

WAMC Lab Template

Math Concept(s): Scale Factor, Similarity, Area/Perimeter, Modeling

Source / Text: Financial Algebra 7.2 (Although it fits in a Geometry Course as well)

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Attach the following documents:

- Lab Instructions
- Student Handout(s)
- Rubric and/or Assessment Tool

Short Description (Be sure to include where in your instruction this lab takes place):

- Students will be drawing floor plans for a one-bedroom apartment and asking ChatGPT*** to design a floor plan as well. This part of the lab would take place in the classroom.
- Students will then be using yarn to layout the actual apartments. **This stage needs a large, open area.** At my school, this would take place on our large blacktop.
- Finally, students will tour each apartment to compare designs, note how technology helps and what limits it has, and decide approximate rental value of each apartment.

*** If students do not have access to ChatGPT there are 3 possible solutions: 1. You can get the ChatGPT information as a class using the teacher computer and just build one ChatGPT apartment. 2. You can use the information attached from my ChatGPT search and build one ChatGPT apartment. 3. You can delete that portion of the lab and just have students compare models to other group models.

Lab Plan

Lab Title: Apartment Design and Build: ChatGPT vs Student

Prerequisite skills: Scale Factors, Measurements.

Lab objective: Create a floor plan to scale and then build a real size layout of a 1-bedroom apartment and compare design to AI generated floorplan and other student work.

Standards: (Note SPECIFIC relationship to Science, Technology, and/or Engineering)

Mathematics K–12 Learning Standards:

- HSG-SRT.A.2: Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar.
- N-Q.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas
- N-Q.2: Define appropriate quantities for the purpose of descriptive modeling
- 7. RP.3: Use proportional relationships to solve multistep ratio problems.

- FinMath 12 SS: Apply consumer skills to spending and saving decisions.

Standards for Mathematical Practice:

- MP 3: Construct viable arguments and critique the reasoning of others
- MP 4: Model with mathematics.
- MP 5: Use appropriate tools strategically.
- MP 6: Attend to precision

K-12 Learning Standards-ELA (Reading, Writing, Speaking & Listening):

- Speaking and Listening
 - 1: Initiate and participate effectively in a range of collaborative with diverse partners, building on others' ideas and expressing their own clearly and persuasively.
 - 2: Integrate multiple sources of information presented in diverse formats in order to make informed decisions and solve problems, evaluating the credibility and accuracy of each source and noting any discrepancies among the data.

Technology

- 1.d. Students understand the fundamental concepts of technology operations, demonstrate the ability to choose, use and troubleshoot current technologies and are able to transfer their knowledge to explore emerging technologies.
- 3.a. Students plan and employ effective research strategies to locate information and other resources for their intellectual or creative pursuits.
- 3.b. Students evaluate the accuracy, perspective, credibility and relevance of information, media, data or other resources.
- 4.a. Students know and use a deliberate design process for generating ideas, testing theories, creating innovative artifacts or solving authentic problems.
- 4.c. Students develop, test and refine prototypes as part of a cyclical design process

Engineering

- HS-ETS1-3: Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.

Leadership/21st Century Skills:

<p><u>21st Century Interdisciplinary themes</u> (Check those that apply to the above activity.)</p> <input type="checkbox"/> Global Awareness <input checked="" type="checkbox"/> Financial/Economic/Business/Entrepreneurial Literacy <input type="checkbox"/> Civic Literacy <input type="checkbox"/> Health/Safety Literacy <input type="checkbox"/> Environmental Literacy			
<p><u>21st Century Skills</u> (Check those that students will demonstrate in the above activity.)</p>			
<p>LEARNING AND INNOVATION</p> <p><u>Creativity and Innovation</u></p> <input checked="" type="checkbox"/> Think Creatively <input type="checkbox"/> Work Creatively with Others <input type="checkbox"/> Implement Innovations <p><u>Critical Thinking and Problem Solving</u></p> <input type="checkbox"/> Reason Effectively <input type="checkbox"/> Use Systems Thinking <input checked="" type="checkbox"/> Make Judgments and Decisions <input type="checkbox"/> Solve Problems <p><u>Communication and Collaboration</u></p> <input checked="" type="checkbox"/> Communicate Clearly <input checked="" type="checkbox"/> Collaborate with Others	<p>INFORMATION, MEDIA & TECHNOLOGY SKILLS</p> <p><u>Information Literacy</u></p> <input checked="" type="checkbox"/> Access and Evaluate Information <input checked="" type="checkbox"/> Use and manage Information <p><u>Media Literacy</u></p> <input type="checkbox"/> Analyze Media <input type="checkbox"/> Create Media Products <p><u>Information, Communications and Technology (ICT Literacy)</u></p> <input checked="" type="checkbox"/> Apply Technology Effectively	<p>LIFE & CAREER SKILLS</p> <p><u>Flexibility and Adaptability</u></p> <input type="checkbox"/> Adapt to Change <input type="checkbox"/> Be Flexible <p><u>Initiative and Self-Direction</u></p> <input checked="" type="checkbox"/> Manage Goals and Time <input type="checkbox"/> Work Independently <input type="checkbox"/> Be Self-Directed Learners <p><u>Social and Cross-Cultural</u></p> <input checked="" type="checkbox"/> Interact Effectively with Others <input checked="" type="checkbox"/> Work Effectively in Diverse Teams	<p>Productivity and Accountability</p> <input type="checkbox"/> Manage Projects <input type="checkbox"/> Produce Results <p>Leadership and Responsibility</p> <input checked="" type="checkbox"/> Guide and Lead Others <input checked="" type="checkbox"/> Be Responsible to Others

Teacher Preparation: (What materials and set-up are required for this lab?)

Materials

- Grid Paper, Paper, Pencils, Calculators, Computer with ChatGPT access^{***}, yarn, heavy objects, measuring tape, student lab procedure/handout/note taker

^{***}See note above if ChatGPT access is blocked

Set-Up Required:

- Classroom with computer access (or shared computer). Graph paper accessible to students.
- Materials for outside lab portion accessible to student. Possibly already grouping into sets for groups.
- Large open space identified for student to lay out apartment designs.

Lab Organization Strategies:

Leadership (Connect to 21st Century Skills selected):

Cooperative Learning:

- Students will take individual ideas to a larger group to discuss designs. They will have to vote/decide on one design to create in real scale as a group. They will then have to work together to create the designs.

Expectations:

- Students will gain experience drawing floor plans and then using the plans to create life sized models of their designs. They will also gain experience using a new technology (ChatGPT) to see the potential benefits and pitfalls of the technology.

Timeline:

- This lab will take approximately 90 minutes. They will spend the first half designing and deciding on a plan and figuring out needed material sizes to create the life-sized model. The second half will be creating the life-sized models, touring other designs, and doing the reflections.

Post Lab Follow-Up/Conclusions:

Discuss real world application of learning from lab

- Students will get experience with blueprints/floorplans, ChatGPT (AI technology) and looking at real life-sized living spaces.

Career Applications

- Architecture, Real Estate, Technology/AI

Optional or Extension Activities

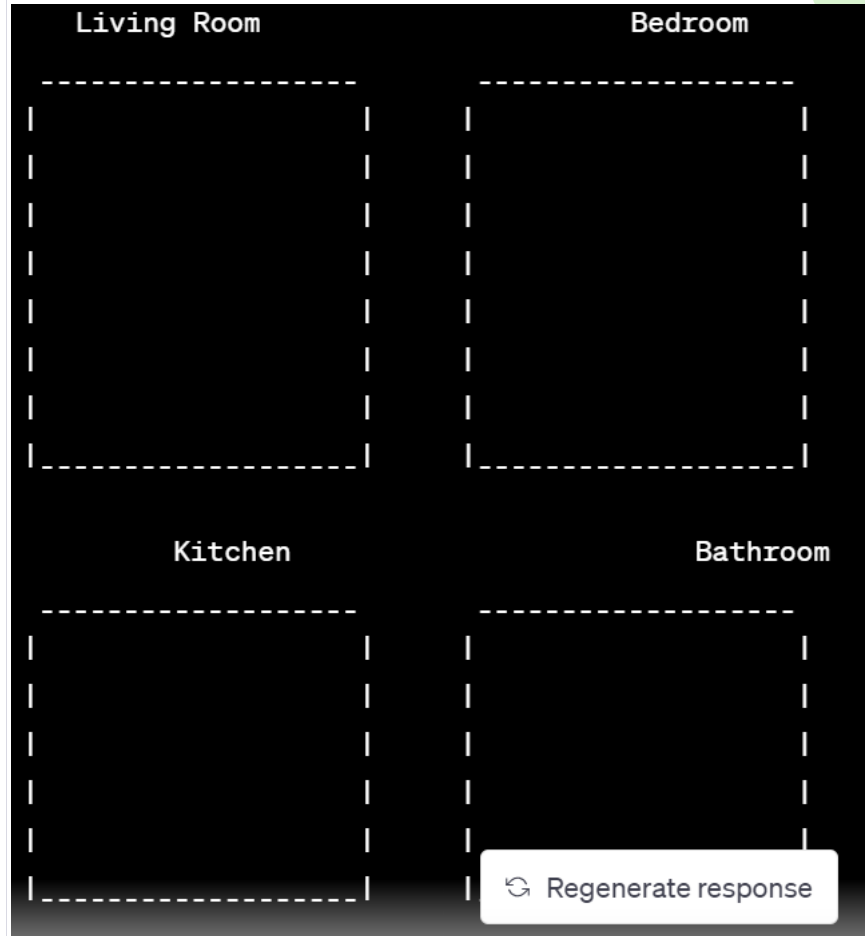
- AI/Technology: Students could go back and ask ChatGPT more detailed questions or provide more constraints to get better designs. They could also ask questions like “How to find an apartment for rent in my area”
- Students can research local rental market to find costs of apartments that are similar to their design size. They could then find out how much they would have to make to afford the apartment.

Example of a ChatGPT Response to Prompt:

Me: Design a floor plan for a 1 bedroom apartment with dimensions

ChatGPT

Certainly! Here's a suggested floor plan for a 1-bedroom apartment:



Dimensions

- Living Room: Approximately 15 ft x 12 ft
- Bedroom: Approximately 12 ft x 10 ft
- Kitchen: Approximately 8 ft x 6 ft
- Bathroom: Approximately 6 ft x 6 ft:

Please note that these dimensions are approximate and can be adjusted based on specific requirements or available space. Additionally, you may want to consider including additional features such as closets, windows, and doors in your floor plan, depending on your preferences and needs.

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Lab Procedure

1. Sketch out a floorplan of a one-bedroom apartment on grid paper. Label the rooms and make sure to list out the scale you are using. (One grid box = ___ ft) Attach your design to this Lab Sheet.
2. List the dimensions of your rooms:

3. Present your floorplan to your group. Each group should pick **one** design they will lay out in real scale. Which design did your group pick and why?

4. Go to ChatGPT and ask it to draw a floor plan for a 1-bedroom apartment and include dimensions. Sketch the floor plan below and include the dimensional data it provides. (If you do not get the needed information, you can prompt it again.)

5. What are your initial thoughts? Did ChatGPT do a good job designing? Where did it provide better information? Where did it fall short?

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6. Gather your require materials: Yarn, measuring sticks, rocks (or other heavy objects), floor plans, pencils, paper. Decide what you will need to measure/cut, in order to build your design.

7. **Outside:** Use the measuring tape and the yarn to build your floor plans. Label the rooms.

8. Walk through your apartment and your AI apartment. How do they each feel? Do any of your opinions change from Step 5?

9. Go on an apartment hunt. Visit each groups' apartments. Take some notes on what features you liked and what things could be improved. How much would you pay in rent for each apartment?

10. Gather back together for a whole class discussion. Capture some highlights on the discussion below.

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Washington Applied Math Council

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Apartment Lab Rubric

Washington Applied Math Council

	1. Standard Not Met	2. Approaching Standard	3. Standard Met	4. Exceeding Standard
MP.4.E - Mathematical Practices assumptions and approximations to simplify a situation	Assumptions and approximations made to simplify a situation are not stated (or some are given but are not correct).	<i>Some</i> assumptions and approximations made to simplify a situation <i>are stated</i> .	A <i>thorough</i> summary is given of the assumptions and approximations made to simplify a situation.	A thorough summary is given of the assumptions and approximations made to simplify a situation. The student <i>reflects on the accuracy and/or the consequences or limitations of the assumptions and approximations</i> that were made.
MP.4.F - Mathematical Practices mathematical representation & analysis	Pertinent quantities, variables, and/or mathematical relationships may be described or expressed, in written or oral form.	Pertinent quantities, variables, and/or mathematical relationships are described and <i>mapped using at least one representation</i> .	Pertinent quantities, variables, and/or mathematical relationships are described, represented, and <i>analyzed, to draw at least one conclusion</i> .	Pertinent quantities, variables, and/or mathematical relationships are described, represented in <i>multiple ways</i> , and analyzed to draw <i>one or more conclusions</i> .
MP.4.G - Mathematical Practices interpret and reflect on the conclusions, possibly improve the model	Mathematical results are stated.	Mathematical results are stated and <i>interpreted in the context of the situation</i> .	Mathematical results are stated and interpreted in the context of the situation and the student has <i>reflected on whether the results make sense</i> .	Mathematical results are interpreted in the context of the situation, the student has reflected on whether the results make sense, and <i>has also critiqued or even improved the model, if it has not served its purpose</i> .

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Washington

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7. Outside: Use the measuring tape and the yarn to build your floor plans. Label the rooms.

Applied

8. Walk through your apartment and your AI apartment. How do they each feel? Do any of your opinions change from Step 5?

Math

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Council

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