.g., 1:10) For ALL Measurements (Height, Width, Depth) When Building A Scale Model?

- ☐ To save time during construction.
- ☒ To ensure the model looks proportionally accurate.



Hint: What would happen if one part was scaled differently from another?

4. Which Profession MOST Commonly Uses Scale Models To Plan Their Projects?

- ☐ Chef
- ☒ Architect



Hint: Think about designing buildings or large structures.