

# ARCHITECTURE & DESIGN 2020



## A PROJECT-BASED LEARNING UNIT INCORPORATING GEOMETRY, PROPORTIONS, MEASUREMENT, STATISTICS, AND STUDENTS' CREATIVITY

“Architecture is the art and science of designing buildings. These buildings include houses, skyscrapers, museums, churches, schools, and office buildings. By looking around our block, town, state, country, and world we know that buildings do not always look the same from one place to another.

An architect is a dreamer, an artist, a realist, a mathematician, a scientist, and an important contributor to the world in which we live.”

\* Taken from Math in the Real World of Architecture

## Architecture Project – Timeframes and Concepts

<b>1</b> <b>1HW</b>	<b>Scale Rooms</b> <b>Scale drawing of room at home OR of DIS</b>	<b>1 – 1.5 days</b> <b>Homework assignment</b>
<b>2</b> <b>2HW</b>	<b>Apartment Size</b> <b>Home Measurements</b>	<b>1 day</b> <b>Homework assignment</b>
<b>3</b> <b>3HW</b>	<b>3D Home Model</b> <b>Home Slopes</b>	<b>1 day</b> <b>Homework assignment</b>
<b>4</b> <b>4HW</b>	<b>Median Cost Per Square Foot</b> <b>Grapevine Median Cost/Home Statistics</b>	<b>1 day</b> <b>Homework assignment</b>
<b>5</b> <b>5HW</b>	<b>Isometric Drawing of Home</b> <b>Linear Equations</b>	<b>1 day</b> <b>Homework assignment</b>
<b>6</b> <b>6HW</b>	<b>Group Inspection Record</b> <b>Individual Inspection Record</b>	<b>1 day</b> <b>Homework assignment</b>
<b>7</b> <b>7HW</b>	<b>Electrical Contractor, Lumber Estimate,</b> <b>Flooring &amp; Windows</b> <b>Ramp It Up</b>	<b>1 day</b> <b>Homework assignment</b>
<b>8</b> <b>8HW</b>	<b>Home Finances</b> <b>Home Finances</b>	<b>1 day</b> <b>Homework assignment</b>
<b>Final</b>	<b>Final Project</b>	<b>4-10 days</b>
	<ul style="list-style-type: none"><li>• Design a dream home with all architectural symbols. Determine the cost and area of the rooms and the home. Create a home flyer with a descriptive paragraph to entice potential buys. Create a 60 second video commercial about your house. Design a logo representing your architectural company.</li></ul>	

## Architecture Project – Timeframes and Concepts

### Suggested Courses of Study

#### ***Three days to spend on the project:***

- Unit 1, Unit 2, and Unit 4
  - These units have the most mathematical concepts incorporated in them and provide a good overview of some of the activities related to homes and architecture.

#### ***Five days to spend on the project:***

- Unit 1, Unit 2, Unit 3, Unit 4. Unit 6

#### ***Eight days to spend on the project:***

- Unit 1, Unit 2, Unit 4, Unit 6
- Simplified version of the final project

#### ***Ten days to spend on the project:***

- Unit 1, Unit 2, Unit 3, Unit 4, Unit 6
- Final project (possibly not including landscaping)

#### ***Twelve to fifteen days to spend on the project:***

- All units
- Final project

“Perhaps the most important connection to be fostered in mathematics instruction is the connection between the mathematical ideas and students’ experience within a real-world context.”

– National Council of Teacher’s of Mathematics *Curriculum and Evaluation Standards for School Mathematics*

## Architecture & Design Correlation to the TEKS

Currently only shows Readiness Standards

Day	Main Objective	Main 6 <sup>th</sup> grade TEKS	Main 7 <sup>th</sup> grade TEKS	Main 8 <sup>th</sup> Grade TEKS
Day 1	Make a scale drawing from a life size room		7.5C	
Day 2	Determine real-life size from a scale drawing	6.3E 6.8D	7.3B 7.5C 7.9C	
Day 3	Create a 3D apartment		7.5C	8.4C
Day 4	Compute and analyze home statistics	6.4G 6.5B 6.12C 6.12D	7.3A 7.4D	
Day 5	Create an isometric drawing/ Linear Relationships		7.7A 7.4C	8.4B 8.4C 8.5I 8.5A 8.5B 8.5F 8.5H
Day 6	Inspect a home using building codes	6.8D	7.5C 7.9C	
Day 7	Become an electrical contractor for a cabin	6.8D	7.5C 7.9C	
Day 7	Analyze building materials and costs (lumber, flooring, windows)	6.3E	7.3B	
Day 7	Ramp It Up			8.4C 8.6C 8.7C
Day 8	Home Finances		7.13A 7.13B 7.13C 7.13E	8.12D
Final Project	Design a home and a landscape within a budget following standard construction procedures	Numerous		

<b>Process standards utilized throughout the project</b>	<b>6.1A, 6.1B, 6.1C, 6.1D, 6.1E, 6.1F, 6.1G</b> <b>7.1A, 7.1B, 7.1C, 7.1D, 7.1E, 7.1F, 7.1G</b> <b>8.1A, 8.1B, 8.1C, 8.1D, 8.1E, 8.1F, 8.1G</b>
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## Architecture Project Portfolio Contents

Architectural Company Name:					
Employee Names:					
		Group	Name:	Name:	Name:
	This schedule page completed				
	Group Contract				
1A	Scale Rooms				
1B	Scale Rooms scratch work with all measurements				
1HW	Scale drawing of room at home (with rough copy) <b>OR</b> DIS scale drawing				
2	Apartment Size				
3	3D Tiny House				
2HW	Home Measurements				
2HW	Bubble Drawing of Home				
3HW	Home Slopes				
4	Real Estate Agent Statistics				
4HW	Home Statistics (1 of 3)				
5	Isometric Drawing of Tiny House				
5HW	Linear Equations				
6	Group Inspection Record				
6HW	Individual Inspection Record				
7A	Electrical Contractor				
7B	Lumber Estimate				
7C	Lumber & Mulch				
7D	Flooring & Windows				
7HW	Ramp It Up				
8	Home Finances				
8HW	Home Finances				
9	Final Project Materials				

## How to Organize Our Final Portfolio

- Architecture Project Portfolio Contents page
- This page
- Group Contract
- Day 1 Final Copies of Bath/Kitchen from school (person 1, 2, 3)
- Day 1 Rough Copies of Bath/Kitchen from school (person 1, 2, 3)
- Day 1HW Final Copies of Master Bath/Kitchen/DIS from home (person 1, 2, 3)
- Day 1HW Rough Copies of Master Bath/Kitchen/DIS from home (person 1, 2, 3)
- Day 2 Apartment Size
- Day 2 Apartment Size Work
- Day 2HW Home Measurements with Bubble Diagram (person 1, 2, 3)
- Day 3 HW Home Slopes (person 1, 2, 3)
- Day 4 Real Estate Median Cost
- Day 4HW Real Estate/Home Statistics (person 1, 2, 3)
- Day 5 Isometric Tiny House/Apartment (person 1, 2, 3)
- Day 5HW Linear Equations (person 1, 2, 3)
- Day 6 Group Inspection Record
- Day 6 Group Inspection Record Work
- Day 6HW Individual Inspection Record (person 1, 2, 3)
- Day 6HW Individual Inspection Record Work (person 1, 2, 3)
- Cabin 1 (person 1, 2, 3)
- Day 7B Lumber Estimate
- Day 7B Lumber Estimate Work
- Day 7C Lumber & Mulch
- Day 7C Lumber & Mulch Work
- Day 7D Flooring and Windows
- Day 7HW Ramp It Up (person 1, 2, 3)
- Day 8 Home Finances
- Day 8HW Home Finances (person 1, 2, 3)

All other pages go in the back of your portfolio.

# GROUP CONTRACT

Members of Group: \_\_\_\_\_

## OUR AGREEMENT

**You must have the following in your agreement:**

- How you will resolve situations when everyone has a different opinion.
- How your group will handle group work when a member is absent.

**We ALL agree to:**

- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_
- ✓ \_\_\_\_\_

**If a group member breaks one or more of our rules, the group will call a meeting and ask the person to follow the rules.**

**If that person continues to break one or more of our rules, the teacher and the group have the right to vote to fire that person.**

**Date:** \_\_\_\_\_

**Group Member Signatures:**

\_\_\_\_\_  
\_\_\_\_\_

## Rubric for Teamwork

Groups that succeed the most on the architecture project are the ones that know the meaning of teamwork. You will be working together for more than 3 weeks, so be prepared to compromise on many aspects of this unit. Below is a chart demonstrating different levels of teamwork.

	<b>Accomplished</b>	<b>Competent</b>	<b>Needs improvement</b>
<b>Shared Vision and Interdependence</b>	Team members agree to a vision of producing high quality work.	Team members generally agree to producing high quality work.	Team members have some difficulty committing to a vision for the team.
<b>Feedback and Conflict Resolution</b>	Team members share ideas and provide and use constructive feedback.	Team members work collaboratively and constructive feedback is mostly accepted.	Feedback given is not always constructive. Team conflicts disrupt work and require intervention.
<b>Efficient Use of Resources</b>	Team members pay attention to what tasks need doing and are willing to do the task, even if it wasn't "their job".	Team members are willing to do tasks beyond their job, but require a leader to identify the task and request them to do it.	Team member focus only on their responsibilities and often resist when leaders request that they do additional tasks.
<b>Task is Accomplished</b>	The team produces a quality product that meets the task requirements.	The team product satisfies the needs of the task; however, some refinement may be needed.	The team product begins to address the task, but is incomplete or needs major revision.
<b>What This Looks Like</b>	The team solves their problems and works together. The teacher acts as a guide to assist the team only as needed.	The team generally solves their problems and works together. The teacher may be called at times when a student is not working toward the team goal.	The team cannot solve their problems. The teacher has to solve conflicts. Often parents start sending email about the group.

\* Taken from the Foundation Skills rubrics developed by Michael Katims, Ph. D. and Eeva Reeder (SchoolWork Initiative, 2000)



# REQUEST FOR HOUSE DESIGN PROPOSALS

To: **Durham Intermediate School Math Classes**  
From: **Planning Commission**  
Re: **Building New Houses in Southlake, TX**

The Planning Commission has asked Durham Intermediate School to come up with possible proposals and plans for several new subdivisions of homes in the Southlake area. The purpose of these homes is to provide reasonably priced housing for a single family of 2-6 members ranging in price from \$250,000-\$325,000. Therefore, the Planning Commission is contacting classes at Durham Intermediate School to develop viable proposals for the construction of such homes. The best proposals will be presented to the Commission upon completion of the project.

Durham Intermediate School hopes to have several acceptable proposals and physical models to present to the Commission and hopes all teams will put forth their best effort.

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*The Job Center: ARCHITECTURE Taken from the Ft. Worth Star-Telegram, March 10, 2008*

Architects do more than design buildings. They also manage projects and sites, evaluate and specify materials, observe construction, plan neighborhoods and outdoor spaces, design interiors, create landscape plans, and work to preserve historic buildings.

Some architects are generalists, handling all or most phases of the projects they work on. Others, especially those in large firms, specialize in one aspect of architectural work, such as project coordination or technical research.

Architects design and build a wide variety of buildings, from office and apartment buildings to schools, libraries, churches, hospitals, college campuses, factories, and homes. Most specialize in one type of building design.

The ability to present ideas and plans through drawings, models, or computer images is also important. Computer skills are essential, especially in the area of computer-aided design and drafting (CADD).

## **What must an architect take into account when designing a building?**

The design of a building involves more than its appearance. A building must also be functional, safe, and economical. And, of course, it must suit the needs of the people who will use it. An architect takes all this into account when he or she designs a building.

## **Is artistic ability a must for architects?**

While artistic ability is helpful, it is not essential. More important are visual orientation skills and ability to conceptualize and understand spatial relationships. Likewise, an architect needs good communication skills, the ability to work as a team, and good computer skills. Organization is also part of an architect's job. They often coordinate activities between various contractors on a job site and also manage their own personnel in the workplace.

**GOAL:** Draw a single room to scale.

SCALE: $\frac{1}{4}$ inch = 1 foot
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### **CLASSWORK DETAILS DAY 1**

Teams of three will measure a total of three rooms. Teams of two will measure two.

#### **How do we complete the measurement part of this activity?**

- The goal is to measure everything you need to be able to draw the room to scale.
- Create this rough copy on computer paper or on the provided paper.
- This rough copy is not drawn to scale. Make it large to fill your computer paper.
- Record the name of the room you are measuring (ex. KITCHEN 1).
- Use a meter or yard stick to measure.
- Measure the outside of the room first.
- Round all your measurements to the nearest 3 inches.

#### **How do we complete the scale drawing part of this activity?**

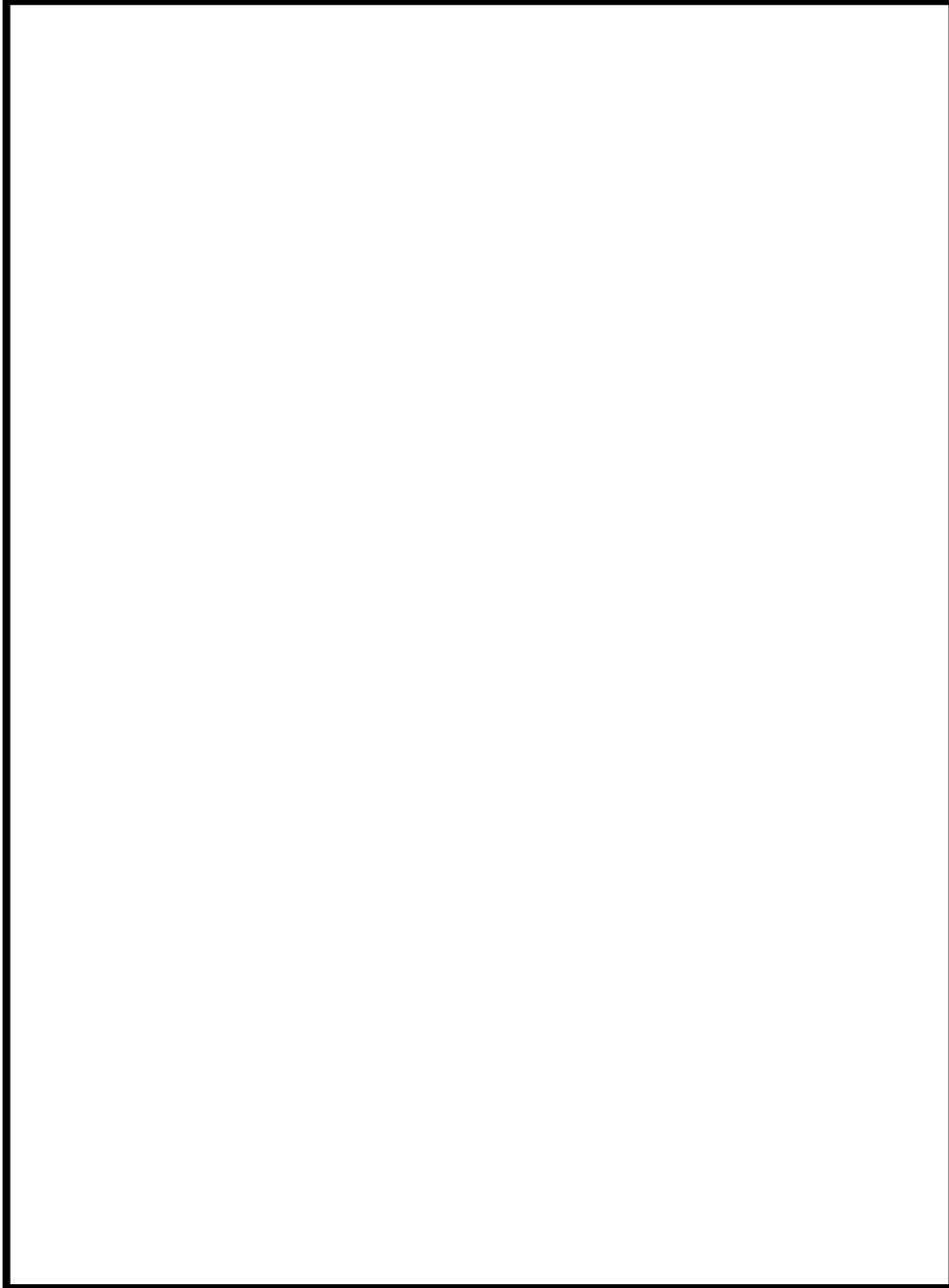
- Choose who will draw each room from the hall using your rough copy.
- Draw your final copy on graph paper using a ruler. Make your final copy professional.
- Start by drawing the outside of the room.
- See your packet for the symbols to use for items such as toilets, sinks, refrigerators, etc.
- **Include the scale** on your final copy.
- Do not include any measurements on the final copy.
- Include your name.
- Write both the **real-life perimeter (feet) and area (square feet)** of the room.

### **HOMEWORK DETAILS DAY 1**

- Choose one of the following:
  - Create a scale drawing of either your kitchen OR your master bathroom
  - Create a scale drawing of the outside of Durham Intermediate School
- If you choose DIS, you will need to access Google Earth. You only need to worry about the outside of the building, not inside rooms or features.
- If you choose a room at your house, follow all the same steps we did at school
- Include all items in the room that are permanently placed (sink, dishwasher, toilet, bathtub, range/stove, countertop space, etc.).
- You do not need to include the following items, but you can if you wish: lights, outlets, fans, and wall thickness.
- **Include your scale** as well as the **real-life perimeter (feet) and area (square feet)** of your room or DIS.

**KITCHEN #**

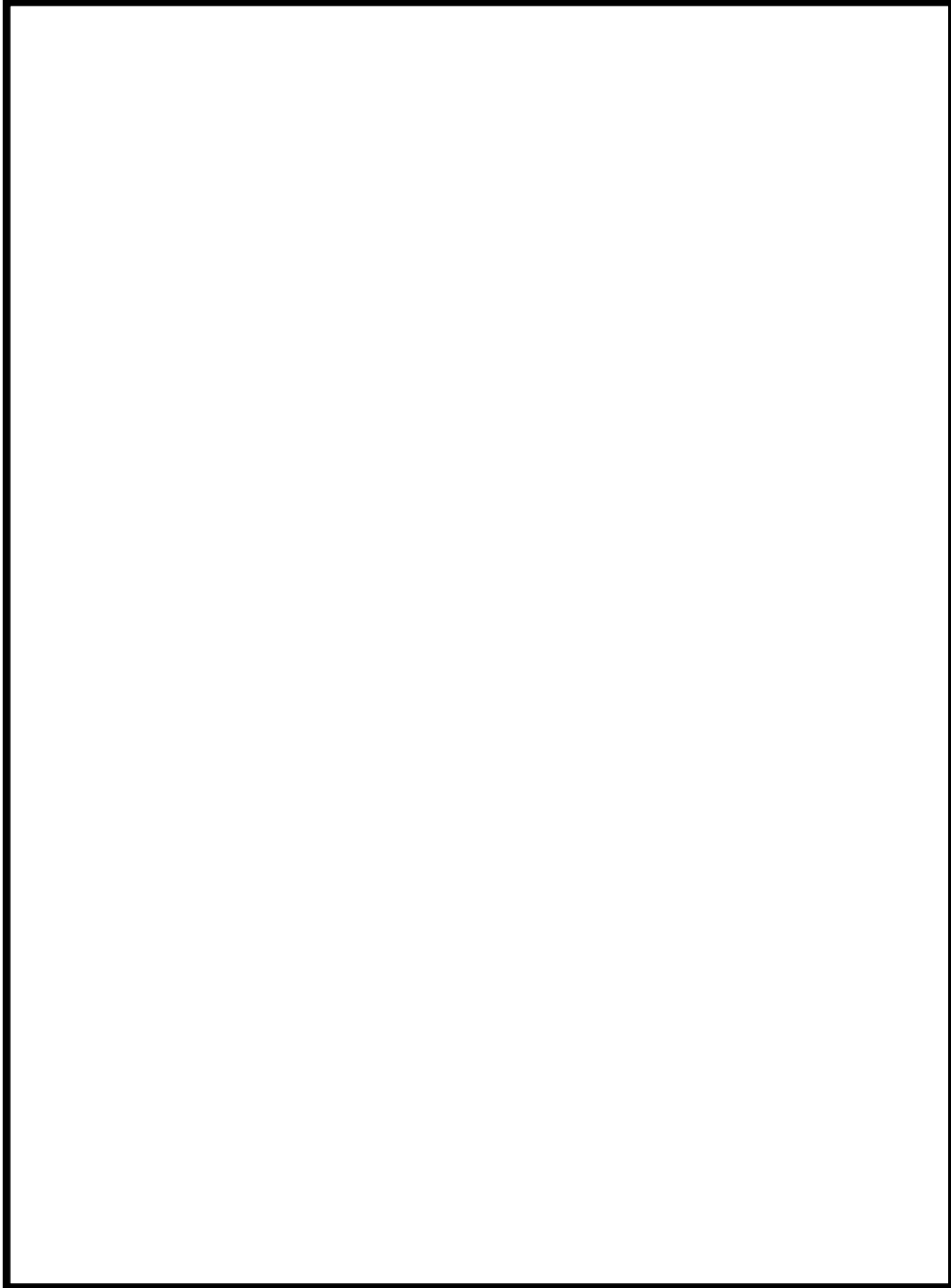
8 feet



10 feet

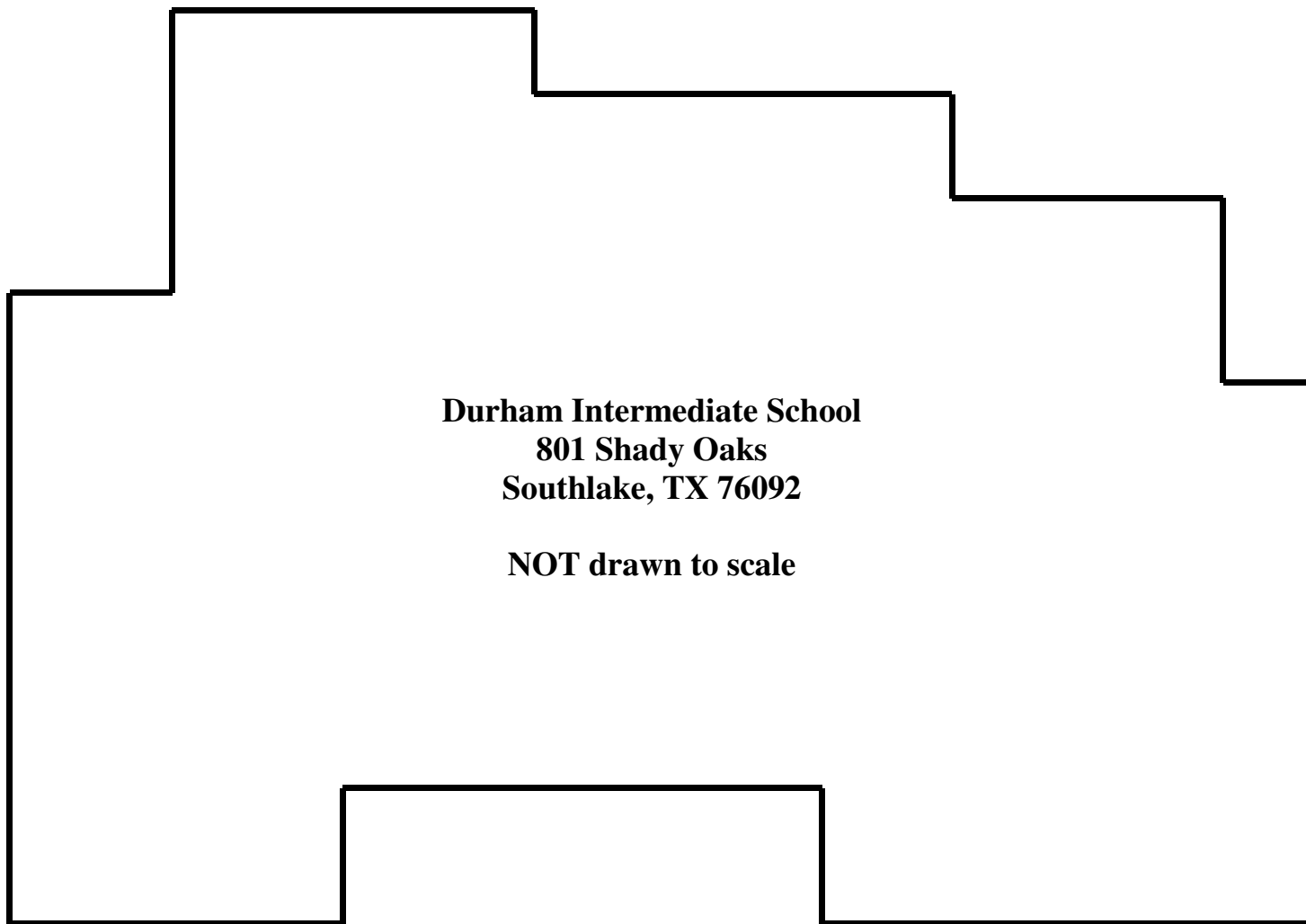
**BATHROOM #**

5 feet




8 feet

Use the diagram below along with Google Earth to determine the actual length of each wall. Label the length of each wall on the diagram below. Then create a scale drawing on graph paper of Durham Intermediate using the scale  $\frac{1}{4}$  inch = 15 foot . Compute the real-life perimeter and estimate the real-life area of the building (based on an approximate rectangle).



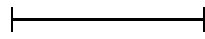
 Standard Electrical Outlet


 Light Switch

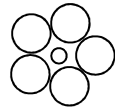
 220 Volt Electrical Outlet

 3 Way Light Switch

 Standard Ceiling Light

 Fluorescent Ceiling Light

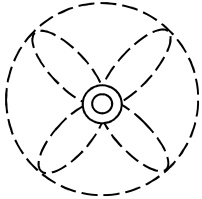
 Recessed Light



Chandelier



Wall Light



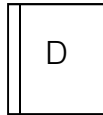
Ceiling Fan with Light



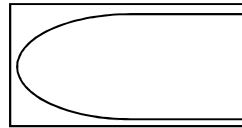
Toilet



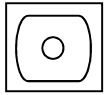
Washer



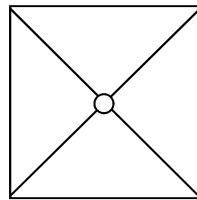
Dryer



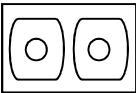
Bathtub



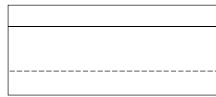
Cabinet with Sink



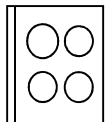
Shower Stall



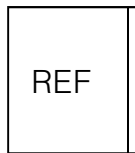
Double-Basin Sink



Cabinet over counter



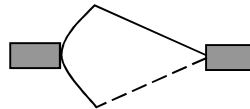
Range



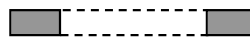
Refrigerator



Dishwasher



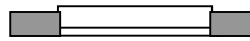
Swinging Door



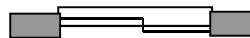
Arched Opening



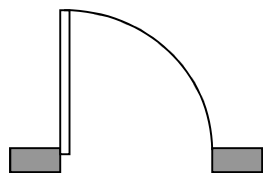
Hot Water Heater



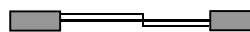
Window




Sliding Glass Door



Door



Sliding Closet Door

 represents the wall



Cable TV Hook-Up



Telephone Jack



Thermostat



Door Bell



Floor Outlet



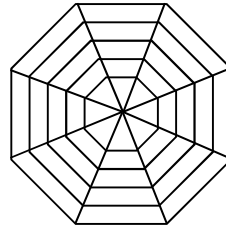
Exterior Light



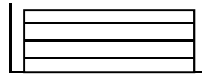
Ceiling Light with Pull Switch



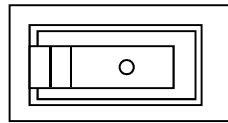
Outdoor faucets



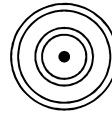
Gazebo



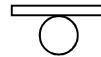
Garden bench



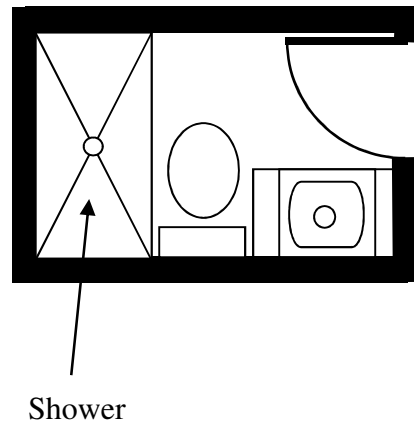
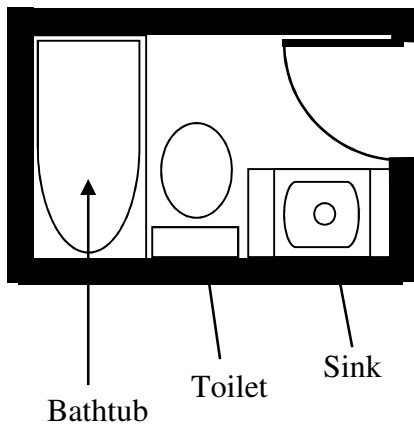
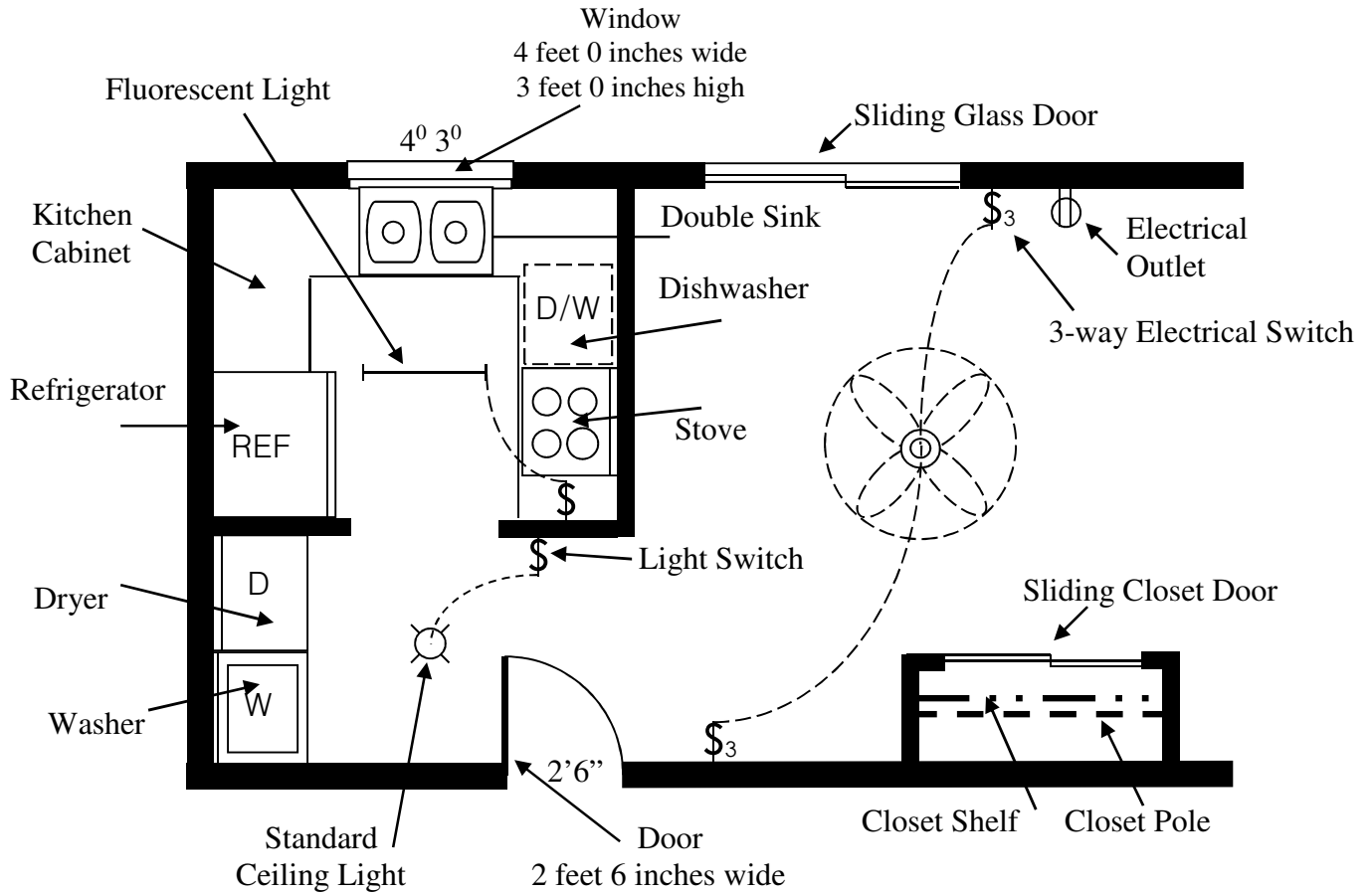
Hot tub



Birdbath or fountain



Basketball hoop





**GOAL:** Determine the actual size of an apartment from a scale drawing.

$$\text{SCALE: } \frac{1}{4} \text{ inch} = 1 \text{ foot}$$

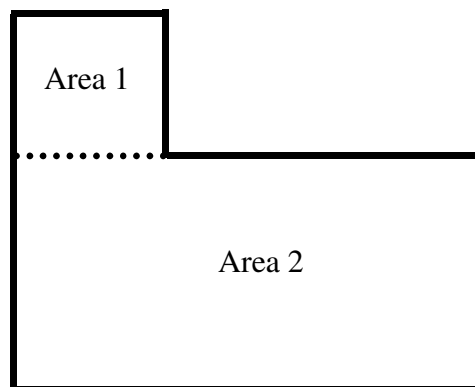
### CLASSWORK DETAILS DAY 2

Today we are going to measure the dimensions of rooms of an apartment as they were drawn to scale. From this we can determine the dimensions of these rooms in real-life.

Important information to remember for today's activity:

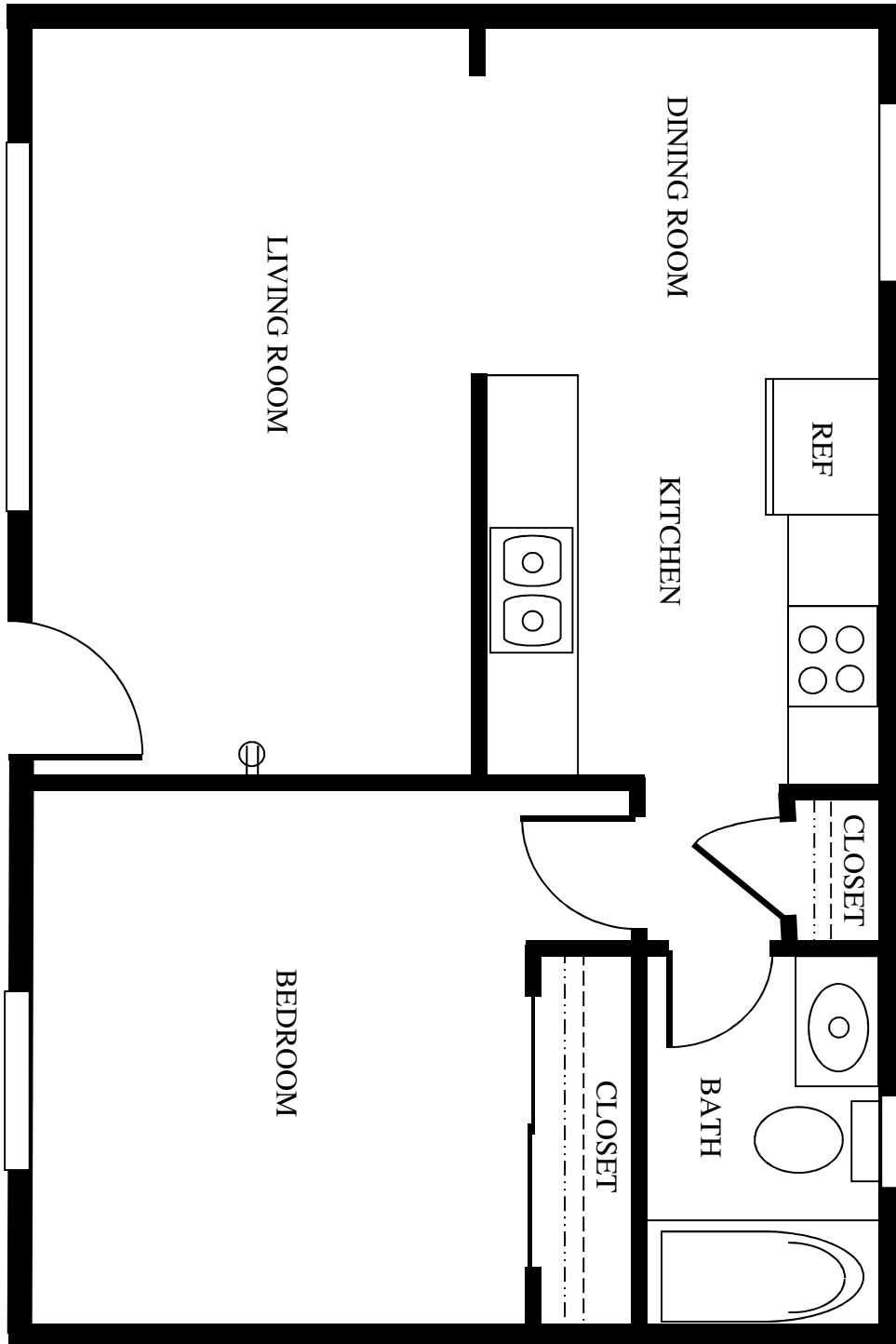
Width  $\longleftrightarrow$  Length  $\updownarrow$

- Measure to the nearest quarter of an inch from the inside of the wall to the inside of the wall
- The perimeter of a rectangle is the distance around the room and can be found by adding all the sides or by using the formula:  $P = 2l + 2w$
- The area of a rectangle is the number of squares that can fit into the rectangle. One easy way to think of it is that the floor covers the area of the room. The area of a rectangle can be found by the formula:  $A = l \cdot w$
- Area is measured in *square units*. You can't compare perimeter and area as they are measured with different types of units.
- The bedroom is not a perfect rectangle. You are going to have to divide up the room into two separate rectangles and determine the area of each. For example:



Place all notebook paper with calculations on it in your architecture binder.

### APARTMENT PLAN



Scale: 0.25 in. = 1 ft.

<i>Scale used</i>		Width $\longleftrightarrow$	Length $\updownarrow$
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ROOM	Drawing Width (in)	Drawing Length (in)	Real-life Width (ft)	Real-life Length (ft)
Living Room				
Kitchen				
Dining Room				
Part 1 (small) Bedroom				
Part 2 (large)				
Bath				
Large Closet				
Hall Closet				

ROOM	Real-Life Perimeter (ft)	Real-life Area (ft <sup>2</sup> )
Living Room		
Kitchen		
Dining Room		
Part 1 (small) Bedroom		
Part 2 (large)		
Bath		
Large Closet		
Hall Closet		
Sum of all rooms		

Now measure the entire apartment, including the outside walls in your measurement.	
What is the real-life width (ft)?	
What is the real-life length (ft)?	
What is the real-life perimeter (ft)?	
What is the real-life area (ft <sup>2</sup> )?	
The sum of the areas of all the rooms does not equal the total area of the apartment. Give two reasons why this is.	
1. _____	
2. _____	

If you doubled the length of each side of a room, the perimeter would multiply by...	
If you doubled the length of each side of a room, the area would multiply by...	
A house has outside measurements of 46 feet by 56 feet. You want to make a scale drawing of the house on 8.5 by 11 inch graph paper. You need to obtain the largest accurate drawing that will fit on the paper. Your scale should be 1 inch equals...	Nearest whole number

**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**

Architecture 2HW: **Home Measurements Matrix**

Name: \_\_\_\_\_

Tonight you are going to start a library of information that you will need to make decisions about the size and layout of the rooms in your final project. The assignment is to find out the size of various rooms in your house. Many of these measurements will be important when designing your own house for the final project.

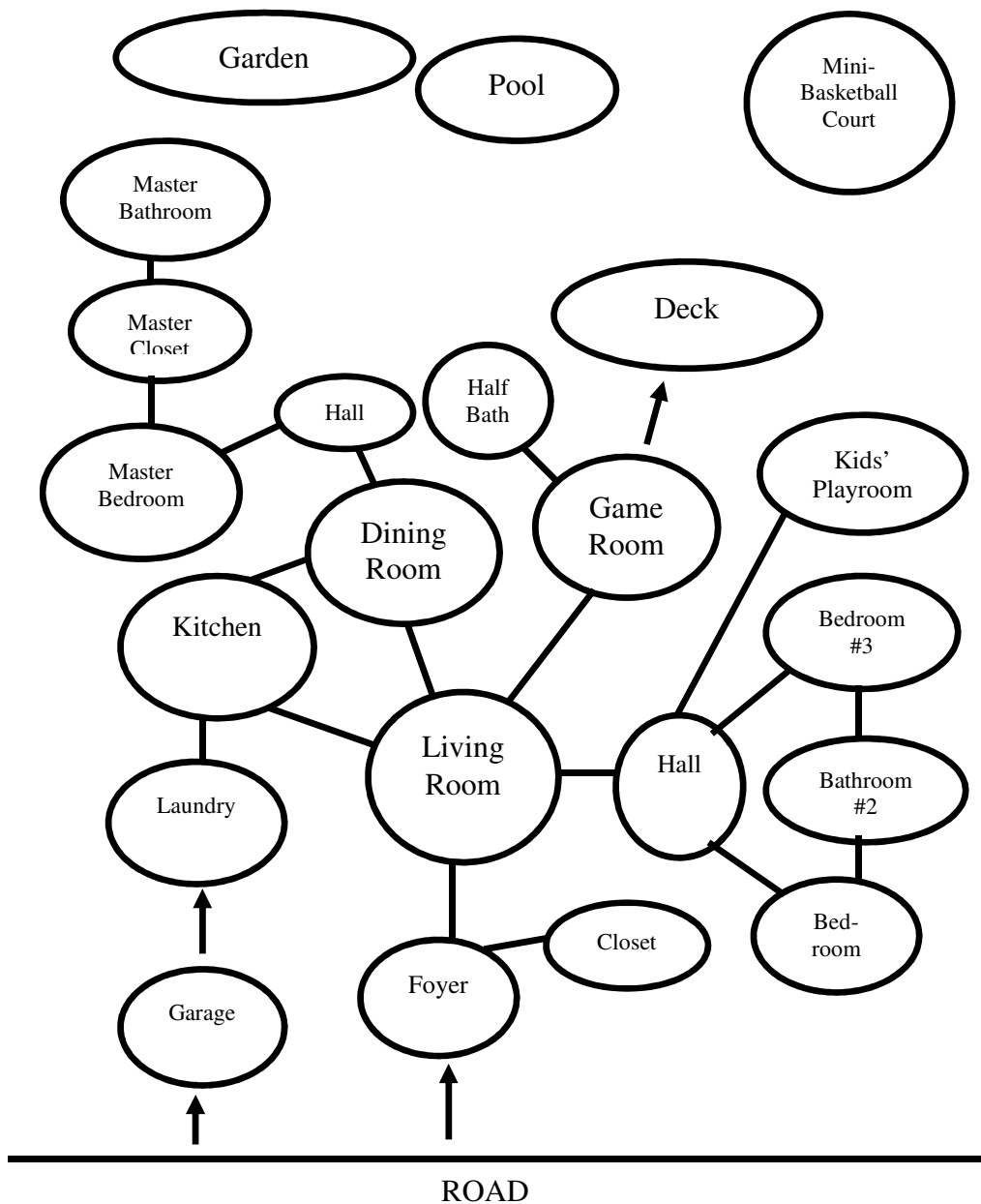
ROOM	Width (ft) ↔	Length (ft) ↕	# of Overhead Lights	# of Light Switches	# of Overhead Fans	# of Electrical Outlet locations	Room has a door to enter	# of exterior & interior doors		Doors open into or out of room?	Room is next to (A) kitchen (B) dining room	Ceiling height	Touches an exterior wall
								Y or N	E I				
	<i>Round to nearest foot</i>		<i>Not light bulbs</i>			<i>Not receptacles</i>							
Kitchen													
Dining Room													
Living Room													
Master Bedroom													
Master Bathroom													
Master Bedroom Closet													
Bedroom #2													
Bathroom #2													
Half bathroom													
Foyer													
Laundry Room													

How thick are your walls in most places?		Total number of rooms in your house (not including closets):	
Are there halls in the house? If so, where? What are they next to and what do they connect?			

On a sheet of computer paper draw a **bubble diagram** (not to scale) of how the rooms in your house connect. You **do not** need to include doors, windows, or any items in the rooms (such as sinks, bathtubs, ovens, etc.). The purpose of this diagram is to see which rooms connect to which other rooms.

Bubble diagrams are intended for the architect as they think through their design. The bubble diagramming process helps to get all their creative ideas down on paper, without worrying yet about what the final design might be. This process is the equivalent of outlining a story you might do in a LA class. Bubble diagrams help architects visualize how the spaces are organized and which spaces are adjacent to each other.

Use an entire sheet of paper per floor. Each bubble represents a different room/space. It should be drawn roughly oval in shape. Don't worry about exact size, but pay attention to the proportion of each bubble and how it fits into the overall building. Label each bubble with the name of the room or space.



**What is a Tiny House?**

<https://youtu.be/f2Z6YwQVPJk>

It is a movement where people are choosing to downsize the space they live in. The typical American home is around 2,600 square feet, whereas the typical small or **tiny house** is between 100 and 400 ft<sup>2</sup>.

**Why live in a Tiny House?**

- It is much cheaper than a larger home.
- Many owners don't want a lot of space.
- It is a challenge, it is fun, and it can be an adventure!

There are several TV shows devoted to building, purchasing, and living in tiny houses.

How big do you think a 384 square foot tiny house is compared to your classroom? In Mr. Mangham's room the floor tiles are a 1 ft. by 1 ft. square.

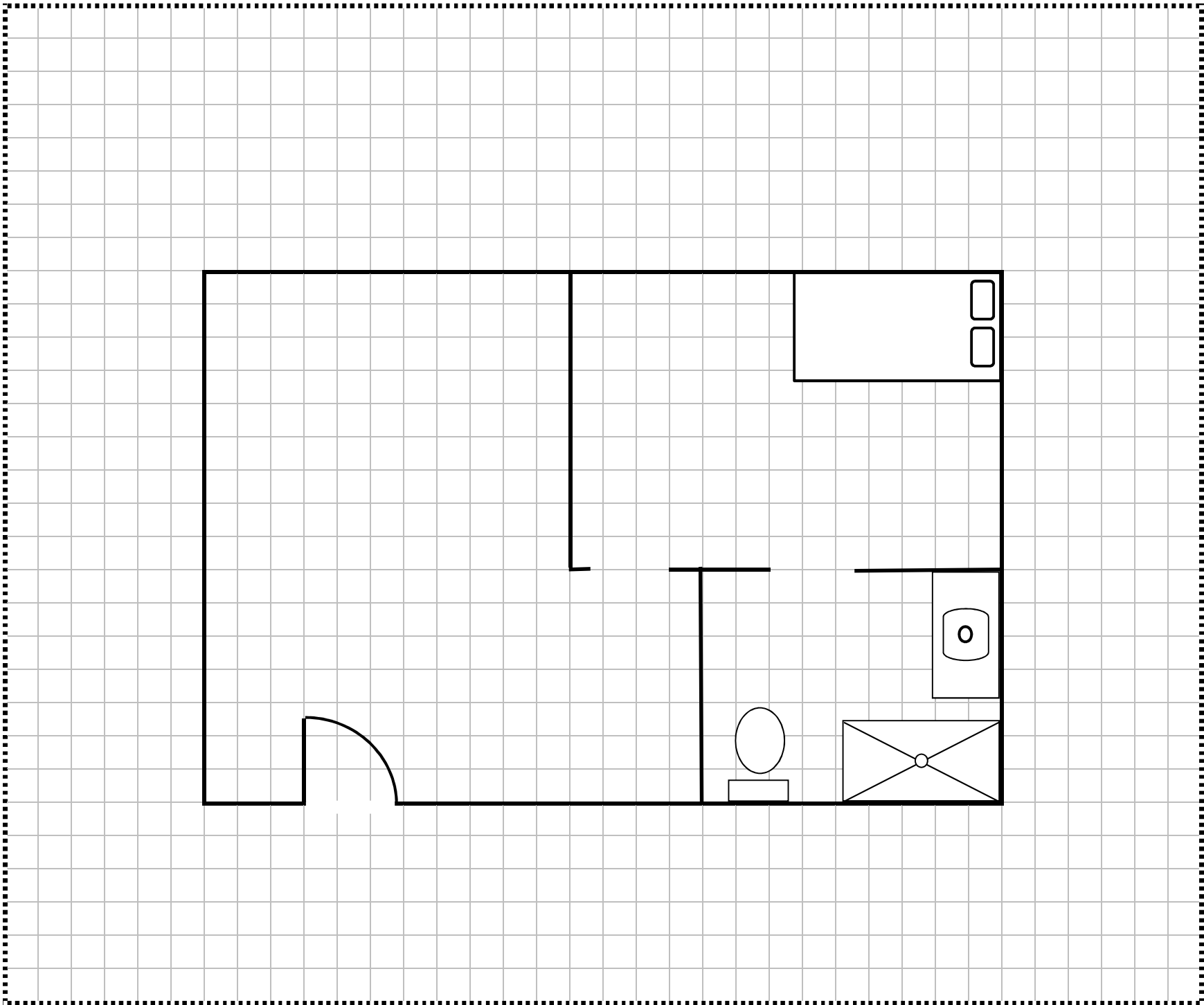
Use architecture templates and rulers on your final copy.

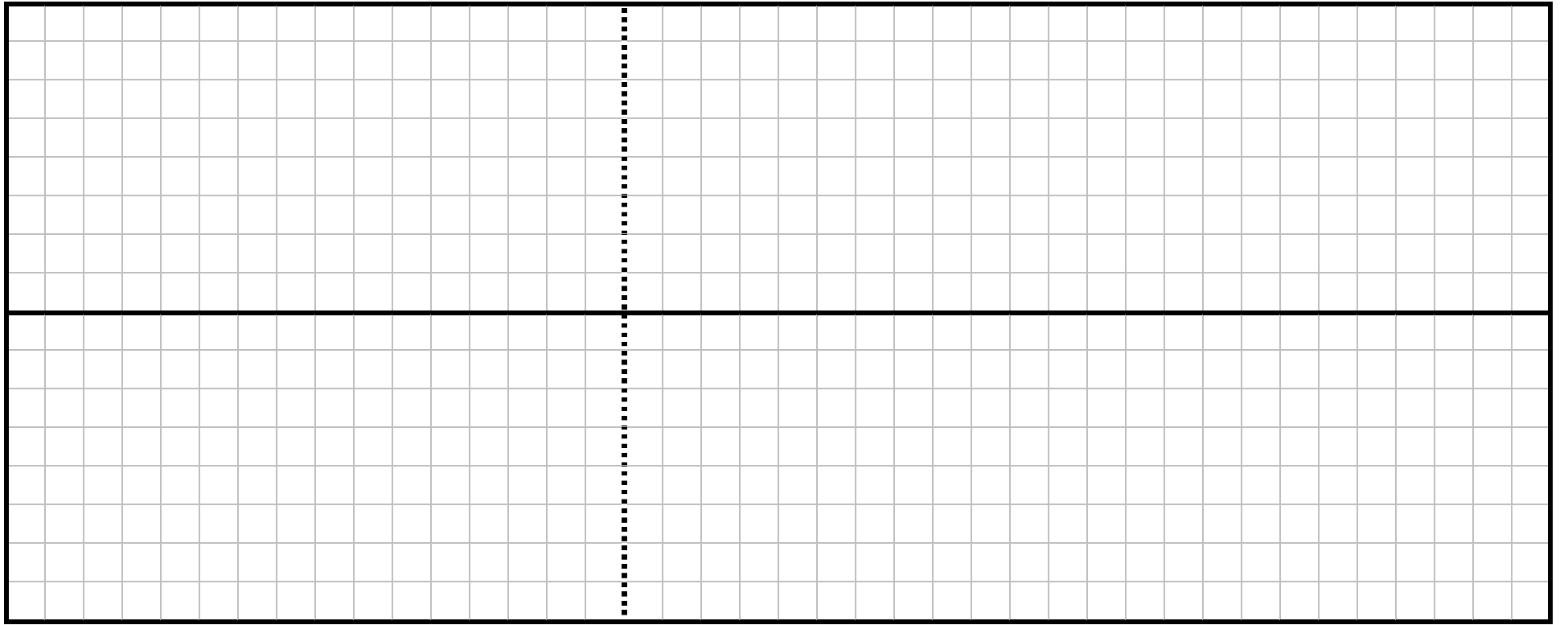
**Your Tiny House will have 3 rooms: bedroom, bathroom, and living/dining/kitchen (great room).**

Items to include in your Tiny House. Look at the **Typical Dimensions** page for furniture sizes.

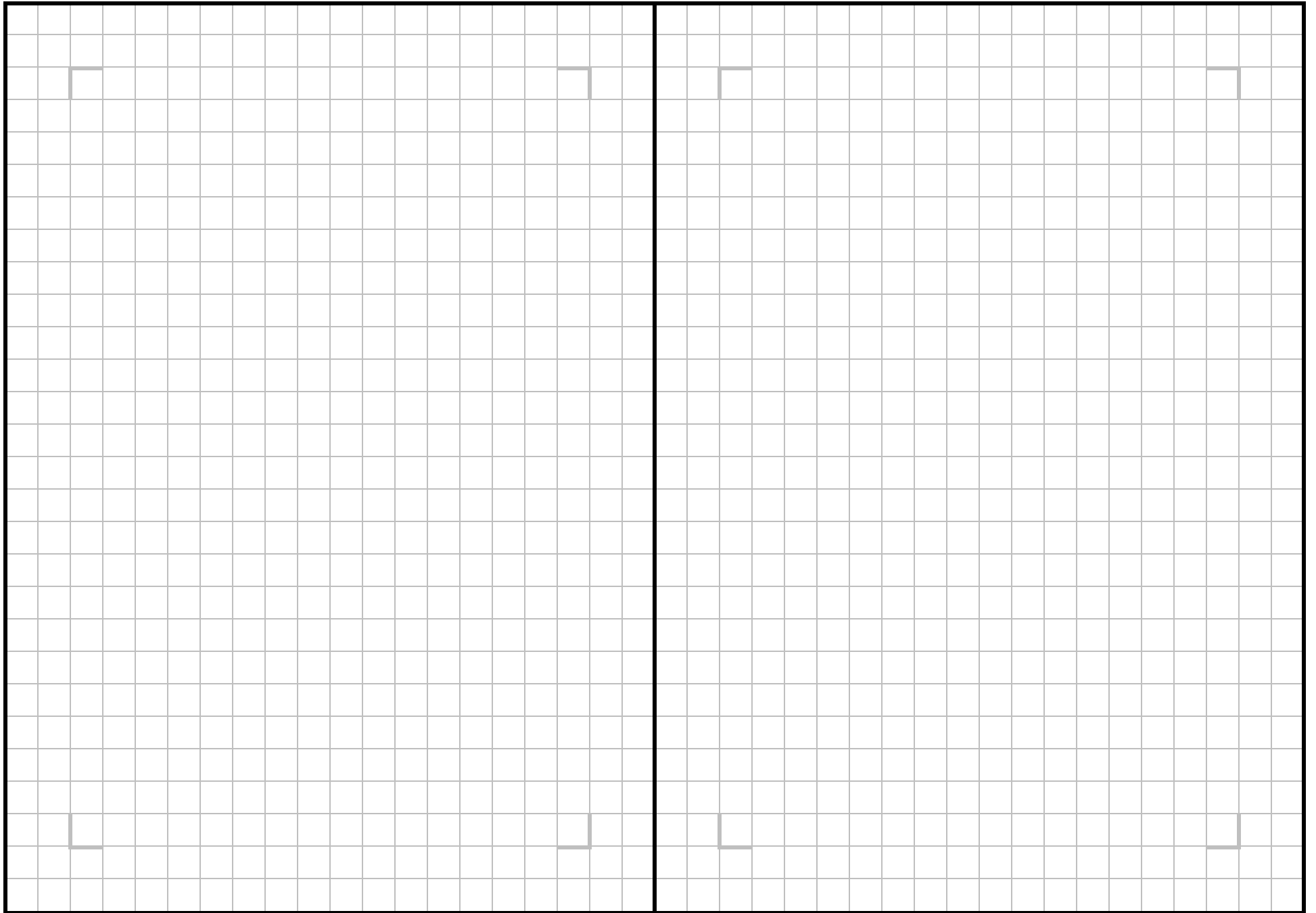
BATHROOM	BEDROOM	GREAT ROOM	
Shower or bathtub	Bed	Refrigerator	Couch, sofa, or recliner
Sink	Closet	Kitchen sink	Table with chairs
Toilet	Nightstand	Range	TV
Counter space		Microwave	Counter space
You will need a width of at least 2.5 feet to walk around your home.			
Make sure you can open all doors (ex. refrigerator, range, shower, etc.)			

On the walls:	Front door <i>(7 feet high)</i>	2+ windows <i>(Start 1 foot below the ceiling)</i>	Mirror	Picture/artwork relating to your favorite college or sports team
On the ceiling:	Fans		Lights	
Exterior:	Choose a style: wood, stucco, log cabin, brick, etc.			
Other:	Use colored pencils. Add designs. Be creative.			









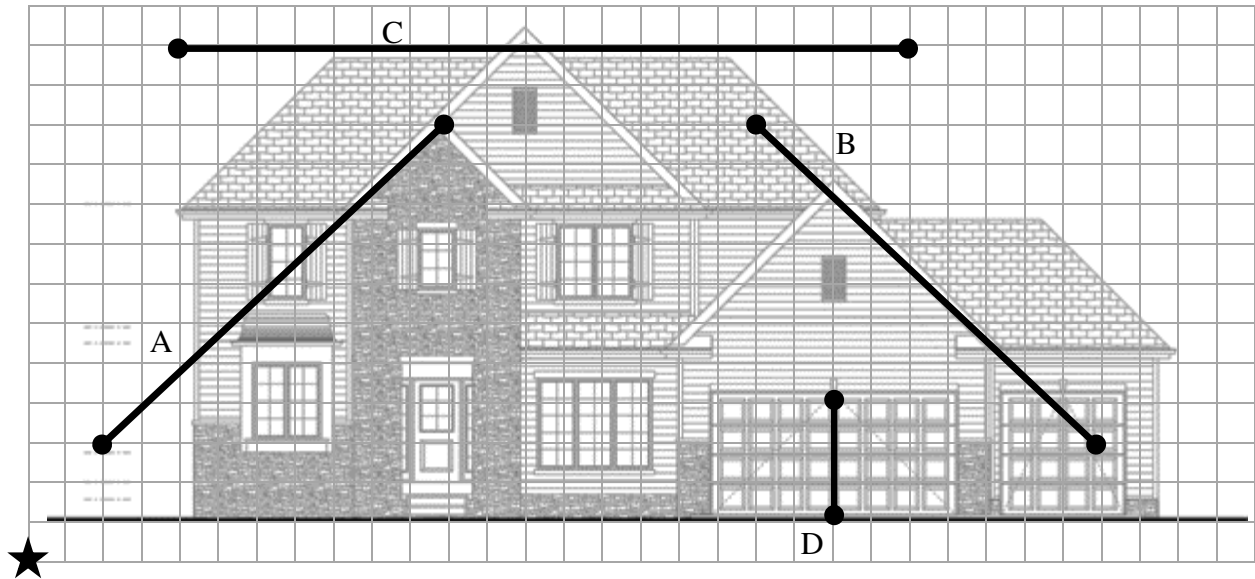
Below are some typical dimensions. You may have to design your furniture smaller to fit inside your tiny house.

### TYPICAL FURNITURE DIMENSIONS

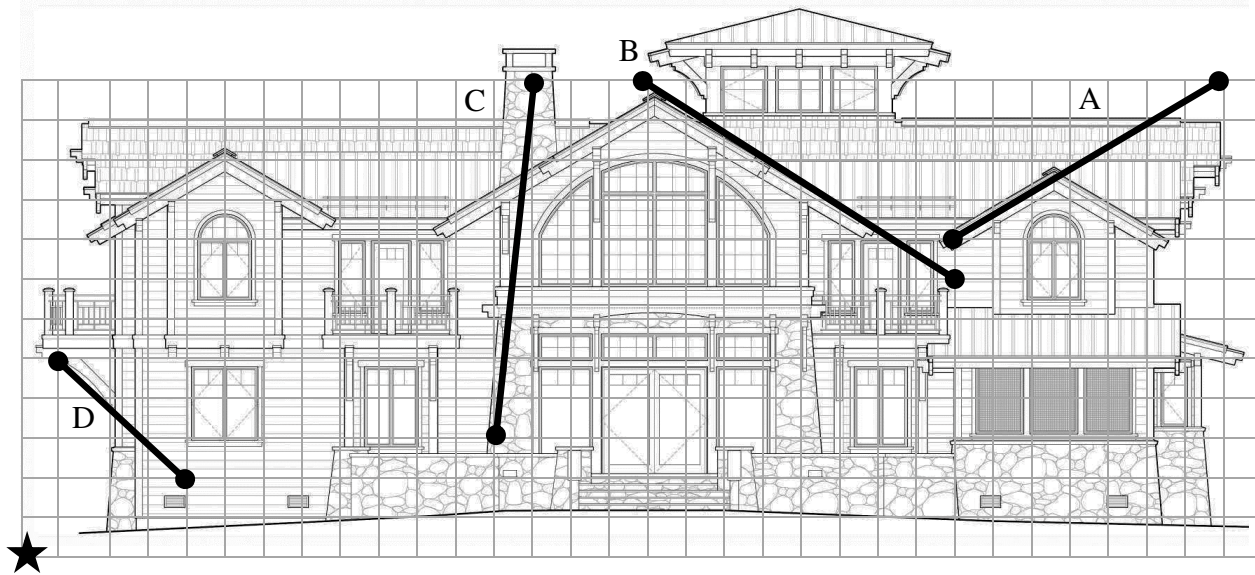
<b>Furniture Piece</b>	<b>Typical Width (in)</b>	<b>Typical Length (in)</b>	<b>Typical Height (in)</b> For drawing on the wall
Twin bed	39	75	27
Queen bed	60	80	27
Small dresser	20	37	30
Wardrobe/Closet	72	20	84
Nightstand	18	18	26
Small sofa	28	48	18 (seat), 36 (back)
Large sofa	36	112	18 (seat), 36 (back)
Living room chair	30	30	18 (seat), 36 (back)
Coffee table	24	45	29
Kitchen table	24	48	29
Kitchen chair	18	20	18 (seat), 36 (back)
Dining room table	30	72	29
Dining room chair	18	20	18 (seat), 36 (back)
Toilet	See template		18 (seat), 33 (back)
Sink	See template		30
Counter space	2 feet deep		36
Doors	2-3 wide		84
Windows	Start 1 foot below the ceiling		

Utilize your knowledge of linear equations while looking at elevation views of homes. For the top house, find coordinates of the beginning and end of each line and then determine the slope. For the bottom house, find coordinates of the beginning and end of each line and then write an equation in  $y = mx + b$  form.

The star indicates the origin. Show all coordinates and work on a separate sheet of paper. Write answers on this page.



A	B	C	D
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A	B	C	D
---	---	---	---

**GOAL:** Use statistics to learn about home prices in various cities.

Find the cost per square foot of each house, **rounded to the nearest cent**. You may use a **calculator**.

AGGIEVILLE				BLUE DEVIL LAND			
House	Cost	Square Feet	Cost per sq. ft.	House	Cost	Square Feet	Cost per sq. ft.
1.	\$176,500	2,450	\$72.04	8.	\$158,900	2,300	
2.	\$108,675	1,725		9.	\$158,695	1,925	
3.	\$112,365	1,870		10.	\$110,995	1,970	
4.	\$143,950	2,200		11.	\$121,490	2,090	
5.	\$106,900	1,452		12.	\$124,900	1,645	
6.	\$154,590	2,160		13.	\$157,990	2,430	
7.	\$151,990	2,055		14.	\$122,975	1,825	
15/16.	What is the median cost per square foot in Aggieville? Blue Devil Land?						
17.	What is the difference between the two medians?						
18./19.	Which house is the least expensive per square foot? Most expensive?						

20.	Calculate the mean and the median of the 5 homes. B. Which of the numbers, mean or median, is closer to the “typical” price of these homes? C. Provide support for your answer in B. What about the numbers makes this a special case?	\$135,000 \$3,375,000 \$99,950 \$126,900 \$119,550	Mean =
			Median =
	B.	C.	

Southlake Median Home Price	2016: \$650,000	2017: \$700,000	2018: \$718,000
Colleyville Median Home Price	2016: \$447,000	2017: \$554,000	2018: \$587,000
Grapevine Median Home Price	2016: \$278,000	2017: \$350,000	2018: \$365,000

21.	What was the percent increase in Southlake home prices from 2017 to 2018?	
22.	What was the percent increase in Colleyville home prices from 2016 to 2017?	
23.	What was the percent increase in Grapevine home prices from 2016 to 2018?	

***Grapevine Real Estate Listings***

Below are 12 single-family homes that were for sale a few years ago in Grapevine. Single family means it is a home that one family would live in. An apartment would be an example of a multi-family home. Homes can have half a bath. A half bath is a bathroom without a bathtub or shower.

Find the cost per square foot of each house, **rounded to the nearest cent**. You may use a **calculator**.

Address	Cost	Square Feet	Cost per square foot	Bed-rooms	Bath-rooms	Age
2825 Panhandle	\$143,500	1508 sq. ft.		3	2	22 years
3430 Spring Willow	\$174,900	2210 sq. ft.		3	2	18 years
4319 Windswept	\$201,000	2462 sq. ft.		4	2.5	13 years
1408 Clearwater	\$216,500	2317 sq. ft.		3	3	3 years
2662 Pinehurst	\$232,000	2402 sq. ft.		4	2	3 years
2702 Yorkshire	\$249,900	2971 sq. ft.		5	3	15 years
2717 Cobblestone	\$257,990	2839 sq. ft.		4	2.5	0 years
3826 Shady Meadow	\$262,000	3042 sq. ft.		5	4	15 years
2715 Cobblestone	\$268,990	2942 sq. ft.		4	3	0 years
2719 Cobblestone	\$283,990	3116 sq. ft.		4	3.5	0 years
3105 Coveside	\$289,900	3198 sq. ft.		3	2.5	4 years
3312 Marsh	\$369,900	4031 sq. ft.		4	3.5	11 years

Use your data to now calculate the following items. Round according to the parentheses.

	Cost (dollar)	Square Feet (whole number)	Cost/Square Foot (cent)	Bedrooms	Bathrooms	Age
1 <sup>st</sup> /Lower Quartile						
Median						
3 <sup>rd</sup> /Upper Quartile						
Range						

**On a sheet of graph paper draw two box plots: one for cost and one for square feet.**

Real estate agents typically use the median price, not the mean, for homes in their area. Below you can see some of the median home prices for residences across the country.

You may use a **calculator** on this page. **Start your rankings with 1 equal to the lowest number.** Include the United States as a city for the purposes of the table.

City	2017 Median Price		Average Size Home (Square Feet)		Price per Square Foot	
		<i>Rank</i>		<i>Rank</i>	<i>Nearest dollar</i>	<i>Rank</i>
San Francisco	\$1,204,700		1198			
New York City	\$685,000		769			
Los Angeles	\$631,600		1556			
Washington DC	\$551,400		1052			
Boston	\$435,900		1608			
Seattle	\$420,500		1789			
Denver	\$394,400		1637			
Miami	\$310,000		1574			
Chicago	\$246,400		1579			
<b>United States</b>	<b>\$240,700</b>		<b>1732</b>			
Phoenix	\$234,700		1608			
Dallas	\$232,200		1773			
Philadelphia	\$232,200		1720			
Houston	\$217,400		1874			
San Antonio	\$210,500		1740			
Tampa	\$199,900		1503			
Atlanta	\$192,000		1684			
St. Louis	\$170,300		1385			
Pittsburgh	\$140,500		1201			
Mean						
Median						
Range						

<p>Review the cost of homes in different cities. Are the highest home prices generally due to larger homes or a higher cost per square foot? Support your answer with numbers.</p>	
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The tables below represent the results of a national survey about people and their homes. Use the results of the survey to complete the missing items and questions. You may use a **calculator** on this page.

**Question #1: What is most important about your home?**

		Number of people in the survey	Number responded	Percent
1.	It is comfortable.	2500		47%
2.	It is clean and safe.	2500		22%
3.	I like the location.	2500		16%
4.	It's well decorated.	2500		11%
5.	It has great curb appeal.	2500		4%

**Question #2: Which of these upgrades would make you happiest?**

		Number of people in the survey	Number responded	Percent
6.	State of the art kitchen	3500	1050	
7.	High-tech family room	3500	875	
8.	Finished basement	3500	595	
9.	Spa-like bathroom	3500	560	
10.	Luxurious bedroom	3500	420	

**Question #3: Where would your dream home be?**

		Number of people in the survey	Number responded	Percent
11.	Beach		728	26%
12.	Country		644	23%
13.	Small Town		532	19%
14.	Big City		476	17%
15.	Mountain		420	15%

16.	<p>Create a bar graph of one of the tables above. Make sure your graph has a <b>title and all sections are labeled</b> with both the answer and either the percent or the number of responses.</p> <p>Use a separate piece of graph paper to create your graph.</p>
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Have you ever wondered how much it costs to have your computer on for an hour? How about the dishwasher or the washing machine? What uses the largest amount of energy in a typical house?

1.	Heating and Cooling	43%
2.	Appliances and Refrigeration	18%
3.	Water Heating	12%
4.	Lighting	11%
5.	Home Electronics	7%
6.	Other	9%

- An average 2000 sq. foot house uses 1600 kWh (kilowatt hours) per month of electricity.
- An average cost per kWh in Texas is \$0.12.
- While many homes use gas as part of their energy consumption, we will assume everything in your house runs on electricity for this exercise.

Use the information above to complete the table below for a typical Texas house. You may use a **calculator** on this page.

	Monthly Electricity Usage (in kWh)	Monthly Electricity Cost (in \$)	Yearly Electricity Usage (in kWh)	Yearly Electricity Cost (in \$)
Heating and Cooling				
Appliances and Refrigeration				
Water Heating				
Lighting				
Home electronics				
Other				
<b>TOTAL</b>				

1.	If a typical family was able to cut their heating and cooling costs by 10%, how much would they save each month? year?		
2.	If a typical family was able to cut their lighting costs by 40%, how much would they save each month? year?		
3.	If a typical family was able to cut their water heating costs by 15%, how much would they save each month? year?		
4.	If a family wishes to spend a total of \$2000 each year on energy, by what percentage are they going to need to decrease their energy usage? (tenth of a %)		
5.	Based on the information on this page, what would be the easiest thing a family could do to save a large amount of money each month on their energy bill?		



Utilities are things at your house such as electricity, gas, telephone, internet, and cable TV. The total monthly cost of utilities can vary quite a bit depending on the city that you live in.

Use the information below to complete the table regarding 2008 utility costs. You may use a **calculator** on this page. Note that the percentages are all compared to the US average.

City	Total Monthly Utility Cost (nearest dollar)	% Compared to US	% Compared to US, fraction form (simplest form)	% Compared to US, decimal form
United States Average	\$290	100%		
LA		81%		
Orlando		86%		
Chicago		98%		
Atlanta		99%		
Philadelphia		109%		
Baltimore		124%		
Houston		129%		
Dallas		130%		

1.	In Dallas the summers are very warm and using a lot of air conditioning can greatly increase the total utility bill. If an average home in Dallas during the summer is spending 40% more than the monthly cost above for Dallas, how much would expect to pay per month in the summer?	
2.	During winter months, the average Dallas bill is 30% below the Dallas average listed above. How much would you expect to pay per month during the winter?	
3.	Looking at the percentage column, what is the ratio of US to Dallas in simplest form?	
4.	If there are between 400,000 and 500,000 households in Dallas, which of the following is a good estimate of the total amount spent on utilities in a month in Dallas?  <div style="display: flex; justify-content: space-around;"> <span>A \$1.7 million</span> <span>C \$17 million</span> </div> <div style="display: flex; justify-content: space-around;"> <span>B \$170 million</span> <span>D \$1.7 billion</span> </div>	
5.	What is the range of the total monthly utility cost of the cities above?	

**GOAL:** Create a three-dimensional looking drawing of your team's tiny house or apartment.

Architects use isometric paper. An isometric drawing is a view seen from above that represents the three dimensions of the space.

- Get one centimeter cube
- Place the cube on the table so that one of the edges is facing toward you (not one of the sides).
- Place a dot on your isometric paper to represent the one vertex pointing out toward you.
- From this vertex, draw the three edges that shoot out from it. One goes straight down, one goes up to the left, and one goes up to the right.
- Draw the final two lines to create the left face, then the right face and top face.
- With the light in the room, the sides all look like slightly different colors. Leave one of your sides blank, lightly shade in one side, and shade in one side dark. This makes the cube look three dimensional.
- Complete the same task with 3 cubes. Add one cube on top of the original and one cube in front of the right face (pointing toward you). Make a brand new drawing of the new shape.
- Optional: Create a third drawing using either 4 or 5 cubes.

Now you are ready to draw your 3-D house isometrically.

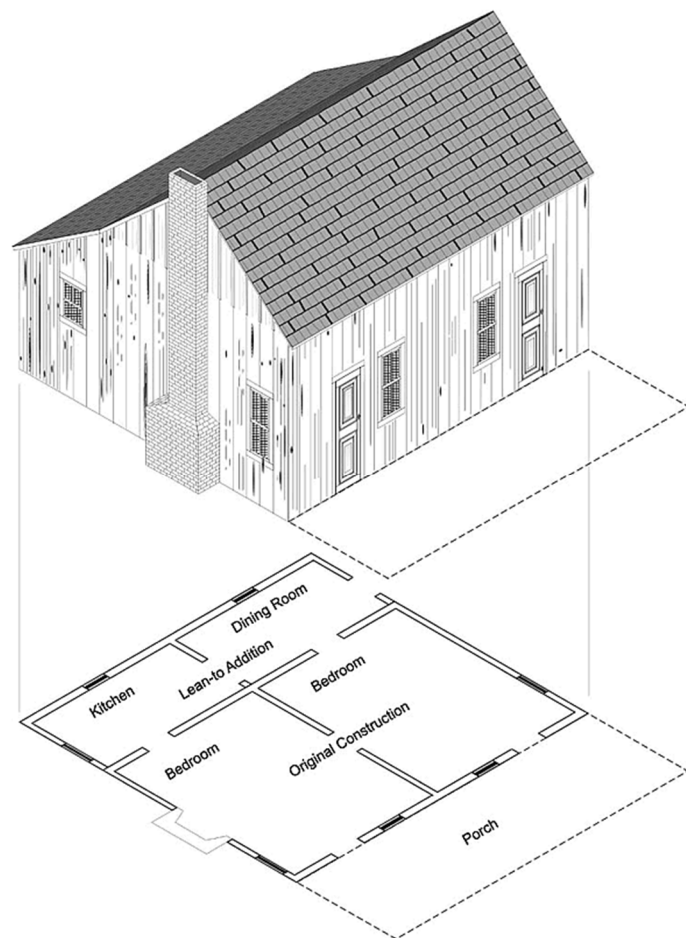
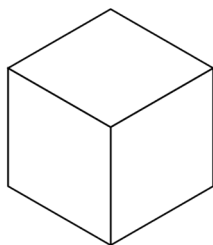
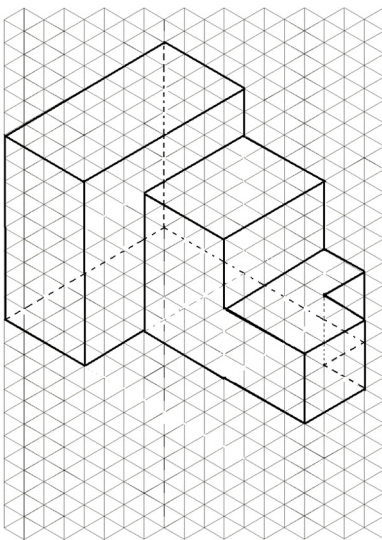
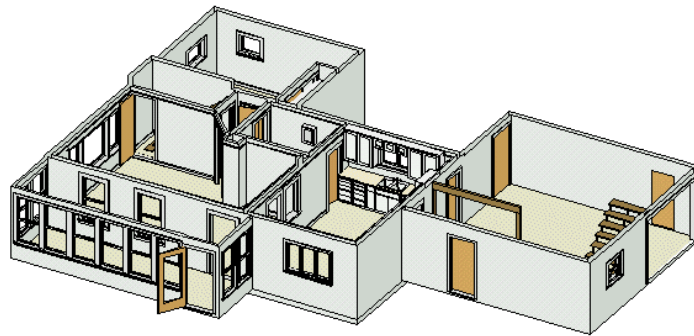
- Use a ruler for this drawing.
- Every two squares on your actual house will equal one square on your isometric drawing. So if your house is 24 lines long, it will be drawn as 12 lines long on the isometric paper. If an item is an odd number, use your best judgment as to whether rounding up or down looks better.
- Draw all windows (at least 2) and the door.
- Shade the house appropriately.
- If time allows, you may wish to try drawing some items around your home as well (walkway, pool, etc.)

### **Your homework for Architecture Day 5:**

- Each person in your group should complete one of the two different linear equations pages: Skyscrapers or Grapevine Home Prices

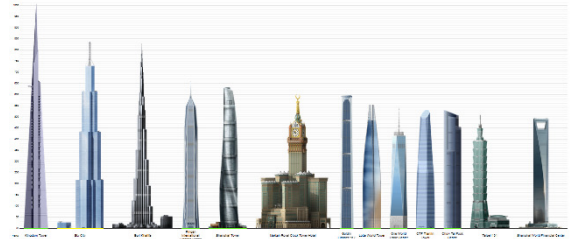
Do you want to draw isometrically on your computer? <http://illuminations.nctm.org/ActivitySearch.aspx>  
In the Advanced Options box type "isometric". Then choose the Isometric Drawing Tool.

Do you want to print out some isometric paper? <http://www.waterproof-paper.com/graph-paper/>



## Skyscrapers of the World

Mr. Underwood wanted to know if there is a linear, proportional relationship between the number of floors in skyscrapers and the height of skyscrapers.



1.	Do you think that there is a proportional relationship between the number of floors in a skyscraper and the height? Explain.	
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Mr. Underwood then searched and found information about some of the tallest buildings in the world.

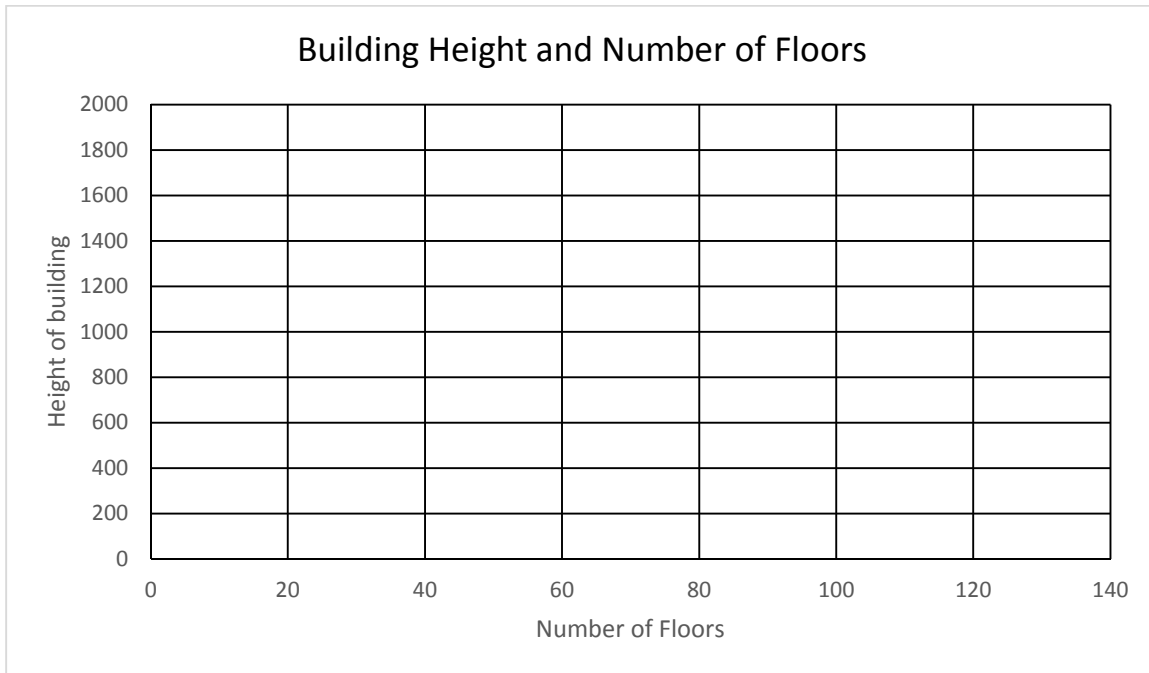
Structure	Country	Number of Floors, $x$	Height, $y$
Intl' Commerce Center	Hong Kong	118	1588 ft
Wills Tower	United States	108	1450 ft
One World Trade Center	United States	104	1368 ft
Princess Tower	United Arab Emirates	101	1286 ft
Q1	Australia	80	1058 ft

Using a calculator, determine the constant of proportionality for each structure. As a reminder, the constant of proportionality is  $k = \frac{y}{x}$ .

Structure	$k$ (nearest tenth)
Intl' Commerce Center	
Wills Tower	
One World Trade Center	
Princess Tower	
Q1	
Average	

2.	Based on your results in the table above, would you say the relationship between floors and height is close to being proportional? Why?	
3.	The constant of proportionality is $k$ . What does $k$ mean in this particular situation regarding building height and number of floors?	

Create a scatter plot the points of the 5 buildings on the graph.



A line of best fit, or trend line, is a straight line that best represents the data in a scatter plot. The line may pass through some points, none of the points, or all of the points. Using a ruler, draw a line of best fit for the data on your graph above. Extend your line so it covers from 0 floors to 140 floors.

4.	Approximately what is the y-intercept of your line? What does this mean?	
5.	Use your graph and line of best fit to predict the height of a 50 story building.	
6.	Use your graph and line of best fit to predict the height of a 130 story building.	
7.	Use your graph and line of best fit to predict how many floors would be on a 675 ft tall building.	
8.	Use your graph and line of best fit to predict how many floors would be on a 1800 ft tall building.	

**Summary Table**

In words explain the relationship between the number of stories and the height of skyscrapers. Use numbers to be specific.	Write an equation in the form of $y = kx$ to describe the relationship between the number of stories and the height of skyscrapers.
--	---

## Home Prices in Grapevine, TX



Mr. Mangham is looking for a new house in Grapevine. He starts researching the prices of different homes. He knows the price of a home is a combination of the price of the land (vacant lot) plus the cost of the home. After analyzing many homes he determines that the following equation provides a pretty good estimate of home prices in Grapevine:

$$y = 125x + 18000$$

$x$  represents the size of the home (square feet) and  $y$  represents the price of the home (dollars)

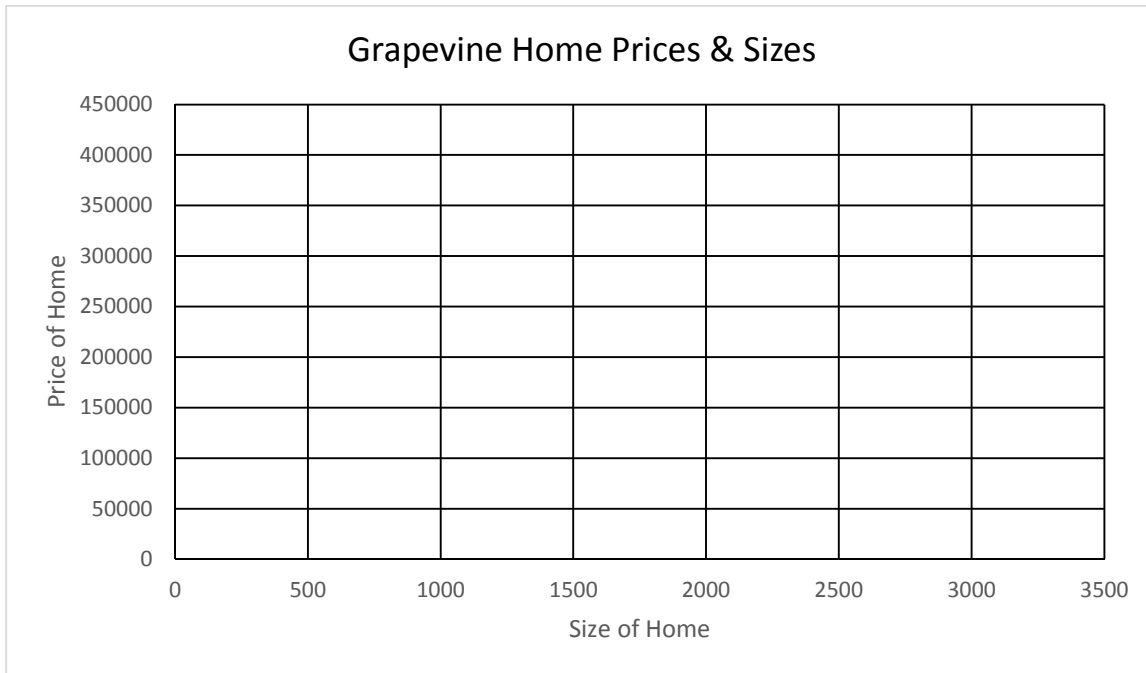
1.	What does the number 125 mean in the equation?	
2.	What does the number 18,000 mean in the equation?	
3.	Is this linear relationship proportional or non-proportional? How do you know?	

Using a calculator, complete the table below to give Mr. Mangham estimates of the home sizes and prices in Grapevine.

House	City	Size (ft <sup>2</sup> ), $x$	Price, $y$
House 1	Grapevine	1600	
House 2	Grapevine	2400	
House 3	Grapevine	3200	
House 4	Grapevine		\$175,000
House 5	Grapevine		\$275,000
House 6	Grapevine		\$360,000

4.	How much would you expect a vacant lot to sell for if it followed the same equation?	
5.	Would you expect $y = 125x + 18000$ to be a good estimate for home prices in cities surrounding Grapevine? Why or not?	
6.	Would you expect $y = 125x + 18000$ to be a good estimate for home prices in New York City? Why or why not?	

Plot the six homes from the previous page on the graph below.



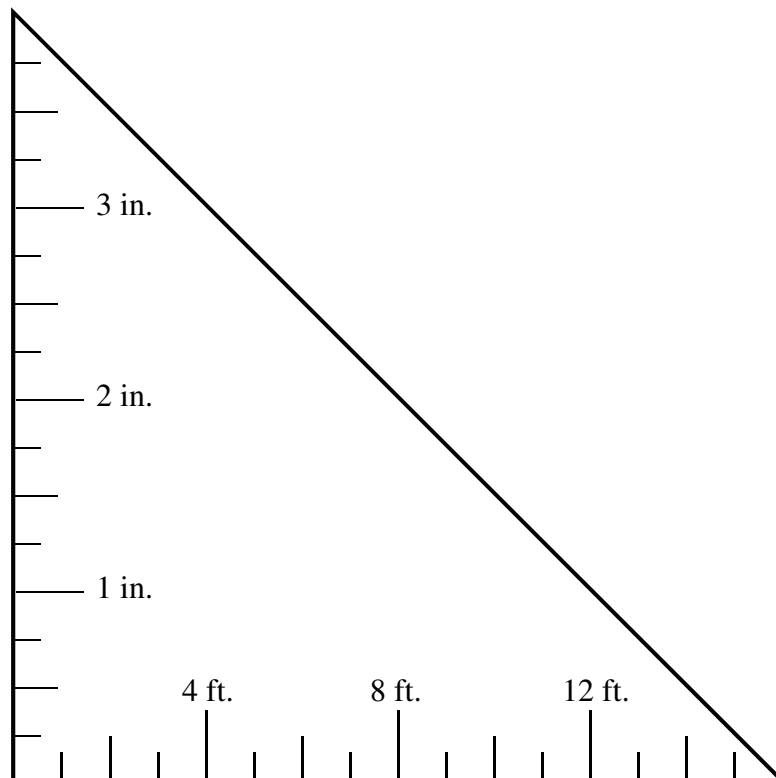
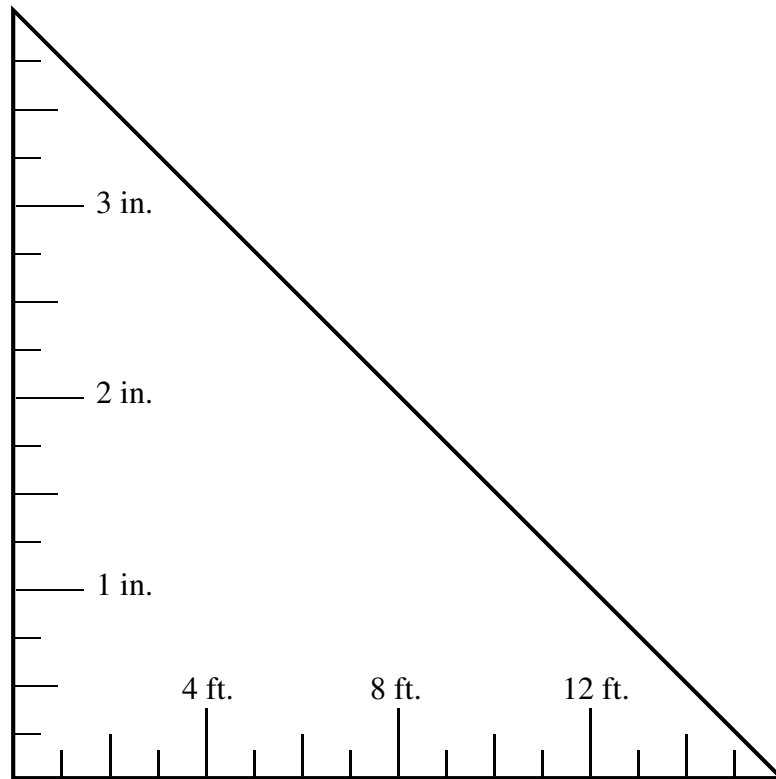
Using a ruler, draw a line to connect your points. Extend your line so it covers from 0 to 3500 square feet.

7.	Does the y-intercept appear to match the y-intercept listed in the $y = mx + b$ equation?	
8.	How does the graph confirm your answer to #3 on the previous page?	
9.	What is the slope of your line?	
10.	Use your graph to predict the price of an 1800 square foot home.	
11.	Use your graph to predict the price of a 3100 square foot home.	
12.	Use your graph to predict the square footage of a \$250,000 home.	

**Summary Table**

In words describe/explain the relationship between the square footage and price of a house in Grapevine to someone just moving to Grapevine. Use numbers as well to be specific.

The following triangles can be used to measure drawing that use the scale 0.25 in. = 1 ft. One side of the ruler measures the drawing's length while the other side automatically converts the drawing to its full size length.





What is a building code?

A building code is established by a community to make sure that buildings are constructed safely for the public. They provide a safe, sound, and sanitary building for people to live in. Codes will be different in different parts of the country. For our project we will be using commonly accepted ones in most areas.

The Great Chicago Fire of 1871 is considered one of the largest catastrophes in the history of the United States. The Great Chicago Fire was an out of control fire that burned from Sunday, October 8 to early Tuesday, October 10, 1871, killing hundreds and destroying about four square miles in Chicago, Illinois. It would pave the way to modern building codes that protect the health, safety, and welfare of all people.

[http://www.cityofsouthlake.com/SouthlakeGovernment/City\\_Departments/Planning\\_and\\_Development\\_Services/OrdinancesandGuidelines/ordinances\\_guidelines.asp](http://www.cityofsouthlake.com/SouthlakeGovernment/City_Departments/Planning_and_Development_Services/OrdinancesandGuidelines/ordinances_guidelines.asp)

[http://www.cityofsouthlake.com/SouthlakeGovernment/City\\_Departments/Planning\\_and\\_Development\\_Services/OrdinancesandGuidelines/CodesandGuidelines/Building\\_Codes.asp](http://www.cityofsouthlake.com/SouthlakeGovernment/City_Departments/Planning_and_Development_Services/OrdinancesandGuidelines/CodesandGuidelines/Building_Codes.asp)

This first website provides a wide variety of codes and guidelines that are required for Southlake. The second website focuses more on building codes. These codes can get very confusing and very technical.

Building plans must be approved as meeting building code before a permit will be granted. A contractor must have a permit to begin construction. While we will look at only a few items, in real life all parts of the building must be reviewed and approved.

Presentation of plans is extremely important as an inspector must be able to read the plans, understand them, and consider them professional before they will be approved.

Today you will complete an inspection record for plans that have several problems with them. Your job is to determine which parts are good and which are bad.

For your final project, I will be a building inspector of your home. Your home must meet all building codes, neatness criteria, and livability issues to earn a high grade.

**Note: The IBC section 1210.5 says: "Toilet rooms shall not open directly into rooms used for preparation of food for service to the public." This requirement does not apply to new single family homes.** However, we will still apply this rule to our homes.

**Official code may allow for only one exterior door and only one exterior door of 3 feet.** We will go with the stricter code of two exterior doors.

**Closets do not have any official code, but a 2'-6" minimum is probably better than 2'.** However, we will continue to use a 2' minimum depth.

**BUILDING CODES**

No bathrooms may open to the kitchen.	Exterior doors must be at least 3 feet wide.
There must be at least two entrances to the house.	Closets must be at least 2 feet front to rear.
The toilet must have 8 inches of free space on each side and 24 inches of free space in front of it.	Bedrooms must have at least one window 3 feet by 4 feet or larger as a fire escape.
The following rooms must have a window: living room, dining room, all bedrooms, master bathroom.	Interior doors, except for closets, and openings should be at least 2 feet 6 inches wide.
No spot on the interior wall may be farther than 6 feet from an electrical outlet, and any wall greater than 2 feet in length needs an electrical outlet. (Thus outlets should never be more than 12 feet apart.) Code requires only one outlet in the bathroom.	

**INSPECTION RECORD**

Architect: \_\_\_\_\_ Building Inspector(s): \_\_\_\_\_

<i>Compute the square footage and cost.</i>				
Total house area (no garage, include all calculations in binder):	x	Median cost per sq. ft. \$125	=	Total cost of construction:

**COMMENTS**

Check the home for all building codes. Report any violations in the comment section.	
Check the home for areas that have measurements listed (doors, windows, etc.). Using the correct scale or your measuring triangle, report any measurements that are incorrect.	
The drawing should be neat and not crowded. Writing should be legible. Lines should be straight.	
All dimensions of doors, windows, and rooms are shown.	
Outlets, lights, and switches are drawn as needed with the appropriate symbols and sizes.	
All room names are labeled and are spelled correctly.	
All doors have room to open and close correctly.	
There should be no extra or dead-end hallways. Movement between the rooms is easy and reasonable.	
Rooms, doors, windows, closets, and counters are the appropriate sizes. Closet space is adequate.	

**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**

**BUILDING CODES**

No bathrooms may open to the kitchen.	Exterior doors must be at least 3 feet wide.
There must be at least two entrances to the house.	Closets must be at least 2 feet front to rear.
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**INSPECTION RECORD**

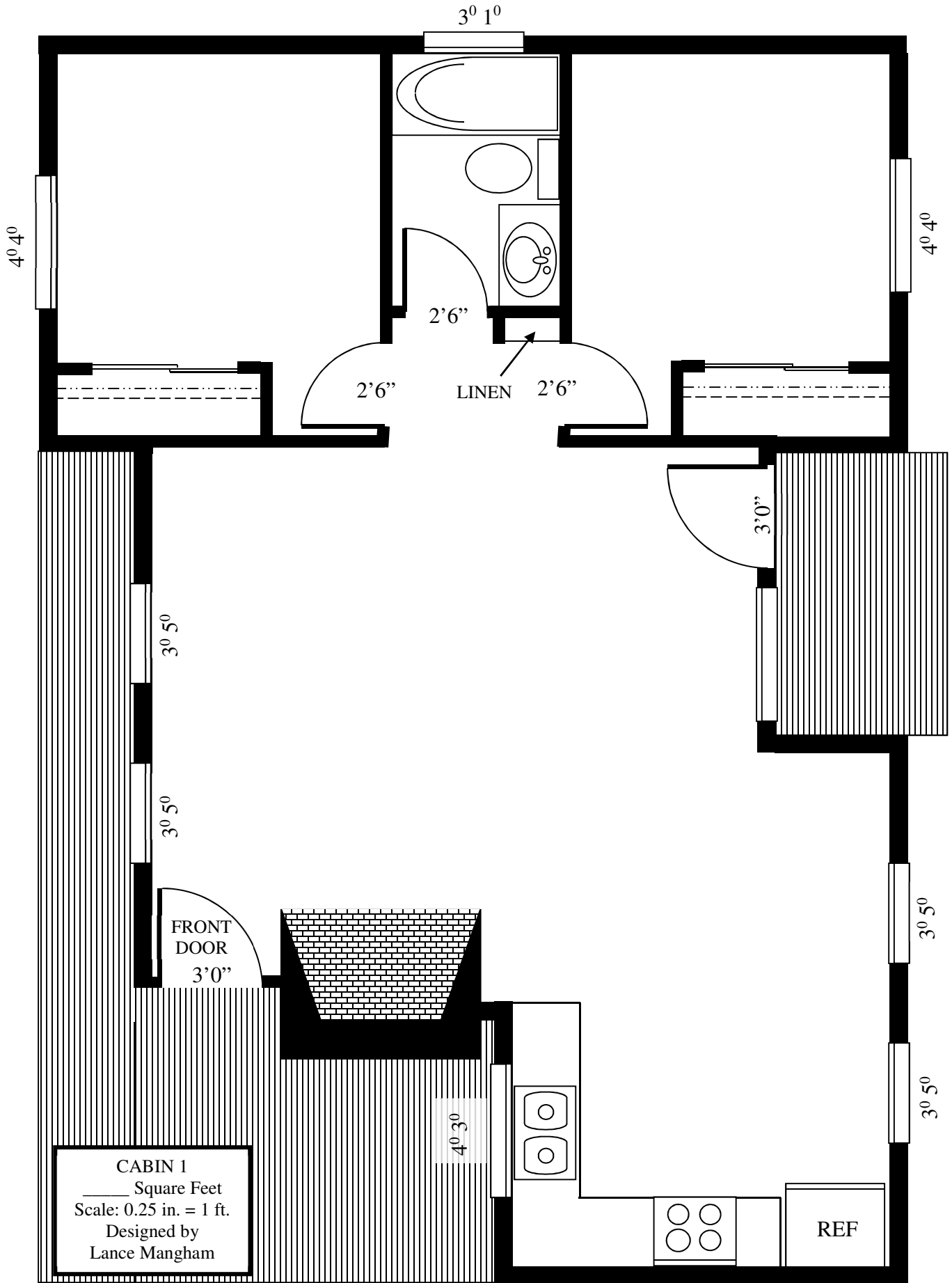
**Architect:** \_\_\_\_\_ **Building Inspector(s):** \_\_\_\_\_

<i>Compute the square footage and cost.</i>				
Total House Area (no garage, include all calculations in binder):	x	Median cost per sq. ft.  \$125	=	Total cost of construction:

**COMMENTS**

Check the home for all building codes. Report any violations in the comment section.	
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Rooms, doors, windows, closets, and counters are the appropriate sizes. Closet space is adequate.	

**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**



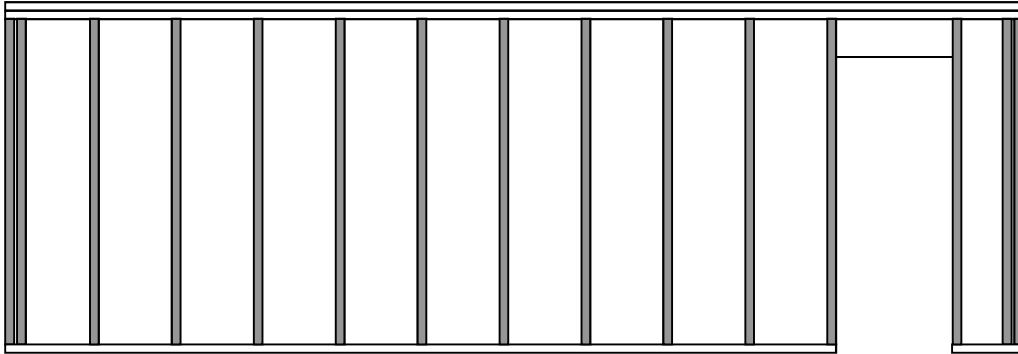
**CABIN 1**  
 \_\_\_\_\_ Square Feet  
 Scale: 0.25 in. = 1 ft.  
 Designed by  
 Lance Mangham

Cabin 1 has no electrical outlets, lights, or switches. You are going to determine where these items go.

1. Determine what rooms are in the cabin. You will write the names at the end of this assignment. There are definitely two bedrooms, one bathroom, a kitchen, and a living room. There could be a dining room.
2. Check your symbol page to determine how to draw and the size of lights, switches, and outlets.
3. Dotted lines show which switch operates each light.
4. Overhead Lighting Requirements:
  - Overhead lights should be in all rooms. The main kitchen light should be fluorescent. All others should be standard ceiling lights or fan/lights.
  - Rooms such as the living room and bedrooms, unless exceptionally large, only require one overhead light.
  - The kitchen should have an additional normal lights near the sink and near the stove.
  - An overhead light should be in all hallways, stairways, and porches. Large closets need a light.
  - All overhead lights need to have a switch. The switch should be near the room's entrance (on the wall near the doorknob if there is a door).
  - Long hallways need switches at each end, and they need to be three-way switches, so that the hall light can be turned on or off at either end of the hall.
5. Electrical Outlet Placement:
  - No place on a wall can be farther than six feet from an outlet. This means that one outlet covers 6 feet on each side.
  - Walls 2 feet or less in length do not need an outlet.
  - Code requires only one outlet in the bathroom.
  - No outlet is needed behind a door or in a closet.
  - Outlets cost money, so while you want enough you don't want to go overboard.
  - The refrigerator, washer, and dryer require a special 220-volt outlet.
  - Doors, fireplaces, sliding glass doors, and other obstacles will restrict outlet placement.
  - A couple of outlets should be placed outside.
6. Write the name of the room in small, all-caps near the center of each room. The names should face toward the reader whenever possible.
7. Underneath each room name write the room's dimensions in small numbers. For example, if the width is 10 feet and the length is 12 feet you would write: 10 x 12

What is a 2 by 4? Have you seen a 2 by 4 before? Is it big or small?

Example wall layout with studs shown in gray



A 2 by 4 is a standard size board that is actually 1.5 inches thick by 3.5 inches wide. The board is 92.25 inches tall (about 8 feet). Two by fours are the most commonly used boards. When used to build walls they are also called studs.

For exterior walls two by six studs are more typically used. A contractor estimates that an average wall requires one stud per linear foot (each stud is usually spaced about 16 inches apart, but there will be extras in places). Thus a 20 foot wall requires about twenty studs.

Calculate the number of studs needed to build the walls of Cabin 1. Studs are needed for all walls, including places where there are windows and doors. Determine how many studs are for exterior walls and how many are for interior walls. Include your scratch work in your portfolio.

Remember to use the rule of thumb that one linear foot required one stud.

Exterior Wall Studs	Interior Wall Studs	Total Studs

**EXPENSE ESTIMATES**

				<b>COST</b> (nearest dollar)
4.	Exterior Walls*	\$140.00 per linear foot	140 • Exterior Studs	
5.	Interior Walls	\$35.00 per linear foot	35 • Interior Studs	
6.	Floors	\$9.75 per square foot	9.75 • Cabin Area	
7.	Roof	1.5 times the floor cost	1.5 • Floor Cost	
8.	<b>Total Wall, Floor, and Roof Cost</b>			

**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**

How much area do you lose on each piece of lumber going down to the actual size? Show and include all of your work. Solve all problems using fractions.

Listed Size of Lumber	Listed Area	Actual Size of Lumber	Actual Area (Mixed Number)	Difference in Areas
2 x 2	4 square inches	$1\frac{1}{2}'' \times 1\frac{1}{2}''$		
2 x 4	8 square inches	$1\frac{1}{2}'' \times 3\frac{1}{2}''$		
2 x 6	12 square inches	$1\frac{1}{2}'' \times 5\frac{1}{2}''$		
2 x 8	16 square inches	$1\frac{1}{2}'' \times 7\frac{1}{4}''$		
2 x 10	20 square inches	$1\frac{1}{2}'' \times 9\frac{1}{4}''$		
2 x 12	24 square inches	$1\frac{1}{2}'' \times 11\frac{1}{4}''$		

**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**

Next, you decide to lay down mulch for your yard around Cabin 1. You want to place the mulch in a 3 foot planting bed on right side and the back of your cabin.

13.	Determine how many square feet you are going to need to cover with mulch.	
14.	If you are going to place mulch <b>3 inches</b> deep, what is the volume of mulch are you going to need (cubic feet)?	
15.	Convert your cubic feet to cubic yards. ( $27 \text{ ft}^3 = 1 \text{ yd}^3$ )	
16.	Bulk mulch averages \$33 per cubic yard. $y = 33x$ What would be the total cost of mulch?	
17.	If you decide to have a 6 foot planting bed instead of 3 feet will you need double the amount of mulch? Explain.	

A contractor must make an accurate estimate of the floor covering needed in a house. Flooring may consist of vinyl, tile, carpeting, or hardwood flooring. For cabin 1 the flooring is listed in the table. Note that flooring will not be needed where the bathtub, toilet, sink, cabinets, etc. are located.

**You may use a calculator for this page.**

**Important Note: A square yard is equal to 9 square feet (3 feet by 3 feet).**

**Flooring Cost Estimate for Cabin 1**

Room	Measurements		Area (sq. ft.)	Material	Cost per Unit	Total Cost (nearest \$)
	Length	Width				
Living Area	13 ft	18 ft		Carpet	\$26.50 / <i>square yard</i>	
Kitchen	13 ft	10 ft		Vinyl	\$3.00 / square foot	
Bathroom	5 ft	3 ft		Tile	\$4.00 / square foot	
Bedroom 1	12 ft	10 ft		Carpet	\$26.50 / <i>square yard</i>	
Bedroom 2	12 ft	10 ft		Carpet	\$26.50 / <i>square yard</i>	
Hallway	3 ft	5 ft		Carpet	\$26.50 / <i>square yard</i>	
<b>*** Total for all flooring ***</b>						

How many sheets of plywood would need to be bought if the entire cabin floor was instead made of plywood? Plywood is 4 feet by 8 feet.

A builder must be able to communicate the size of windows needed. Windows are assigned a code number that corresponds to the size of the window. A window that reads 2846 would be 2 feet 8 inches across and 4 feet 6 inches high. The 2846 window is called a two eight, four six.

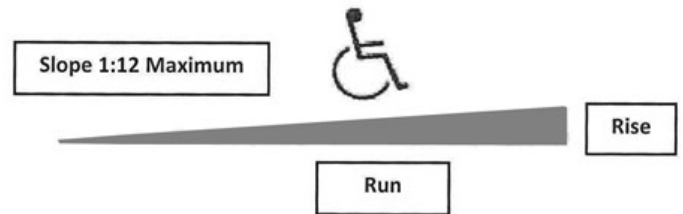
**Window Perimeters and Areas**

Window Code	Window Width	Window Height	Width in inches	Height in inches	Perimeter in inches	Area in square inches
2846	2'8"	4'6"	32	54	172	1728
3444						
3852						
4468						
2646						
3268						
8068						



Ramps are inclined surfaces that allow people handling wheeled objects (wheelchairs, carts, strollers) an easier access to a path or a building. A ramp’s slope refers to its steepness. The slope is the ratio of the rise to the run, measured on the line perpendicular to the rise. It can also be displayed as:

$$\text{slope} = \frac{\text{rise}}{\text{run}}$$



The Americans with Disabilities Act (ADA) specifies that any path with a slope greater than 1:20 should be considered a ramp. The ADA accessibility guidelines require that in general the smallest possible slope should be used for any ramp. Ramp slopes of 1:16 to 1:20 are preferable, and no ramp should have a slope greater than 1:12. In addition, as the difficulty in using an incline depends both on its slope and on its length, the maximum rise for any run is 30 inches.

The following formula will be beneficial in some problems:  $\text{total length} = \sqrt{(\text{rise})^2 + (\text{run})^2}$

When applying this formula you may use a calculator and **round to the nearest hundredth**. Still show all other work. Record answers in inches, except for #9 (meters).

1.	You must build a ramp with a rise of 15 inches to roll some lab equipment into your school. If you follow the ADA specifications, what is the horizontal length (the “run”) of the shortest ramp you can build?	
2.	What is the ramp’s total length in the questions above?	
3.	You find out that the equipment is very heavy, so you decide to use an incline that is less steep with a ratio of 1:16. What is the horizontal length (run) of this ramp?	
4.	What is the ramp’s total length in the question above?	
5.	What is the total length of the shortest ramp for the maximum ADA acceptable rise of 30 inches?	
6.	A warehouse uses ramps that are 10 feet long (run) to load its forklifts onto flatbed trucks for handling. If the bed of the truck is 2.5 feet above (rise) the ground, and the ramp is secured to the end of the truck, what is the slope of the ramp?	
7.	In the problem above, would this slope be acceptable for a wheelchair?	
8.	In the problem above, how long should the ramp be to be ADA compliant?	
9.	You are building a skateboard ramp with a piece of plywood that is 8 meters long (run), and you want the height (rise) of the ramp to be 3 meters. What should the total length of the ramp be?	

**TURN IN ALL WORK DIRECTLY BEHIND THIS PAGE**

As you get older you will start earning money and paying taxes. Among the three major taxes that many people pay are income taxes, sales taxes, and property taxes.

An **income tax** is a percent of earnings paid to federal, state, or local governments.

A **sales tax** is a percent of the cost of a purchase.

A **property tax** is the percent of the value of the property owned.

1.	Suppose a family earns total wages of \$800 a week and pays state income taxes of 5% on annual earnings. How much will the family pay as state income tax per year?	
2.	Suppose the local government taxes income at 1%. How much additional money will the family pay in taxes to the local government each year?	
3.	What amount of money each week is left after taxes above are paid?	

In addition to income tax people pay Social Security tax, which is 6.2% of earnings up to \$113,700. In addition to income tax people pay Medicare tax, which is 1.45% on all income.

4.	If you had a taxable income of \$54,000 a year and you pay 22% of your income in federal taxes, how much federal tax would you pay?	
5.	You have a taxable income of \$400 each week and you pay 14% of your income in federal taxes. How much would your taxable income (income before taxes) be in one year? How much federal income tax would be withheld?	
6.	If you have a taxable income of \$49,000 a year and you pay 18% of your income in federal taxes, what would be your income after federal tax?	
7.	The money that is left after taxes are withheld is called <b>take-home pay</b> . Calculate the income taxes, Social Security taxes, and Medicare taxes you would pay on a taxable income of \$49,000. What is your take-home pay?	

8.	You buy a llama for a sale price of \$150. If there is 8% sales tax added to the price, what is the total price of the llama?	
9.	You buy a unicorn for a sale price of \$720. If there is a 6% sales tax added to the price, what is the amount of tax added?	
10.	A narwhal is originally priced at \$400, but Discount Narwhals decided to pass along a 35% price increase to the customer. What is the new price?	
11.	Fluffy neon hopping bunnies are originally \$40 each. Then they go on sale a 22% off. You decide to buy two. There is a 22% sales tax on all bunnies. What is your total price, including tax? (nearest cent)	

The Swift family is examining their personal finances to determine if they can afford to purchase a home. The Swift family has a current monthly net income of \$3185. The Swift family’s monthly expenses are shown below.

Rent \$900	Entertainment \$200	Car insurance \$120
Clothes \$120	Emergency savings \$100	Electricity \$122
Car payment \$240	Restaurants \$175	Retirement savings \$150
Car expenses/maintenance \$170	Cell phones \$89	Home Utilities (Water/Gas) \$52
Groceries \$275	Miscellaneous \$72	

Complete the personal budget for the Swift family in the table below and find the percentage of monthly income going to each category. **You may use a calculator on this page.** Round percentages to the nearest whole percent.

<b>Swift Family Monthly Budget</b>		
Monthly Net Income		
<b>Expenses</b>	<b>Cost</b>	<b>Percentage of Monthly Net Income</b>
Housing		
Food		
Utilities (Electric, Water, Gas)		
Savings		
Transportation		
Other		
Total Expenses		

1.	Does the Swift family spend more than they make? Explain.			
2.	What percent of the family’s net income is housing currently?			
3.	What percent of the family’s net income is transportation?			
4.	Assuming all other costs remain the same, will the Swift family be able to afford a monthly house payment of \$1000? \$1200? \$1400?			
5.	Calculate the exact amount the family can afford to spend on housing and still break even each month.			
6.	Based on the number calculated in the question above, what percent of the net income would be spent on housing?			
7.	Fixed expenses are those that remain the same each month. Give two examples of expenses that fixed.			
8.	Variable expenses are those expenses that vary from month to month. Give two examples of expenses that vary from month to month.			

The Bieber family is trying to determine their net worth. Net worth is equal to your assets (things you own) minus your liability (things you owe). **Monthly expenses such as utility bills or paying for piano practice are neither an asset nor a liability.**

Use the data below to determine the net worth of the Bieber family. The family has one working parent, a stay-at-home parent and three children. Two of the children are in elementary school and the youngest child is in pre-Kindergarten. They have a house, a car, a mini-van, and carry some credit card debt.

The house is valued at \$123,000 with a mortgage balance of \$80,000.
The car is worth \$15,000 and the mini-van is worth \$20,000. They owe a total of \$31,000 on the vehicles.
The family has \$4500 in brand new household furniture, but they took out a \$4,500 loan to pay for it.
They have \$15,000 in their retirement account.
They have \$1,500 in emergency savings, \$1,000 in savings, \$500 in checking, and \$1500 in a CD (a type of saving account).
They have \$300 in cash.
Their balances on credit cards total \$15,000.
The family pay \$500 per month for school loans; the current balance is \$25,000.
The family pays \$350 a month for pre-K tuition and \$100 a month for each child as they are all on soccer teams.

<b>Net Worth Worksheet for the Bieber Family</b>			
<b>Assets</b>		<b>Liabilities</b>	
All bank accounts		Home mortgage	
Retirement accounts		Auto loan(s)	
Cash		Credit card(s)	
Value of home		Student loan(s)	
Value of auto(s)		Other loan(s)	
Value of furniture/household items		<b>TOTAL LIABILITIES</b>	
Value of jewelry/art/etc.			
<b>TOTAL ASSETS</b>			
<b>NET WORTH =</b>			

1.	Which items did not count as an asset or a liability?	
2.	Does this family have a positive or negative net worth?	
3.	Determine three suggestions for this family to increase their net worth.	

Many families in the United States are saving at this very moment to buy a home. Paying 20% of the cost of the home as a down payment is a smart financial decision. However, it often takes a long period of time to save up enough money to make that down payment.

Look at the families listed below. Each is earning interest on their savings. Complete the rest of the table. **You may use a calculator for calculations on this page.**

<b>Simple Interest</b>	$I = prt$	<b>Compound Interest</b>	$A = P(1 + r)^t$
Remember $I$ is the amount of interest		Remember $A$ is the total amount (principal + interest)	

		<b>Type of interest</b>	<b>Interest Earnings</b>	<b>Total \$</b>
			<i>nearest dollar</i>	<i>nearest dollar</i>
1.	<b>Adams family:</b> \$16000 at 5% for 5 years	Simple		
2.	<b>Bruns family:</b> \$14000 at 3% for 12 years	Simple		
3.	<b>Cobb family:</b> \$15000 at 4% for 10 years	Simple		
4.	<b>Daly family:</b> \$17000 at 7% for 4 years	Simple		
5.	<b>Edmond family:</b> \$11000 at 5% for 13 years	Compound		
6.	<b>Farmer family:</b> \$13000 at 3% for 10 years	Compound		
7.	<b>Grizwold family:</b> \$12000 at 6% for 8 years	Compound		
8.	<b>Hayes family:</b> \$10000 at 10% for 8 years	Compound		

9.	Each family above wishes to purchase a \$200,000 home. If they all have \$20,000 savings plus the total amount from above, which families will be able to afford a 20% down payment on their new homes?	
10.	Mary and Macey each invest \$100 at an interest rate of 5% for 8 years. Mary's is simple interest and Macey's is compound interest. Which person will have the most money at the end of 8 years? Why?	
11.	$A = 800(1 + 0.03)^{2.5}$ In the compound interest formula above, what does 800 represent?	
12.	In the problem above, what does 0.03 represent?	
13.	In the problem above, what does 2.5 represent?	

**Your Client (Home Buyer)**

- A famous athlete, his wife, and their two children ages 5 and 11
- Needs: Spaces to cook, eat, wash, relax, and sleep
- The family likes some green space where they can garden, play, or just enjoy the outdoors.
- Your client often has teammates over to visit, so he will need a large space to entertain guests.
- Your client’s wife is a financial planner and she needs a study area when working from home.
- Your client will also need a space to train and work out.

**Requirements for Final Project Design**

**Single Story House**

**Required Rooms**  
 Kitchen  
 Dining Room  
 Living/Family Room  
 3 Bedrooms  
 2 Full Bathrooms  
 1 Half Bathroom

**Required Spaces**  
 A place to work from home  
 A place to train/work out

**Required Closet Spaces**  
 Pantry  
 Linen Closet  
 Front Coat Closet  
 Bedroom Closets

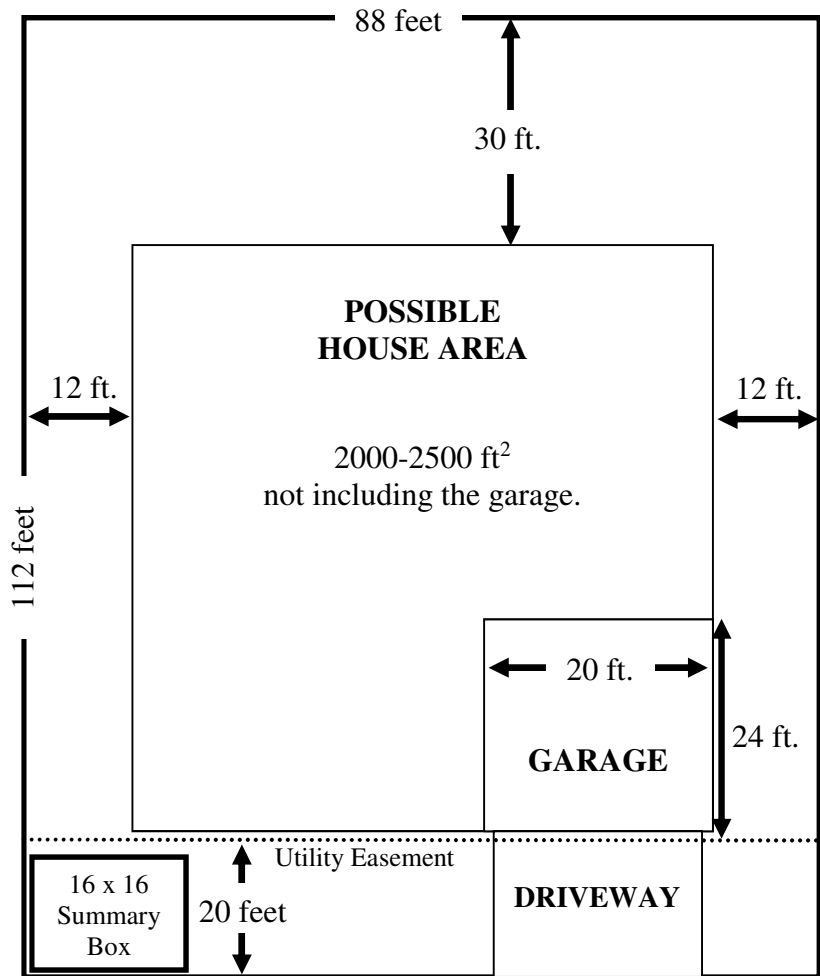
**Required Extras**  
 Hot Water Heater  
 Washer  
 Dryer

**BUDGET = \$375,000**

Cost of the land = \$20,000  
 Cost of house = \$125 / square foot  
 Cost of garage = Half of the rest of the house

**BUILDING SITE PLAN**

This plan show where you can build your house.



## ARCHITECTURE JOBS

*Each team member should be the lead in one of the following three categories.*

	<b>Lead</b>	<b>Back-Up</b>
<b>Architect</b> – Assumes the main role for drawing all house items on the graph paper. This person needs to be neat and precise. They must also listen to the inspector and contractor to make sure they follow the rules.		
<b>Project Manager</b> – Assumes the main role for making sure all rules on these pages are followed at all times. This person must be able to remind his or her teammates of the rules and implement all guidelines.		
<b>Contractor</b> – Assumes the main role of making sure room sizes are within range, completes the main inside cost page, and ensures that the team is staying under budget. This person must work with his or her teammates on designing rooms and features that meet cost guidelines.		

*Each team member should be the lead in one of the following three categories.*

*The lead architect should **not** be the lead landscape designer.*

<b>Landscape Designer</b> – Assumes the main role for drawing and coloring all outside items on the graph paper such as pools, trees, walkways, fences, and playgrounds.		
<b>Real Estate Agent</b> – Designs the home listing to sell your house. This role includes both math related items and the ability to write an informative, descriptive paragraph about your house.		
<b>Graphics Designer</b> – Designs the logo representing your company. This person must be good at art, have a creative mind, and be able to come up with a professional looking final product.		

*Each team member should be the lead in one of the following three categories.*

<b>The Public Opinion</b> – This person will visit other groups at specific times and give feedback on their designs. The public opinion should stay respectful but give helpful feedback to each group. In addition, this person will be able to come back and share ideas with their team.		
<b>The Enforcer</b> – This person will make sure the team is keeping on track and hitting deadlines throughout the project. This person will coordinate when their team needs to come in to catch-up.		
<b>The Encourager</b> – This person makes sure group rapport is positive. The person makes suggestions when a time-outs might be needed to gather thoughts and finds ways to turn problems into opportunities.		

# PROJECT MANAGER CHECKLIST

- You may use a calculator at all times during the final project.
- Your goal is to have a professional looking final product.
- Use rulers or templates to draw everything.
- Have out Architecture 9: Architecture Final Project at all times for guidance


## **Create a Bubble Diagram Layout/Rough Copy**

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- See Bubble Diagram Checklist page for suggestions/requirements
- Read Bad Home Layouts page
- Get teacher approval and then pick up \$20,000 poster board

## **Determine parts of poster board where you may not draw the house**

---

- See Architecture 9 page for basic layout requirements
- Have the graph paper crease toward the back of your land
- Lightly draw four corners  to indicate the area in which your house can be built

## **Draw Summary Box, driveway and garage**

---

- Your summary box is 16 by 16 and will be drawn two small squares over and up from the front left or right corner (in the front yard).
- Try not to draw your house right on the edge as that does not leave room for wall thickness
- Your driveway, at least 14 feet wide, should be on the left or right side at the front
- Your garage must be the standard size listed on Architecture 9

## **Draw all other rooms**

*[End of Day 1: A few rooms have been drawn]*

---

- A room's longest dimension should not be more than twice the other dimension (not closets)
- Start with rooms close to the garage and connect each new room to an existing room.
- Review minimum and maximum room sizes listed on Final Project Inside Calculations page
- Draw lightly so that if you erase it won't leave much of a mark
- If you must, write names lightly in the corner to keep track of rooms.
- Make at least one front or back room "interesting" - not all right angles.
- BC:** No bathrooms may open to the kitchen.
- BC:** There must be at least two entrances to the house.
- BC:** The following rooms must have a window: living, dining, all bedrooms, master bathroom
- BC:** Closets must be at least 2 feet front to rear.
- Front door faces towards the front (street) and back door faces towards the back.
- All bedrooms are near bathrooms.



- See Architecture 9 for required closet spaces
- Minimize hall space – Hall space is a waste of money that could be spent on rooms.
- Any halls you do have should be 3 or 4 feet wide after wall thickness.
- Complete the Final Project Inside Calculations and verify house area is within range.

**Draw doors and eliminate walls**

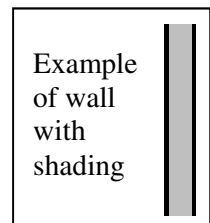
[End of Day 2]

- Eliminate walls that are not necessary between rooms (kitchen, dining, living areas)
- BC:** Exterior doors must be at least 3 feet wide
- BC:** Interior doors, except for closets, and openings should be at least 2 feet 6 inches wide.
- Front door and back doors also opens **into** the house
- Most doors open **into** the room in which you are going, except for closets and small rooms
- No doors to get between the kitchen, living room, dining room (just openings)
- Door dimensions should face toward the front yard

**Draw wall thickness and windows – check examples**

[End of Day 3]

- Draw the windows before drawing the wall thickness
- BC:** Bedrooms must have at least one window 3 feet by 4 feet or larger.
- All walls = 6 inches thick
- Total window area must be 8-15% of the area of the house.
- Window dimensions should not face toward the back yard



**At this time you may begin drawing your landscape if you have an approved bubble diagram.**

**Draw sinks, toilets, washer, dryer, kitchen appliances, etc.**

[End of Day 4]

- See Kitchen Design Checklist page on how to place objects in the kitchen
- BC:** The toilet must have 8 inches of space on each side and 24 inches of space in front of it.
- All items have specific sizes – if you are not sure of the size ask your teacher
- Hot water heater in the garage = 24” circle (can be in a garage closet or not)
- Fireplaces, if you want one, should be included in a common area such as the living room.

**Draw outlets, lights, switches, etc.**

[End of Day 5]

- BC:** See Electrical Outlet Checklist page
- EC:** Follow all electrical contractor rules (Architecture 7A) for outlets, lights, and switches
- Lights are circles on the templates (use “8” circle)
- Outlet circle size is shown on the main template
- Fluorescent lights go in the garage and kitchen and they are 4 feet long
- The refrigerator, washer, dryer require special outlets 220V outlets
- The vast majority of rooms will only require one overhead light/fan.

**Write names and list dimensions on all rooms**

[End of Day 6]

- All room names should face toward the street (small rooms may be written vertically)
- All room names written neatly, in capital letters, and be one square high
- One person should write all room names so that they look similar
- List the width (across) first, then the length (up and down)
- Example: 16 x 20 or 16<sup>0</sup> x 20<sup>0</sup>
- For “not perfect” rectangles, use the dimensions listed on your Inside Calculations page

**Improve erasures, correct rips and tears, look professional**

**Complete summary box (see example)**

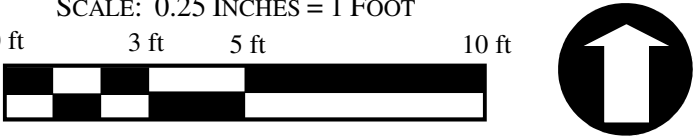
[End of Day 7]

- All capital letters and all neat
- See example to the right.
- Street Address
- Company name and architects
- Bedrooms / Bathrooms
- Living area = Area of the house without the garage.
- Garage Area
- Total Area
- Final Price = Total Inside Cost + Total Outside Cost
- Scale / Scale Visual
- The north symbol points in the direction you choose. Think which rooms will get sunlight at different times during the day.

<b>101 DRAGON DRIVE</b>	
MODERN DESIGN ARCHITECTS INCORPORATED SARAH NICHOLS, MAEGHAN MCFARLAND, EMMA SMITH	
BEDROOMS:	4
BATHROOMS:	3.5
LIVING AREA:	2,100 FT <sup>2</sup>
GARAGE AREA:	480 FT <sup>2</sup>
TOTAL AREA:	2,580 FT <sup>2</sup>
FINAL PRICE:	\$329,000

SCALE: 0.25 INCHES = 1 FOOT

0 ft      3 ft      5 ft      10 ft



**Complete recording sheets, organize, and order**

[End of Day 8]

**All recording sheets should be completed in a neat and professional manner.**

- Write the company name at the bottom of your logo page
- Company logo: Slide it in the front cover of your portfolio
- Tape your chance card to the inside front cover of your portfolio
- Home Listing page and place as your first page in your final portfolio
- Next, inside area and cost calculations, then outside calculations
- Next, mortgage calculations, then energy/flooring/paint heating calculations
- Next, landscape design recording page, then company logo recording page
- Next, your jobs page and then this project manager checklist
- Next, your electrical outlet checklist and, finally, your kitchen design checklist

[End of Project]

**BUBBLE DIAGRAM CHECKLIST**

Think of your home as divided up into 3 separate areas: **SLEEP, LIVE, WORK**

**Live:** living, dining, family

**Work:** kitchen, pantry, workshop, study, half bath

**Sleep:** bedrooms, bath, storage, halls, utility

Think about what rooms you will see when you look at your house from each side.

What rooms do you see from the front, back, and sides of your house?

Which rooms can be in the middle because they don't need windows?

<input type="checkbox"/> Kitchen	No window required	Can be located anywhere*
<input type="checkbox"/> Dining Room	Window required	Often in the front
<input type="checkbox"/> Living Room	Window required	Often in the back
<input type="checkbox"/> Master Bedroom	Window required	Must be in the back
<input type="checkbox"/> Bedroom #2 and #3	Window required	Often in the back
<input type="checkbox"/> Master Bathroom	Window required	Back or side
<input type="checkbox"/> Other Bathrooms	No window required	Can be located anywhere

\* Kitchen is often connected to a Nook or Breakfast Area which contains a window

The kitchen, dining room, and living room need to be located close to each other. They often make a triangle. One needs to be able to go from the living room to the dining room without going through the kitchen.

- Laundry room
- Coat closet near front door
- Linen closet near a bedroom
- Pantry near kitchen
- Closets for all bedrooms
- At least one half bathroom
- Foyer
- When I am standing in the foyer and look straight ahead I see \_\_\_\_\_
- Front door in the front and back door in the back
- Garage in the front
- Place to study, Place to entertain, Place to train/workout

# **Bad Home Layouts: How You Can Avoid Building a Home with a Bad Layout Design**

**Common Bad Layout Designs** - Here are a few of the common complaints we hear from buyers.

- **Hallway Facing the Entrance**  
Entrances are important because an entrance forms a first impression. Buyers make up their minds within 6 seconds of entering a home. It might not be a conscious decision, but buyers either feel good or feel bad walking in the door. Long, narrow, dark hallways are a huge turnoff, especially near the entryway.
- **Dining Room in the Center**  
In this type of layout, upon entering the home, you walk through the living room into the dining room. To get to the kitchen, family room or bedrooms, one must walk through the dining room because all rooms are connected through multiple entrances to the dining room.
- **Bedrooms Located Directly Off the Living Room / Dining Room**  
It is undesirable to locate a bedroom door directly leading from a room where family members or guests gather. Apart from the noise factor, it reduces privacy as well. Nobody wants to look at a bed while dining. Most people want to dine, entertain family in the family room or greet visitors in the living room without a view of the bedroom.
- **Poorly Located Guest Bathroom**  
The only thing worse than staring down a long hallway upon entering a home is capturing a full view of a toilet at the end of it. Closing the door to the bathroom is unattractive and uninviting, so that's not a practical solution. A main-floor or guest bathroom, which is accessible only by walking through a utility / laundry room or bedroom, is unappealing as well.
- **No Views From One Room to Another**  
Even if your home is small, as long as one can see several other rooms from a central spot, it will make the home appear larger. Multiple doorways or arches to main meeting areas help to accomplish this purpose. Open spaces create a feeling of spaciousness. Opening the kitchen to the living / family areas is popular.
- **Satellite Living Rooms**  
This type of layout generally places the living room off to one side of the entrance, and it connects to no other room but the entrance. In new home construction, the trend is moving away from building homes with living rooms and replacing those areas with great rooms or expanded family rooms.

What extras do Americans want most in the homes?

- 59% say a backyard deck
- 47% want a gourmet kitchen
- 46% want an open floor plan
- 45% say a balcony with a view
- 40% want a vegetable garden
- 38% say a swimming pool

**ELECTRICAL OUTLET CHECKLIST**

(Based on common building codes)

**Most Rooms** (*expect ones listed below*)

- Interior walls 2 feet or less do not need electrical outlets.
- Interior walls between 2 and 12 feet need one electrical outlet.
- Interior walls between 12 and 24 feet need two electrical outlets, and so on.

**Bathrooms**

- At least one electrical outlet shall be installed in bathrooms and it should be located within 36 inches of the sink. The outlet should be placed on a wall that is adjacent to the sink.

**Laundry areas**

- One 220V outlet is needed for the washer and one is needed for the dryer.

**Garages**

- At least one electrical outlet shall be installed in each attached garage.

**Hallways**

- Hallways of 10 feet or more in length shall have at least one electrical outlet. The hall length shall be considered the length measured along the center of the hall without passing through a doorway.

**Closets**

- No outlets are needed in closets.

**Outside**

- At least one electrical outlet shall be installed outdoors at the front and back of each house.

### KITCHEN DESIGN CHECKLIST

The design of your kitchen is based on the three most important items in the kitchen:

#### Refrigerator, Sink, and Stove

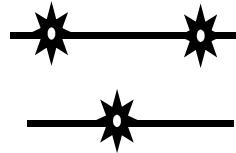
These three form the “work triangle” and set the foundation for designing your kitchen. Here are the three most common examples of how to set your kitchen up.

A U-shaped kitchen with the sink in the middle and the refrigerator and stove on opposite sides.



An L-shaped kitchen has two of the three on the same wall and one on a second wall.

A parallel kitchen has two counters opposite each other.



Kitchen Design (pick one):

U-Shape

L-Shape

Parallel

All counter space is 2 feet deep (from front to back).

Sink: 2 feet of work area on both sides of the sink.

Range/Stove: 1.5 feet of work area on at least one side of the stove and 3.5 feet of open space in front of the stove.

Refrigerator: 1.25 feet of counter space on an open side.  
One 220V outlet is needed for the refrigerator.

Dishwasher: 3.5 feet of open space in front of the dishwasher.

A pantry is for storage off of the kitchen.

Be sure to include plenty of counter space in the kitchen.

## DESIGNING YOUR LANDSCAPE

The area around your home is an important part of your living environment. Landscaping can increase property value, invite wildlife into your yard, and conserve energy. Today, more people want their home landscape to meet functional and social needs.

### **Step 1: Landscape Style Options. You will choose one.**

1. *Geometric-Structural*: Geometric structure is primary and plants play a minor role. Straight lines for walks, driveways, and planting beds are typically used.
2. *Geometric-Natural*: Structure dominates, but plants and other natural elements play an important – perhaps nearly equal role. Straight lines and more formal curves often define landscape features.
3. *Natural-Structural*: Plants, rocks, water, and earth forms dominate, but there is a clear sense of geometric arrangement. Naturally flowing, curved lines are used to soften the transition from one area to another.
4. *Natural*: Natural elements and materials dominate, and there is no obvious human-determined form or structure. Elements in the landscape flow naturally into each other with few or no clearly defined lines.

### **Step 2: Review the Landscape Checklist on the next page**

**Step 3: Determine a budget** - Approximate how much you will be able to spend on your landscape

### **Step 4: Identify home landscape use areas**

- **Public Area**: This is most often the front yard and is the area the public sees from the street. The main purpose is to frame the house and create a visually appealing and inviting landscape. An attractive entryway or walkway to the house is a primary feature.
- **Private or Family Area**: The private area is often the backyard and sometimes the side yards. There should be easy access from the house to the outdoor space and features such as outdoor furniture and lighting should be considered.

### **Step 5: Sketch a landscape bubble diagram and receive teacher approval**

### **Step 6: Complete Landscape Checklist, Draw your final plan, and Outside Cost page**

**LANDSCAPE CHECKLIST****LANDSCAPE STYLE OPTIONS (pick one)**

\_\_\_\_\_ Geometric-Structural    \_\_\_\_\_ Geometric-Natural    \_\_\_\_\_ Natural-Structural    \_\_\_\_\_ Natural

**YARD USE**

Who will use the yard?    \_\_\_\_\_ Adults    \_\_\_\_\_ Children    \_\_\_\_\_ Elderly    \_\_\_\_\_ Pets

**OUTDOOR STRUCTURES**

What outdoor structures/features would you like to add? See Final Project Outside Calculations for a full list.

**STORAGE**

What items need storage space?    \_\_\_\_\_ Garden equipment    \_\_\_\_\_ Garbage cans    \_\_\_\_\_ Bicycles  
\_\_\_\_\_ Outdoor toys    \_\_\_\_\_ Sports equipment    \_\_\_\_\_ Lawn furniture

**COLOR**

List colors that you think will work well with your landscape: \_\_\_\_\_

- All items drawn using templates, when available, or very neatly
- Shapes should include circular and curving arcs to appeal to the buyer.
- Pools are not allowed within 10 feet of the house.
- Pools require a fence with a gate on both sides of your house.

To demonstrate geometric attributes there should be well thought out examples of the following:

- There should be something outside that demonstrates **symmetry**.
  - There should be something outside that demonstrates a **reflection**.
  - There should be something outside that demonstrates a **rotation**.
  - There should be something outside that demonstrates a **dilation**.
  - There should be at least one **circular** object (other than trees) in your yard.
- 
- A walkway/pathway should connect your driveway to the front door.
  - At the end you might want to come back and add a bird's eye view of a car in the driveway.
  - Side fences need a gate that is 3 feet wide.
  - Pathways may be 2 to 5 feet wide.
  - There should be at least 2 large trees (8 ft or more diameter canopy).
  - Write the name on all outside features that are not obvious.
  - You do not need to write dimensions of outside objects.



House \$:	G+L \$: \$50k	Outside \$:	Total \$	U/O Budget
-----------	---------------	-------------	----------	------------

Final House Design (Livability, Mathematical Accuracy)			50 points		
Rooms	Kit Din Liv	3Bed MBath FBath HBath	Foyer Work Train		
Windows	Din Liv	3 Bed MBath			
Closets	Pantry Linen	Coat Bed			
Correct	Symbols	Sizes			
Codes	Bath-Kitch 2 Entrances	Closet-2ft. BWin-3x4			
Various	Flow (K-D-L)	Driveway & Garage	Doors		
Various	Unique room	# of Lights	Bed near Bath		
Kitchen	Frig Sink DW Range	Counter	Lights (Sink/Stove)		
Lights	Fluor – Kit Gar	Size	Switches		
Outlets	Frig Wash Dryer	Outlet BC-12ft	Size		
Bath	Sink Tub Toilet	Toilet BC 8/24			
Doors	No – Kit Liv Dine	Yes – Bed Bath	E-3ft I-2.5ft Into House		
Halls/Walls	3-4 ft halls	6in walls			
Other	No 2x dim room	House in build area	HWH		

Professional Final Product & Summary Scale Box			20 points		
Professional	Rulers Templates	Lettering	Names to reader		
Professional	Rips Eraser Smears	Neatness	Spelling		
Various	Win/Door Dim listed	Wall shading	Room names & sizes		
Summary	Scale Company Names	Rooms Area Price	Address		

Indoor, Outdoor, and All Cost Calculations					30 points	
Indoor	Area Percent Cost Totals	Min/max sizes				
Outdoor	Size Cost Totals					Neat, professional
Mortgage	Mortgage Insurance Tax PITI Income					
Energy/Heating	Energy Flooring Paint Heating					

<b>Landscape Design</b>			<b>100 points</b>
Professional, Interesting structures	Flows well/walkway from driveway to front door	Not too many items/Drawn to scale	Coloring is neat and enhances the landscape
Correct symbols used/items labeled	Big trees	Well explained on recording page	Pools 10+ ft. from the house
Symmetry	Reflection	Rotation	Dilation

<b>Home Flyer</b>			<b>100 points</b>
Address shown/Dimensions shown	Professional sounding	Year correct	Calculations and all numbers correct
Interesting, informative paragraph	Professional photo	Company history	

<b>Team Logo</b>				<b>100 points</b>
Architecture/geometric concepts	Neat	Professional	Appropriate use of color	Well explained on description page
Slogan	Meaning of color	Unique/memorable		

For rooms that are not rectangles, place an X in the column. For width and length, measure the majority of the room. Calculate the exact area of the room (it will not be the listed width times the listed length). For the percentage of house area, round to the nearest tenth of a percent.

Room name	X	Width ↔	Length ↕	Min-Max Area (ft. <sup>2</sup> )	Our Area (ft. <sup>2</sup> )	% of Total House Area (w/o garage)	Cost \$125/ft <sup>2</sup> (\$)
Kitchen & Pantry				130-280			
Dining Room				140-280			
Living/Family Room				230-460			
Master Bedroom				180-360			
Bedroom #2				110-220			
Bedroom #3				110-220			
Master Bathroom				80-160			
Full Bathroom #2				50-100			
Half Bathroom				20-50			
Office, Study, or Library				80-200			
Game or Media Room				140-320			
Foyer/Entryway				20-100			
Laundry				30-60			
Training/Workout Room				150-350			
Total closet space not included above				-----			
All rooms not listed/included above				-----			
Total hall space				0-150			
<b>HOUSE</b> (w/o garage or land)				2000-2500		100%	
Garage		20 ft.	24 ft.		480		\$30,000
Land		88 ft.	112 ft.		9,856		\$20,000
<b>TOTAL INSIDE COST (House + Garage + Land)</b>							

The following is a list of features that may be included outside of the normal house and garage. The cost of each feature is listed next to each one.

**Linear foot:** Same as a regular foot. Linear means you are **not** talking about square feet.

**Every 10 linear feet:** Means the item is sold in increments of 10.

ITEM	Cost	Typical Dimensions	Our Dimensions Or Area	Cost
<b>LANDSCAPING</b>				
<b>Trees/Bushes</b>	\$3000 (all the trees/bushes you want)		√	<b>\$3,000</b>
<b>Garden (Flower or Vegetable) or Dry Creek Bed</b>	\$10 per square foot			
<b>Pond</b>	\$25 per square foot			
<b>Stone/Brick Path/Walkways</b>	\$1000 per every 10 linear feet Sold in 10 linear feet sets	3 feet wide		
<b>Fencing</b>	\$25 per linear foot (Not needed on property line)			
<b>Hedge</b>	\$15 per foot			
<b>FUN AND GAMES</b>				
<b>Swimming Pool</b>	\$12,000 + \$30 per square foot	Max: 18 ft. by 36 ft.		
<b>Tetherball Court</b>	\$500	10 ft. diameter		
<b>Trampoline</b>	\$500, \$750, \$1000, \$1500	8, 10, 12, or 14 ft. diameter		
<b>Hot Tub</b>	\$160 per square foot + cost of deck (required) around hot tub	Min: 20 sq. ft. Max: 50 sq. ft.		
<b>Horseshoe Court</b>	\$500	6 ft. by 50 ft.		
<b>Mini-Basketball Court</b>	\$10 per square foot	Min: 14 by 18 ft. Max: 25 by 40 ft.		
<b>Mini-Volleyball Court</b>	\$6000	15 ft. by 30 ft.		
<b>Putting Green</b>	\$20 per square foot	Min: 5 by 12 ft. Max: 15 by 30 ft.		
<b>Sandbox</b>	\$10 per square foot	12 ft. by 12 ft.		
<b>DETACHED BUILDINGS</b>				
<b>Utility Shed</b>	\$10,000	10 ft. by 12 ft.		
<b>Trash Can Shed</b>	\$2500	3 ft. by 5 ft.		
<i>more ideas on the back.....</i>				

ITEM	Cost/Dimensions	Typical Dimensions	Our Dimensions Or Area	Cost
<b>ATTACHED TO THE HOUSE</b>				
<b>Wheelchair Ramp</b>	\$300 per linear foot	4 feet wide		
<b>Patio/Deck</b>	\$40 per square foot			
<b>Porch (enclosed with screens)</b>	\$70 per square foot	8 ft. by 14 ft.		
<b>Porch (open)</b>	\$25 per square foot	24 ft. by 16 ft.		
<b>Greenhouse</b>	\$200 per square foot	6 ft. by 10 ft.		
<b>Sunroom</b>	\$250 per square foot	6 ft. by 10 ft.		
<b>LANDSCAPE ACCESSORIES</b>				
<b>Garden Arbor</b>	\$20 per square foot			
<b>Hammock (Trees 15 feet apart)</b>	\$150	10 feet long + 2.5 feet on each side attaching to each tree		
<b>Outdoor Fountain</b>	\$1500 \$4000 \$1500 \$4000	6 ft. by 8 ft. 10 ft. by 13 ft. 7 ft. diameter circle 11 ft. diameter circle		
<b>Benches</b>	\$600 for 3 linear feet \$100 for each additional foot	2 feet wide		
<b>Picnic Table with Chairs</b>	\$1000 for 5 feet \$100 for each additional foot	3 feet wide		
<b>Low-Voltage Lighting</b>	\$2500 for first 4 lights \$750 for additional 4 lights			
<b>Gazebo</b>	\$4000 +\$1000	Circle or Octagon 8 foot diameter +2 foot diameter		
<b>Firepit</b>	\$750	4 ft. diameter		
<b>ADDITIONAL ITEM</b>				
<b>TOTAL OUTSIDE COST</b>				

**Porch:** A porch is a raised platform with a roof that that serves as a covered entrance to a house.

**Patio:** A patio is defined as an area, often paved, adjoining a house and used for lounging. Usually roofless.

**Deck:** A deck is defined as an open, uncovered porch extending from a building. Usually wooden. Usually elevated.

**Landscape Design Recording Page**

1. What was your landscape style (in Step 1 of planning)? What features demonstrate this?

- 
- 
- 

2. How is symmetry demonstrated in your landscape design? Be specific.

3. Where can a rotation be found in your design?

4. Where can a reflection be found in your design?

5. Where can a dilation be found in your design?

## BUYING A HOME - MORTGAGE CALCULATIONS

For all calculations on these pages, **round to the nearest dollar.**

<b>Final Price for Our Home</b> Total Inside Cost + Total Outside Cost	
<b>Down Payment</b> 20% of the price of the house	
<b>Mortgage (Principal)</b> 80% of the price of the house	

Most families pay off their mortgage over a period of 15 or 30 years. Use the table below to calculate the monthly payment necessary for your mortgage above.

### Mortgage Payment Calculation

Principal	Loan term	Multiply price by...	Monthly Mortgage Payment
	15 yr.	0.0074	
	30 yr.	0.0048	

Lenders typically require homeowners to purchase **homeowner's insurance**, which covers both the home and its contents in the event of a flood, fire, or other damage.

### Insurance Calculation

Final Price	Insurance Rate	Monthly Insurance
	0.0005	

**PROPERTY TAXES** – You must pay annual **property taxes**. Property taxes can either be paid monthly as an addition to your mortgage or they can be paid yearly separate from your mortgage payment. For this project you will pay them as part of your monthly mortgage payment.

**Property Tax Calculation**

<b>Tax</b>	<b>Final Price</b>	<b>Yearly Tax Rate</b>	Yearly Taxes = Price • Tax Rate	<b>Monthly Tax</b>
City of Southlake		0.00462		
Tarrant County, College & Hospital		0.006085		
Carroll ISD		0.01385		
<b>Total</b>		<b>0.024555</b>		

**PITI** – The total monthly mortgage payment is often referred to as the **PITI**, which stands for principal, interest, taxes, and insurance.

**PITI Payment Calculation**

<b>Loan Period</b>	<b>Monthly Mortgage</b>	<b>Monthly Insurance</b>	<b>Monthly Property Tax</b>	<b>Mortgage Payment (PITI)</b>
15 years				
30 years				

**INCOME NEEDED** – Banks use formulas to determine if a person qualifies for a loan based on their income. Banks generally use the guideline of 30%. This means that the total cost of the monthly mortgage payment (**PITI**) should not exceed 30% of the family’s monthly income.

**Total Yearly Income Estimate**

<b>Loan Period</b>	<b>PITI Payment</b>	<b>Bank Rule of Thumb</b>	Monthly Income = $\frac{\text{PITI}}{0.30}$	<b>Yearly Income Needed To Buy This House</b>
15 years		Payment = 30% of income (Maximum)		
30 years		Payment = 30% of income (Maximum)		



### Energy Efficiency Study

<b>Area of our house</b> (not including garage)	<b>Area of all windows</b>	<b>Window Percentage</b> $\frac{\text{Area of windows}}{\text{Area of house}} \cdot 100$ <i>(round to the nearest tenth)</i>	The area of the windows must be between 8% and 15% of the area of the house as this provides a balance between natural lighting and excessive energy consumption.

### Flooring Calculation

9 square feet = 1 square yard

<b>Total square footage</b> (not including garage):			
	<b>Square Feet</b>	<b>Unit Rate</b>	<b>Cost</b>
<b>Tile</b> <i>(all bathrooms)</i>		\$4.00 per ft. <sup>2</sup>	
<b>Vinyl</b> <i>(kitchen)</i>		\$3.00 per ft. <sup>2</sup>	
<b>Carpet</b> <i>(Rest of house, except garage)</i>		\$27.00 per yd. <sup>2</sup>	
Installation (\$5.00 per square foot):			
Total flooring cost (flooring + install):			

### Paint Estimate Calculation

**Area covered by a gallon of paint = 300 ft.<sup>2</sup>**

**Cost of Paint = \$35 per gallon**

<b>Area of all walls</b> Find the perimeter of each room using your inside cost page. Then multiply by 10 since you have 10 ft. walls.	
<b>Gallons of paint needed</b> (round up to next whole gallon)	
<b>Total Cost</b>	

### Heating System Calculation

<b>Area of house</b> (not including garage)	<b>Average height of ceiling</b>	<b>Volume of house</b>
	10 ft.	

Volume of a house will determine the type of heating/air conditioning system that will be installed.

Your job: Create a **logo** and a **slogan** for your architecture company.



A **logo** is used to help develop a name for a business. Some of the most famous logos that everyone will recognize are on this page. A logo is designed for immediate recognition. The logo shapes, colors, fonts, and images usually are different from others in a similar market. Some logos contain the full company's name as part of the logo and some don't.

Today there are many corporations, products, services, agencies and other entities (like states and countries) using a sign or a symbol or a combination of sign and emblem as a logo.

**Qualities of an effective logo**

1. Makes a good first impression.
2. Represents who you are and your ideas and attitudes.
3. Possesses something unique or interesting to help you stand out from the crowd - a mark of distinction.



Italic type (slanted) denotes action or speed and projects a modern image.  
 Capital letters suggest formality and steadiness.  
 Lowercase letters suggest an informal manner or casual image.  
 Outlined letters project an informal image.  
 Thin letters denote professionalism.  
 Thick or bold letters project strength or dependability.  
 Script denotes gentleness or caring.



Color is important to brand recognition, but it should not be the main component of the logo design because it could conflict with its functionality. In the United States red, white, and blue are often used in logos for companies that want to project patriotic feelings.

Your architecture firm needs a logo that people will remember. Examples of architectural companies' logos are also included below. They often have the company name or initials. **Your logo must contain something geometric or architecture related.** It should be in color (unless you specifically want it black and white) and should be neatly drawn (no computers) on paper that will slide into the cover of your binder. You should use a specific font and not just normal handwriting.



## Hidden Meanings in Popular Logos

Sometimes a company or brand logo is more than it first appears. For example, take a look at the hidden meanings or messages embedded in these popular logos below. You won't look at these designs the same way again.



Scott Olson, Getty Images)

### **FedEx**

Can you spot something in this logo? The FedEx logo, designed in 1994 by Linden Leader & Landor Associates, at first appears simple and straightforward. However, if you look at the white space between the "E" and "x" you can see a right-facing arrow. This "hidden" arrow was intended to be a subliminal symbol for speed and precision.



Getty Images

### **Amazon.com**

That yellow arrow is more than just a decorative swoosh. The Amazon logo was created to represent the message that it sells everything from A to Z (the arrow connects the two letters) and also represents the smile that customers would experience by shopping on the Amazon.com Web site (the arrow becomes a smile).



AP

### **Baskin-Robbins**

In 2005, as part of its 60th anniversary celebration, Baskin-Robbins launched a new brand identity. The new logo was intended to "capture the fun and energy of Baskin-Robbins." In the old logo, the number "31" appeared within a simple arc, suggestive of a scoop of ice cream, and next to the name. In the new logo, you can see that the "31" still exists. It is now formed by the pink portion of the ice cream store's two initials: "B" and "R."



AP

### **Northwest Airlines**

Back in 2003, lamenting the loss of the old Northwest Airlines logo (shown here), pilot Patrick Smith published his critique of the new logo in his "Ask the Pilot" column at Salon.com, saying the airline's previous circular corporate logo was, "quite simply, a work of genius. It was an N; it was a W; it was a compass pointing toward the northwest."



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### **Sun Microsystems**

Sun's logo -- which features four interleaved copies of the word "sun" -- was designed by professor Vaughan Pratt of Stanford University. It is an ambigram, which is defined as a typographical design or artform that may be read as one or more words not only in its form as presented, but also from another viewpoint, direction or orientation.



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### **Goodwill**

Do you see the right half of a smiley face? Or do you see a lower case "g"? In either case, you'd be correct.

### **Company Logo Recording Page**

1. Describe your final logo.
2. How does your logo relate to your company name?
3. What geometric or architectural element is included in your logo so that one knows you are an architectural company?
4. What is the business purpose or meaning you are conveying to customers with the colors that you used for your final logo?
5. What is your company's slogan? Why does this slogan represent your company?
6. What makes your logo unique and memorable?
7. Below include any other important comments about your logo that have not been stated above.