

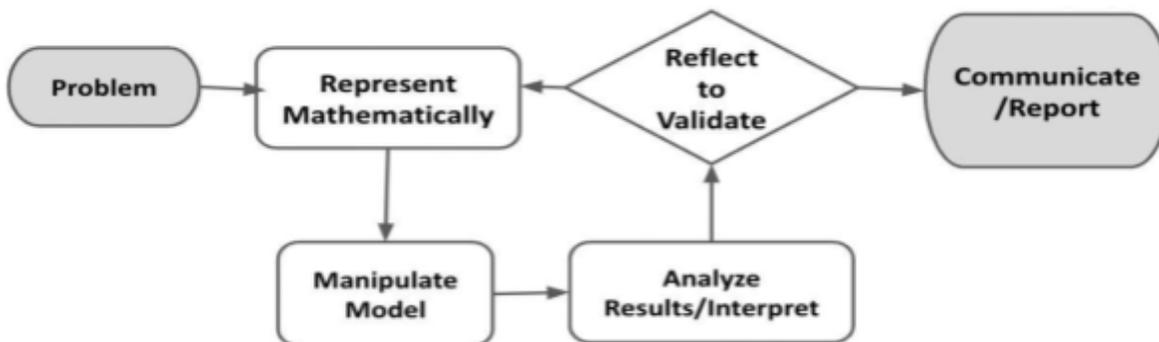
M151B Performance Task

Small-Scale Home Design

The Modeling Cycle

Shelter is considered a basic human need. In this task, you will consider the relationship between basic human needs and housing design. You will apply geometric principles to design, evaluate, and report your findings. While you work through this task, keep in mind that your report at the end will be a presentation, article, or short video in which you pitch your findings as a solution to potential investors. Gather ideas as you work to help inform how you decide to present your findings.

Mathematical models are used to make sense of ideas and phenomena in our world. As illustrated in the image below, the modeling cycle is a process of collecting data about an idea or problem, creating models of that data, analyzing the story told by those models, and reporting the results to the appropriate audience.



Source: *Diagram of Modeling Process.* From "Progressions for the Common Core State Standards for Mathematics."

In this task, you will be engaging with this mathematical modeling cycle to help solve issues of housing insecurity. You will use the models and your takeaways from this task to create a presentation, article, short video, or other creative product to persuade city investors of a potential solution for housing insecurity. Your product will provide an explanation that is supported by evidence as well as visual renderings of your ideas and a discussion of their applicability in helping solve the problem.

Introduction: Small-Scale Home Design

What does a person need to survive? How much space do they need? What makes a shelter adequate to meet these needs? What happens when resources are not available to help meet these human needs? Consider a person's physical, psychological, and socio-cultural needs, and then respond to the questions below.

QUESTION 1



What items does a home need to be livable for 1 person? Create a list.

[This question is not meant to be scored. Look for reasonable responses (see teacher-facing guide for ideas). Expect students to answer individually on their own forms, as well as participate in a small group or class discussion.]

Student A

Electricity, shelter, ac, food, water, bed

The list provided by the student is acceptable. This is just the first attempt at thinking about what is needed to make a home livable. It doesn't need to be comprehensive at this point.

Student B

- Kitchenette
- Bed
- Sink in the bathroom
- Toilet
- shower/bathtub
- Closet
- Pantry/Cabinets in kitchen.
- Mirror in bathroom
- Ceiling fan
- Bathroom light

This is an example of a much more comprehensive list than Student A. Though, after a discussion with classmates, it is likely that this student would still add other items.

Student C

- Fire extinguisher
- First aid kit
- Bottles of water
- Electricity
- Light switch
- Light bulb
- Gas
- Air conditioning unit
- Bed to sleep in
- Fire
- Microwave oven
- Fridge/freezer
- Cabinet
- Dishes
- Pantry
- Toothbrush
- Toothpaste
- Soap bottle
- Shampoo/conditioner
- Deodorant
- Mouthwash
- Floss
- Canned food
- Dry shampoo
- Blanket
- Toilet
- Shower/bath
- Sink

The student put a lot more thought into this list than was intended (evidenced by dry shampoo, mouthwash, floss, etc.) but it serves to get the student to think about the space that will be needed to make a small-scale livable home for this student.

Introduction: Small-Scale Home Design

QUESTION 2



What do you think is the smallest space that is livable?

[Again, this question is not meant to be scored. Look for reasonable responses (see teacher-facing guide for ideas). Expect students to answer individually on their own forms, as well as participate in a small group or class discussion.]

Student A

Small apartment

The student technically answered the question, but it is worth asking this student during the consultation what dimensions or square footage they think fits their definition of a “small apartment.”

Student B

A studio apartment (300-600 square feet)

This student answered the question and included a range of square feet...which serves well as they proceed through the task.

Student C

A 20 ft squared floor space with an 8ft ceiling

Since this is an introductory question, it will be good to see how this student refines their answer as they proceed through the task. They'll likely realize that 20 sq ft is not adequate.

Problem and Formulate

In the **Problem** and **Formulate** sections, you will consider issues of housing insecurity and begin to work toward solutions by identifying essential living items and the geometric parameters associated with livable spaces. The **Problem Formulation Checklist** can be used to ensure you have the necessary components before moving on to the remaining parts of the task.

Problem

QUESTION 3



Use online search engines to help you summarize the following information:

- What is housing insecurity?
- What percent of people experience housing insecurity?
- How could small homes provide a potential solution for housing insecurity?

[Look for reasonable responses (see teacher-facing guide for ideas). Expect students to answer all three questions.]

Student A

- What is housing insecurity? Having trouble paying rent, overcrowding, moving frequently and spending the bulk of their money on repairs
- What percent of people experience housing insecurity? State: total of 15,482 people 6% of the national total of people living in places not meant for human habitation , Nation: In January 2023 there was a report of 1 out of every 500 Americans experiencing homelessness.
- How could small homes provide a potential solution for housing insecurity? They would cost less and use less electricity

The student responded to all three questions. This response is adequate, even if their data isn't the most current. Encourage students to share both their answers and the sources they used to support their answers.

Student B

1. a lack of security in a person's shelter due to high housing costs, poor housing quality, or other factors
2. US - 10-15%
3. They are less expensive to build and maintain and can help people spend less money

Student C

- Not having a stable living environment (due to one's surroundings)
- 19%
- There more affordable making it easier for people to buy and own a house

These students adequately responded to all three questions. Again, expect different responses, particularly to the second question, and encourage students to share both their answers and sources.

Formulate

QUESTION 4

Refer back to your response to Question 1. Decide whether to add or remove any items from your original list and make those changes in Question 1. Remember you are designing this for 1 person. Then answer these questions:

- Explain why you added and/or removed any items from your list.
- Add your final items, their approximate dimensions (with units), and any notes in the table below.

Student A

Item	Dimensions (with units)	Notes
Hisense 4.4-cu ft Mini Fridge with Freezer (Sliver) ENERGY STAR	H: 46.35-46.56 L: 19.29 W: 18.7	Semi Large Mini Fridge/ Freezer combo
King Koil pillow Top plush Queen Air Mattress	80l x 50w x 20h	Fabric, adjustable, blow up
Standard Fit Alcove Bath and Shower Kit	30x60x7.5	Fit in bath
Bathroom Vanity Sink Combo	7.5" x 17.5" x 34"	Dark Oak with Ceramic Sink in White with Faucet Drain and Overflow
Stainless Steel Drop-in Topmount	15" x 15"	2-hole Single Bowl Bar Sink
Project Source Pro White dual flush elongated chair height 2-piece watersense toilet 12-in rough in 1.1-GP	399mm (W) x 711mm (D) x 755m (H) x 15,7" (W) x 28" (D) x 30.5 (H)	Chair height, elongated bowl
GE Electric stacked laundry center with 3.8-cu ft Washer and 5.8-cu ft Dryer	75.875x30.875	Dryer controls, auto-sensing

This student used different units of measure throughout which could make calculations more challenging later. The student understood the direction to list each item with dimensions and add notes per the table. While there were multiple items removed from question 1, the student did not complete question 1 to explain why they decided to add or take away items from their original plan. During the consultation, ask the student to reevaluate their answers to Question 1 based on their completed table.

Student B

Item	Dimensions (with units)	Notes
A twin bed	38" x 75"	A small bed but still comfortable
A compact shower	30" x 30" x 75"	Necessary for basic hygiene
A toilet	32" x 18" x 30"	Necessary for basic hygiene
A refrigerator	33" x 75" x 24"	You need this to store your perishables
A pantry	Built into wall	You need this to store your non-perishables
A table	31" x 62" x 30"	To eat or play games on
An oven/stove	30" x 27" x 36"	To cook food on
A trash can	13" x 16" x 24"	To get rid of trash and keep the space clean

The student understood the direction to list each item with dimensions and add notes per the table. They used a consistent unit (inches) to identify the dimensions of each item. Again, the multiple items removed from question 1, and the student failed to explain why they decided to add or take away items from their original plan. During the consultation, ask the student to reevaluate their answers to Question 1 based on their completed table.

Student C

Item	Dimensions (with units)	Notes
Cabinetry	78(w)in x 29(h)in x 24(d)in	Like 8, 4 under and 4 on top
Burners	24(d)in x 36(w)in	On top of one set of cabinets
sink	20(d)in x 25(w)in	
toilet	25(d)in x 14(w)in x 28(h)in	
Shower stall	30in x 30in	small
Bed	36(w)in x 72(l)in x 24(h)	Acts like a bed and seating
Mini Table	18(w)in x 20(d)in x 27(h)in	
Mini Fridge	24in x 24in x 36(h)in	

This student understood the direction to list each item with dimensions and add notes per the table. They addressed each item on their Question 1 list, so no adjustments needed to be made and explained. The notes here were informative in terms of how they were fitting all their "needs" into a small space.

QUESTION 5



What rooms would you require in a house for the items on your final list? What other considerations are there for figuring out how big each room needs to be?

[Look for reasonable responses that connect their previous responses to earlier questions (see teacher-facing guide for ideas).]

Student A

Rooms:

- Kitchen/dining area
- Living space
- Bedroom
- Bathroom

Other consideration:

You want to see how much excess space you need for moving about while still being compact.

This student gave a thoughtful response, complete with “other considerations.”

Student B

A bathroom, bedroom, and kitchen

The things inside and the people living there should determine the size.

This student’s response is adequate. The rooms listed are typical of what many students answered in terms of minimum number of rooms.

Student C

Rooms:

- Kitchen/dining area
- Living space
- Bedroom
- Bathroom

This student’s response is adequate and addressed considerations which are useful to think about when continuing with this task.

Other consideration:

You want to see how much excess space you need for moving about while still being compact.

Problem Formulation Checklist

Requirement	Fulfilled?
I can define <i>housing insecurity</i> and identify the percent of people experiencing it.	<input type="checkbox"/>
I have hypothesized how small homes could provide a potential solution for housing insecurity.	<input type="checkbox"/>
I have evaluated my original list of housing items and refined it accordingly.	<input type="checkbox"/>
I have determined the dimensions of essential living items and identified the necessary rooms and required space for a livable area that contains these items.	<input type="checkbox"/>
Teacher Consultation:	_____

Model

In the **Model** section, you will create and justify a floor plan that adequately represents your estimates and ideas for livable spaces and needs. The **Model Checklist** can be used to ensure you have the necessary components before moving on to the remaining parts of the task.

ACTION 1



A floor plan is a scale drawing that shows the different rooms in a home.

Using your work from Question 4, create a scale floor plan showing how you would structure the rooms within a small home. Assume 1 person living in the space.

- Show the dimensions of each room in your drawing.
- Show how the items would fit into the space you design.
- Label each item or use drawings that clearly show what the items are.

Here are some ideas to help with this task:

- Use graph paper, pencils, and rulers
- <https://www.smartdraw.com/>
- [GeoGebra](https://www.geogebra.org/)
- Any other helpful online floor plan creator platform you can find!
- Creating and manipulating shapes in Google Draw, Google Slides, or Microsoft PowerPoint

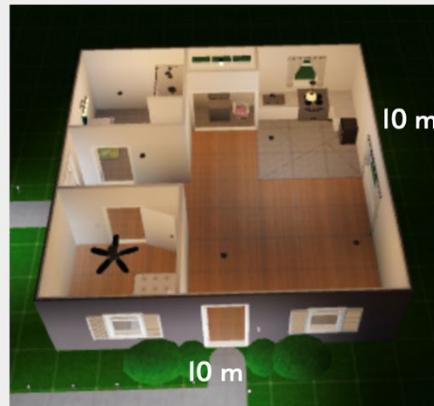
Student A

Full House

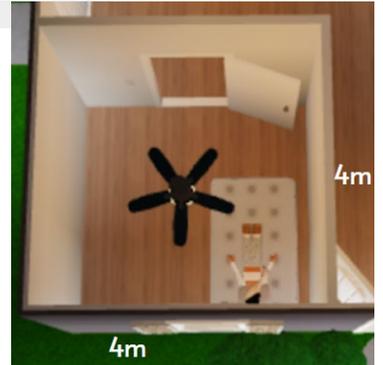
Scale Factor: 1 cube: 4 ft : 1.2 m

Dimensions: 10m by 10m

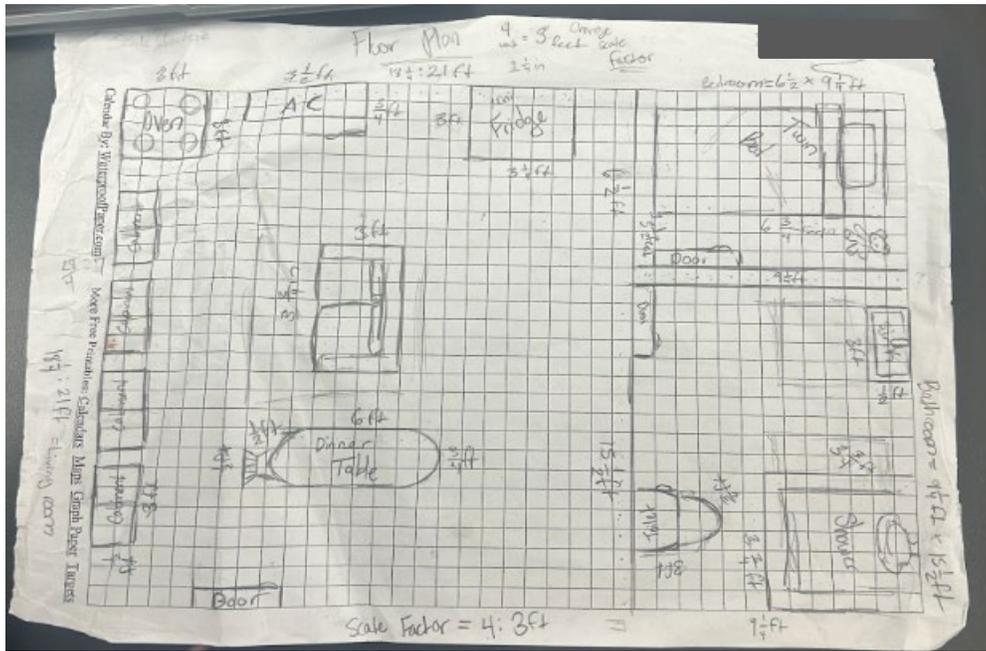
Total Area: 100 square meters or 1076.39 square feet



The student used a creative method (Roblox) to model the tiny home. They understood how to state the scale factor, dimensions, and total area. The student was able to convert meters to square feet. There are dimensions for each room with the items listed in question 1 placed in each room. Although there are no labels, the student used clear illustrations of the items in each room.



Student B



The student sketched a floor plan on grid paper and labels all the dimensions for the items and rooms they included in question 1. They added a couch and dinner table that wasn't previously included. The scale factor appears to be 4 grids = 3 feet. During the consultation, I would ask the student what the total square footage is for entire space. It wasn't asked for specifically in the question, but it would be good for the student to know.

Student C

House - 255.4 square ft
(with small transition spaces between each room)

Scale Factor: 3 squares = 1 foot
3 rooms:

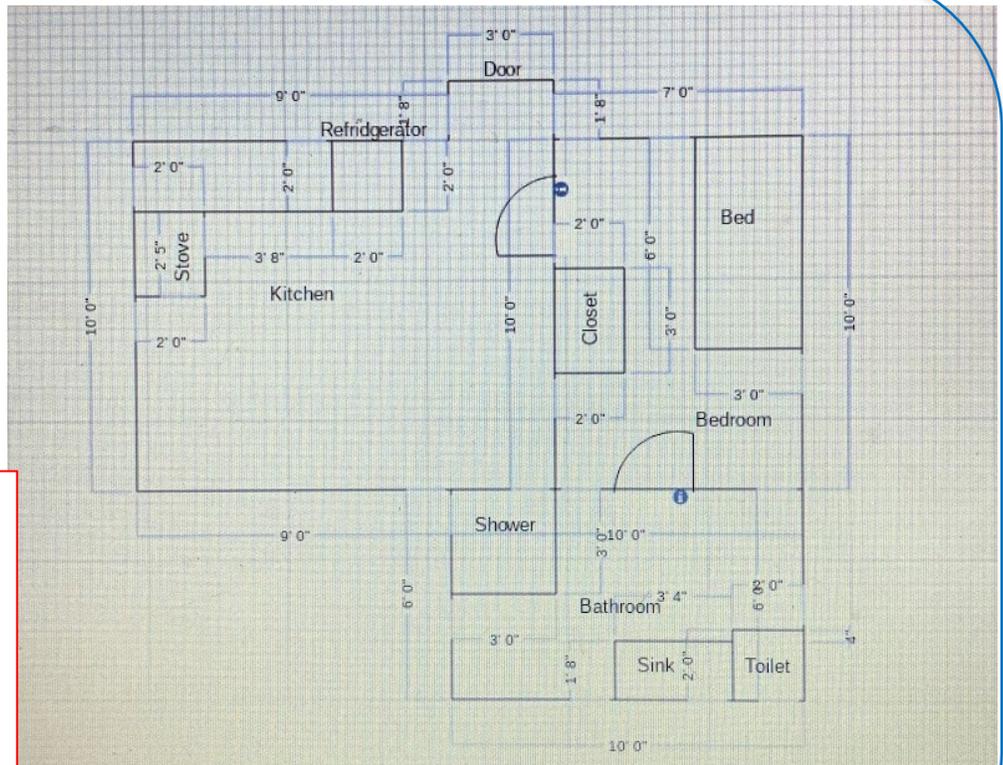
Kitchen - 120 square feet

Bedroom - 70 square feet

Bathroom - 60 square feet

It is small but provides basic needs for mankind

This student submitted one of the smallest livable spaces for the class and did include everything listed in question 1. The scale factor is 3 squares for each foot and the dimensions are clearly labeled. Nicely done!



QUESTION 6



What is the approximate area (in square feet) of the small home you designed? Show how you determined your answer.

Student A

1076.39 square feet

The student included an area using square feet; however, they did not show how they determined their answer. In their floor plan from Action 1, they show the scale factor, and they have the dimensions of the house. They gave the area in square meters and square feet but did not show the conversion. Have students show how they found this solution so that others can see their thinking.

Student B

598.5 square feet

28 ½ by 21

The student included the area, as well as the dimensions. In the description of the process the student described the steps. Encourage them to include the calculations they described so that others can see their thinking.

We found the square foot by counting the units of the length and width. We then cross multiplied the units with the scale factor and multiplied the products of said equations

Student C

The house is 255.4 sq ft. We found the area of each room then added them together.
Scale factor- 3 squares = 1 foot

The student included an area using square feet and explained how they produced the total, using the square factor of 3 squares = 1 foot. The three rooms in their floor plan actually add up to 250 square ft, but they noted "small transition spaces between each room" on their floor plan in Action 1 to account for the extra 5.4 sq ft.

Model Checklist

Requirement	Fulfilled?
I created and labeled a scaled floor plan with room dimensions and item placement for a small home big enough for 1 person.	<input type="checkbox"/>
I demonstrated how each room's dimensions are appropriate for the necessary home items and can be considered a livable space.	<input type="checkbox"/>
I computed an approximate total area of the home.	<input type="checkbox"/>
Teacher Consultation:	_____

Analyze and Validate

In the **Analyze** and **Validate** sections, you will expand your housing to accommodate more people, consider your assumptions, and examine how any proposed changes would or would not impact your overall design. You will also research existing alternative housing options, make comparisons between those and your own designs, and use them to inform proposed changes to your designs. The **Analyze & Validate Checklist** can be used to ensure you have the necessary components before moving on to the final parts of the task.

Analyze

QUESTION 7



How would your design change for 4 people living in the space? What would remain the same? How would the area of the space be different than with just one person? State any assumptions.

Student A

Floor plan would almost double in size to accommodate for the extra beds

The student barely addressed this question. While stating it would “almost double in size to accommodate for the extra beds” might have seemed adequate to the student, the teacher should ask this student to elaborate on their answer. Doubling the square footage doesn’t necessarily make sense given their original design. Would the kitchen need to be double in size? Does it mean more bedrooms, bathrooms, etc.? Ask for clarification.

Student B

I would add more beds, extra bathrooms, as well as more storage and more living space. The size of most of the appliances and rooms would be smaller since you would need extra space for 4 people rather than 1 person. As well as the layout, it would have to be altered to accompany said more people.

To get said sizes, I'd reduce the bathrooms from $9\frac{1}{4} \times 15\frac{1}{2}$ to $6\frac{1}{4} \times 12\frac{1}{2}$ by subtracting 3 units each, so another one could fit in the house. The shower would turn into 3ft by 3ft instead. I'd reduce each bedroom $6 \times 6\frac{3}{4}$ so we could at least 2 more, for a sum of 3. I'd switch the 4 cabinets ($\frac{1}{2} \times 3$ ft) to one cabinet that'd be (1×3 ft) for the kitchen and two big closets. One closet would be for personal items (6×8 ft) and a closet for clothes (4×4 ft).

They're probably a family. They would need a good amount of storage, and assuming 2 of the people are children, they can share a room if we want to only do 2 rooms instead (depending on their age and gender of course), or the parents could share a room as well. For the clothing, they're probably able to fold a lot of stuff along with hanging it, so they probably don't need a big closet. They probably don't have a lot of clothes and personal items if they're struggling with finances. The kids can share a bathroom and the parents can share a bathroom.

This student gave a thorough response to this question, including specifics about how to reduce the current sizes to allow for adding more rooms.

Student C

I would have to make the size of each room and the entire house bigger since there are 4 times more people. I think the items in the house would remain the same. It would just take some organization to keep everyone on the same page because there would be a lot of arguments without any order.

The student answered the question but in vague terms. Ask the student “How much bigger, in square feet?” or “What items remain the same?” Providing additional details and clarification would make this a better response.

Validate

ACTION 2



Research some different “small spaces” that are used to house people. Some ideas may include shipping containers, tiny homes, studio apartments, and recreational vehicles (RVs).

- What are the dimensions or square footage of some of these small living spaces?
- How do they compare to the total area of the space you created? Are any smaller?
- Would you change anything about your design based on your research?

Student A

- What are the dimensions or square footage of some of these small living spaces?
900 to 1200 square feet
- How do they compare to the total area of the space you created? Are any smaller?
Ours is right in the middle
- Would you change anything about your design based on your research?
I would probably cut back on the living room space

The student answered each of the questions with the opportunity for more information. Ask the student about what kinds of homes have that square footage. Also ask if any homes are smaller with more probing questions such as how are they able to make a smaller home? The students chose to cut back on the living room space, feel free to probe by asking why they chose this given their initial basic requirements?

Student B

- What are the dimensions or square footage of some of these small living spaces?
Shipping container: 300 square feet, tiny home: max of 500 square feet, studio apartment: 400 to 600 square feet, RV: 320 to 400 square feet.
- How do they compare to the total area of the space you created? Are any smaller?
Our house is a bit smaller then the studio apartment being 600 square feet while our house is 598 square feet, and then only being a little bigger then the tiny home that is around 500 square feet.
- Would you change anything about your design based on your research?
We'd add a lot more nooks for storage if it came to more people, so it can consume less space and the owner wouldn't run into trouble trying to organize things.

This student gave a thorough response to this question, including dimensions found for shipping containers, tiny homes, studio apartments, and RVs. This student seems to be completely engaged in the task. It might benefit the class to have a whole group discussion about how different students approached this task upon the conclusion of the performance task.

Student C

- What are the dimensions or square footage of some of these small living spaces?
Studio apt: 400-600 square feet, Cubicle: 6x8ft, Rv: 7-8.5x12-35 ft
- How do they compare to the total area of the space you created? Are any smaller?
All except for the RV are way larger than the home we created.
- Would you change anything about your design based on your research?
- **I would add more space for our person/people to move around**

This student did some online research to answer the question and concluded that they could add more space to their original design because it was smaller than all but the RV.

Analyze & Validate Checklist

Requirement	Fulfilled?
I described how my design would or would not change after expanding it to 4 people.	<input type="checkbox"/>
I identified the dimensions and square footage of existing alternative housing options and made comparisons across these and my own designs.	<input type="checkbox"/>
I evaluated my designs against these parameters and proposed any appropriate changes.	<input type="checkbox"/>
Teacher Consultation:	_____

Reflect

QUESTION 8



Reflect on what you learned about how professional designers create small spaces for housing. What surprised you from your research? What ideas of yours were affirmed by the research?

Student A

It made me more aware of how simple a house can be while still being beneficial.

While the student technically answered the question, the teacher should ask the student to provide elaboration as to which ideas were affirmed by the research.

Student B

Houses are set around budget and small homes can still be expensive for people that need them.
Each home is about 150 dollars per square foot which is expensive for some.
They try to fit every appliance tightly together and set a floor plan to fit things in.

This student was surprised that the price per square foot was still expensive, in spite of being small. That topic is worth having a larger discussion with the class. They'll typically conclude that kitchens and bathrooms tend to cost more per square foot than open rooms because of fixed costs for appliances, plumbing, sinks, commodes, etc.

Student C

When working on this design I learned that when creating small spaces we have to use the storage areas we have and pick things that don't fill up the space too much. How you can create a scale factor to create a reduction. Some ideas that were affirmed by my research was using the right storage unit in order to have enough storage but still not fill up the whole living area.

This student adequately responded to this question, complete with an idea affirmed by the research.

Report

QUESTION 9



Create a presentation, article, or short video for city investors to pitch your design as a potential solution for eliminating housing insecurity for its people.

In your product:

- Explain how creating smaller living spaces can help reduce or eliminate housing insecurity.
- Cite any applicable research or resources.
- If your product is primarily visual, include an outline or brief script to accompany it.
- If desired, research a particular city and include city-specific data as available.
- Include your own design as part of your argument.

[The following pages include the slides of PowerPoint presentations by three students (A, B, C). These students were allowed to work in small groups on their final presentations.]

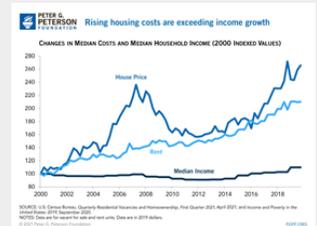
Student A

Small Home

1

What % of people experience housing insecurity?

US - 10-15%



3

What is housing insecurity?

Housing insecurity is the lack of security in a house in a shelter due to high housing costs, which can create poor housing conditions when maintenance becomes an issue.

How can small homes provide a solution?

They are less expensive to build and maintain and can help lower income people have home stability.

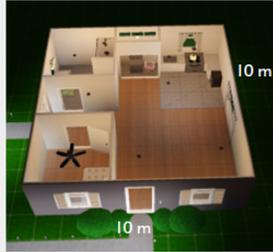
Student A continued

Full House

Scale Factor: 1 cube: 4 ft : 1.2 m

Dimensions: 10m by 10m

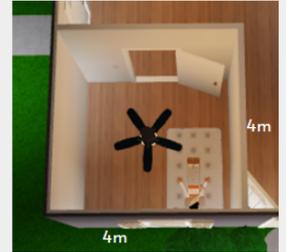
Total Area: 100 square meters or 1076.39 square feet



5

Bedroom

Bed: King Koil pillow Top plush Queen Air Mattress : 203.2cm L - 40.64cm TH - 152.4cm W



7

Bathroom

Toilet: Project Source Pro White dual flush elongated chair height 2-piece water sense toilet 12-in rough in L1-GP : 77.47cm H - 71.12cm D - 39.878cm W

Shower/Bath: Standard Fit Alcove Bath and Shower Kit: 81.28cm L - 152.4cm W - 154.91cm H

Vanity Sink: Dark Oak with Ceramic Sink in White with faucet Drain and Overflow: 60.96cm W - 48.26cm D - 80.01cm H 80.01



6

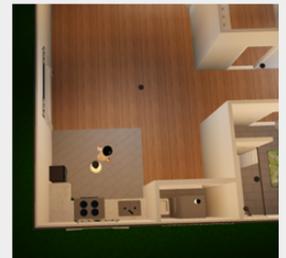
Kitchen/Laundry

Washer/Dryer: GE Electric stacked laundry center : 78.4225cm D - 192.7225cm H - 67.945cm W

Fridge: Hisense 4.4-cu ft Mini Fridge with Freezer (Silver) ENERGY STAR : 48.9966cm D - 118.2624cm H - 47.498cm W

Sink: Stainless Steel Drop-in Topmount : 38.1cm L - 15.5575cm H - 38.1cm W

Oven: Built in Electric Stove Top 24 in. 4 Burners Glass Radiant Cooktop with Sensor Touch Control, Timer and Child Lock: 52.07cm L - 5.08cm H - 58.928cm W



8

Sources

[Toilet, Bath, Vanity Sink](#)

[Bed](#)

[Washer/Dryer](#)

[Fridge, Sink, Oven](#)

+

[Housing Insecurity, % of People, 1st Chart, 2nd Chart, How](#)

+

[Our Model \(Bloxburg on Roblox\)](#)

9

Student A presented a lot of specifics for their own design and some of the research related to housing insecurity. Their response to smaller homes being a solution needs further investigation. It could be argued that their own design doesn't really meet the small home definition and wouldn't be economical enough to help with housing problem.

Student B

Small home- Performance task



1

How can creating smaller living spaces can help reduce or eliminate housing insecurity?

- **Small houses would not only allow people a safer place to stay instead of being on the street. It can also help them be able to afford living and have basic resources to live with a lower chance of being evicted.**

3

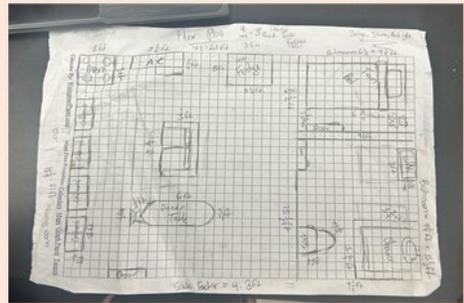
What's Housing Insecurity?

Housing insecurity is the state of not having stable or adequate living conditions, risking eviction and/or unsafe and uncomfortable living. This can also be expressed with homelessness.



2

Our design



4

What was our Square Feet?

598.5 square feet.

28 ½ by 21

We found the square foot by counting the units of the length and width. We then cross multiplied the units with the scale factor and multiplied the products of said equations



5

- What is the average family size?
In Florida the average number of people in a family is usually 3 people.
- Is there a standard tiny home size?
The average size of a tiny house is 400 square feet or less
- Are these two values related in any way?
Yes, because you need to know the average family size to know whether to make a tiny home or not, because for a family of 3 they would need 1,800 square feet at least while a tiny home is usually 400 or less.



7

Explanation for design

- Our design has enough square feet to accommodate for one person because...
- There's all of the necessary amount of appliances without taking up all of the space.
- The bedroom is 6 ½ x 9 ¾ making it comfortable for someone to sleep in and fit the twin bed well.
- The bathroom is 9 ¾ x 15 ½ making it enough room to move around.
- We added small cabinets (½ ft x 3 ft) so they can have another source of storage, therefore they can be a little organized.
- The table can be optional, it's not really a necessity. Same with the couch, it's just another source of comfort.

6

Citations

- <https://www.apartmenttherapy.com/what-is-considered-a-small-apartment-243701>
- https://www.urban.org/sites/default/files/publication/101608/improving_measures_of_housing_insecurity.pdf
- <https://www.jkmoving.com/blog/residential-moving/pros-and-cons-of-moving-into-a-smaller-house#:~:text=Pros%20of%20living%20in%20a%20smaller%20home&text=With%20a%20smaller%20home%2C%20you,have%20a%20lower%20utility%20bill>

Thank you!

8

Student B chose to reference Florida with respect to average family size. They presented the definition of housing insecurity, why creating smaller living spaces could help reduce housing insecurity, and a lot of specifics for their own design.

Student C

Small Home Presentation

1

Inside the City

Over 70,000 people in Los Angeles, California experience housing insecurity and the rate has grown by 9% since 2023. This has been due to not enough available homes for people's budget, overcrowding, and expensive housing/transportation.

To treat this problem, education programs have been established to teach financial coaching to families, along with workshops that educate landlords on how they should help and provide resources their tenants may need.

3

Reduce Housing Insecurity

10-15% of people across the United States experience housing insecurity, problematic living conditions where a person struggles to support a household due to finances or overcrowding. Though it seems inevitable, smaller living spaces can eliminate this problem.

A smaller living space gives you a wider range of places to live as well as reduces the amount of renovations that need to be made on a home. By investing in a smaller sized home, your house will also be more energy efficient which produces less greenhouse gases so you are also helping the environment.

Therefore, a smaller living space is more convenient as the living cost will be cheaper and you are more prone to living in your desired location.

2

Our design

House - 533.4 square ft

(with small transition spaces between each room)

Scale Factor: 3 squares=1 foot

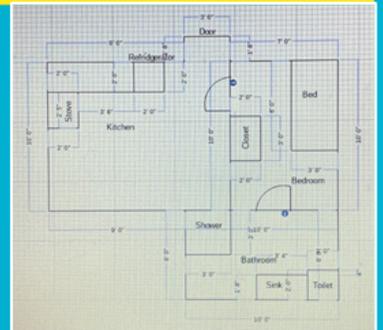
3 rooms:

Kitchen- 120 square feet

Bedroom- 70 square feet

Bathroom- 60 square feet

"It is small but provides basic needs for mankind"



4

Citations

<https://www.lowermybills.com/learn/buying-a-home/benefits-of-buying-a-small-house/>

<https://www.thegarantors.com/blog/owners-and-operators-the-affordable-housing-crisis-in-florida-an-opportunity-for-landlords>

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<https://sdg.lacity.gov/our-work/projects/angeleno-journey-housing-insecurity-housing-stability>

5

In addition to presenting their own small home design, **Student C** talked first about housing insecurity across the U.S., then further explored the problem in Los Angeles, CA. They also touted the benefits of smaller homes (more energy efficient, less greenhouse gases) as well as what kind of education programs need to be established to solve the housing insecurity problem.

Extension **Optional**

For this extension, you get to keep thinking like a designer! Ponder the following question, then choose one or more of the bulleted questions below to tackle.

How do professionals use what they know to improve their designs, make production more efficient, and apply equations to inform how big or how small to make their spaces?

Now, use a search engine to research and respond to one or more of the following:

- What is the average family size? Is there a standard tiny home size? Are these two values related in any way?
- Is there an ideal size for tiny homes that are mass-produced? What is the ideal ratio of size to number of people being housed? Is there a constant rate in which each person being housed gets a certain amount of square footage? How do designers efficiently and economically create homes for people they don't know?
- Write an equation that represents the relationship between the size of the space and the number of people being housed. The number of people should be one of the variables that changes. How can you apply this equation to help refine the solutions you proposed earlier to combat housing insecurity?

[The extension is optional for students. However, one student's response is shown below that is fairly typical of the kinds of responses you might expect from students.]

- What is the average family size? Is there a standard tiny home size? Are these two values related in any way?

Average family size in florida- 2.62 people, in the US is 3.13 persons. Standard tiny home size- 100 x 400 square feet. These two values are related because your family size should play a part in looking for a home. Too tight of a space could lead to uncomfortable, stressful, and frustrating living conditions.

- Is there an ideal size for tiny homes that are mass-produced? What is the ideal ratio of size to number of people being housed? Is there a constant rate in which each person being housed gets a certain amount of square footage? How do designers efficiently and economically create homes for people they don't know?

The ideal size for tiny homes is 393 square feet, the ratio of people to house is about 1 to 4 therefore, each person should get 1/4th of the space but that could vary based on the size of the house and the amount of people so there is no constant. For designers to create homes for strangers they LOOK for advice like books, magazines, and photos, or have a verbal conversation to get an idea of what their client may like.

- Write an equation that represents the relationship between the size of the space and the number of people being housed. The number of people should be one of the variables that changes. How can you apply this equation to help refine the solutions you proposed earlier to combat housing insecurity?

Space / people. Personal preference is a big part of housing so consider a good size home for you then divide that by the amount of people living in it which could vary amongst households. If that number is too small the buyer may consider a larger home, if too large the buyer may lower the number of square footage to one that is still comfortable to save money.