



Architecture 2011: Design Your Dream Home

A sixth grade math 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.

Architecture can be compared to writing. When we write, we put letters together to form words and then put words together to make complete thoughts. In architecture, we put building parts together to create whole buildings. Roofs, walls, floors, and windows become structures. Structures become neighborhoods or blocks, which in turn become cities and towns.

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

DIS PTO has kindly purchased most of our supplies for our architecture project. If you wish to own your pencils and erasers, below is a list of what you can purchase. Look in the drafting/art supply section of Office Depot, Office Max, Staples, Michaels, Hobby Lobby, etc.



**Staedtler Mars Lumograph Pencils (100HB)
(Often times they are available in packs of 6)**



Staedtler Mars Plastic Erasers, 4/Pack or single

Architecture Project – Timeframes and Concepts

1	Scale Rooms	1 – 1.5 days
	<ul style="list-style-type: none"> Measure kitchens and bathrooms and make a scale drawing of the rooms <ul style="list-style-type: none"> Proportions, Measurement, Architectural symbols 	
1HW	Scale drawing of room at home	Homework assignment
	<ul style="list-style-type: none"> Measure a room at home and make a scale drawing of the room 	
2	Apartment Size	1 day
	<ul style="list-style-type: none"> Measure rooms on a scale drawing and determine the real-life dimensions and areas <ul style="list-style-type: none"> Proportions, Measurement, Area 	
2HW	Home Measurements Part 1	Homework assignment
	<ul style="list-style-type: none"> Measure rooms at home 	
3	3D Home Model	1 day
	<ul style="list-style-type: none"> Create a 3D model of an apartment with walls, window, and a door <ul style="list-style-type: none"> Proportions, 3D geometry 	
3HW	Home Measurements Part 2	Homework assignment
	<ul style="list-style-type: none"> Tabulate key characteristics of their home including doors, outlets, and a flow chart 	
4	Median Cost Per Square Foot	1 day
	<ul style="list-style-type: none"> Calculate the mean, median, and mode price for a group of homes <ul style="list-style-type: none"> Mean, median, mode 	
4HW (2)	Grapevine Median Cost	Homework assignment
	<ul style="list-style-type: none"> Calculate the mean, median, and mode price for a set of homes in Grapevine 	
5	Isometric Drawing of Home	1 day
	<ul style="list-style-type: none"> Create an isometric drawing of their 3D apartment <ul style="list-style-type: none"> Isometric/3D geometry 	
5HW	Isometric Initials	Homework assignment
	<ul style="list-style-type: none"> Create an isometric drawing of their initials 	
6	Group Inspection Record	1 day
	<ul style="list-style-type: none"> Inspect a house for building codes violations 	
6HW	Individual Inspection Record	1 day
	<ul style="list-style-type: none"> Inspect a cabin for building code violations 	
7A	Electrical Contractor	
7B	Lumber Estimate	
7C	Flooring Estimate	1 day
	<ul style="list-style-type: none"> Determine the placement for electrical outlets, lights, and switches. Determine the amount of lumber needed to build a cabin and the amount/cost of flooring for the cabin. 	
Final	Final Project	4-8 days
	<ul style="list-style-type: none"> Design a dream home with all architectural symbols. Determine the cost and area of the rooms and the home. Optionally, create a flyer and/or a video to sell your home. 	

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

Architecture Project Schedule

Architectural Company Name:					
Employee Names:					
		Group Activity	Name:	Name:	Name:
	Cover page with title, members, and company name				
	This Schedule page (completed)				
1A	Scale Rooms				
1B	Scale Rooms scratch work with all measurements				
1HW	Scale drawing of room at home (with rough copy)				
2	Apartment Size				
3	3D Home Model				
2HW	Home Measurements Part 1				
3HW	Home Measurements Part 2				
3HW	Bubble Drawing of Home				
4	Median Cost Per Square Foot				
4HW	Grapevine Median Cost				
4HW-2	Median Home Cost				
5	Isometric Drawing of Home				
5HW	Isometric Initials				
6	Group Inspection Record				
6HW	Individual Inspection Record				
7A	Electrical Contractor				
7B	Lumber Estimate				
7C	Flooring Estimate				
7D	Heating System Size				
7E	Window Percentage				
7F	Elevation Sorting				
7G	Roof Contractor				
8	Final Project				

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.

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.

Today we are going to measure the taped rooms in the hall and create a scale drawing of each of the rooms. Your HW tonight will be to do the same task with either the kitchen or the master bathroom at your house. Here are the guidelines for the in-class part of the project:

How many rooms do we measure?

- If you have a group of 3, you will work together to measure 3 of the rooms in the hall.
- If you have a group of 2, you will work together to measure 2 of the rooms in the hall.

How do we complete the measurement part of this activity?

- Your group will use a meter or yard stick to measure all the parts of the room. The goal is to measure everything you need to be able to redraw the room without looking at it.
- Your group will create this “rough copy” (*which will be included in your binder*) on computer paper or on the provided paper (not on graph paper).
- This rough copy is NOT drawn to scale. It should fill up paper with things spread out enough that they are easy to see.
- Round all your measurements to the nearest 3 inches (ex. 5 ft. 6 in. OR 2 ft. 3 in.).
- Be sure to record the name of the room you are measuring (ex. KITCHEN 1).
- Measure the outside of the room first.

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

- Each person in your group will take one of the rooms you drew in the hall.
- When you start your scale drawing, you will use the scale $\frac{1}{4}$ inch = 1 foot. Remember on your graph paper each block is $\frac{1}{4}$ inch. Therefore, one square = 1 foot.
- See your packet for the symbols to use for items such as toilets, sinks, refrigerators, etc.
- As with all scale drawing, you must write the scale on your final copy.
- Since the scale is included, you do not include measurements on the final copy.
- Use a ruler for all straight lines. Your final copy should look professional. Include your name on your final copy.
- Start by drawing the outside of the room

Your homework for Architecture Day 1:

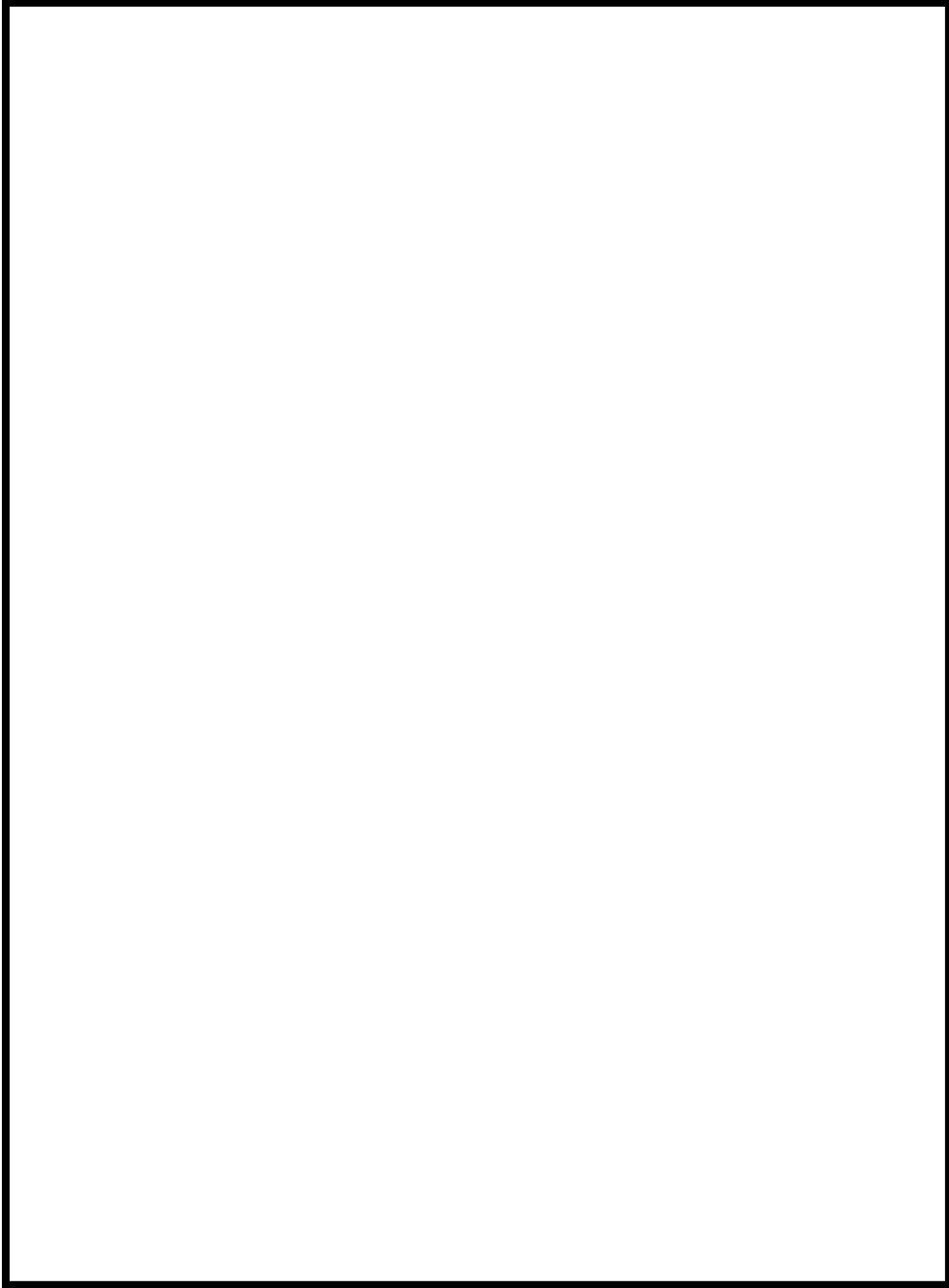
- Choose one of the following rooms at your house:
 - The Kitchen
 - The Master Bathroom

With that room you will complete the exact same steps as we did at school with the taped rooms in the hall.

- Measure all of the dimensions using a ruler, yard stick, or measuring tape. This is your rough copy *that will be turned in with your group folder*. Include your name at the top.
- Create a scale drawing of the room. Use the scale 0.25 in = 1 ft.
- Your final copy should be on graph paper and all straight lines should be drawn with a ruler.
- You need to 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.
- Use the appropriate architectural symbols found on your symbol page.
- Be sure to include the scale on your final copy as well as your name at the top.
- Place all pages in your team’s architecture folder.

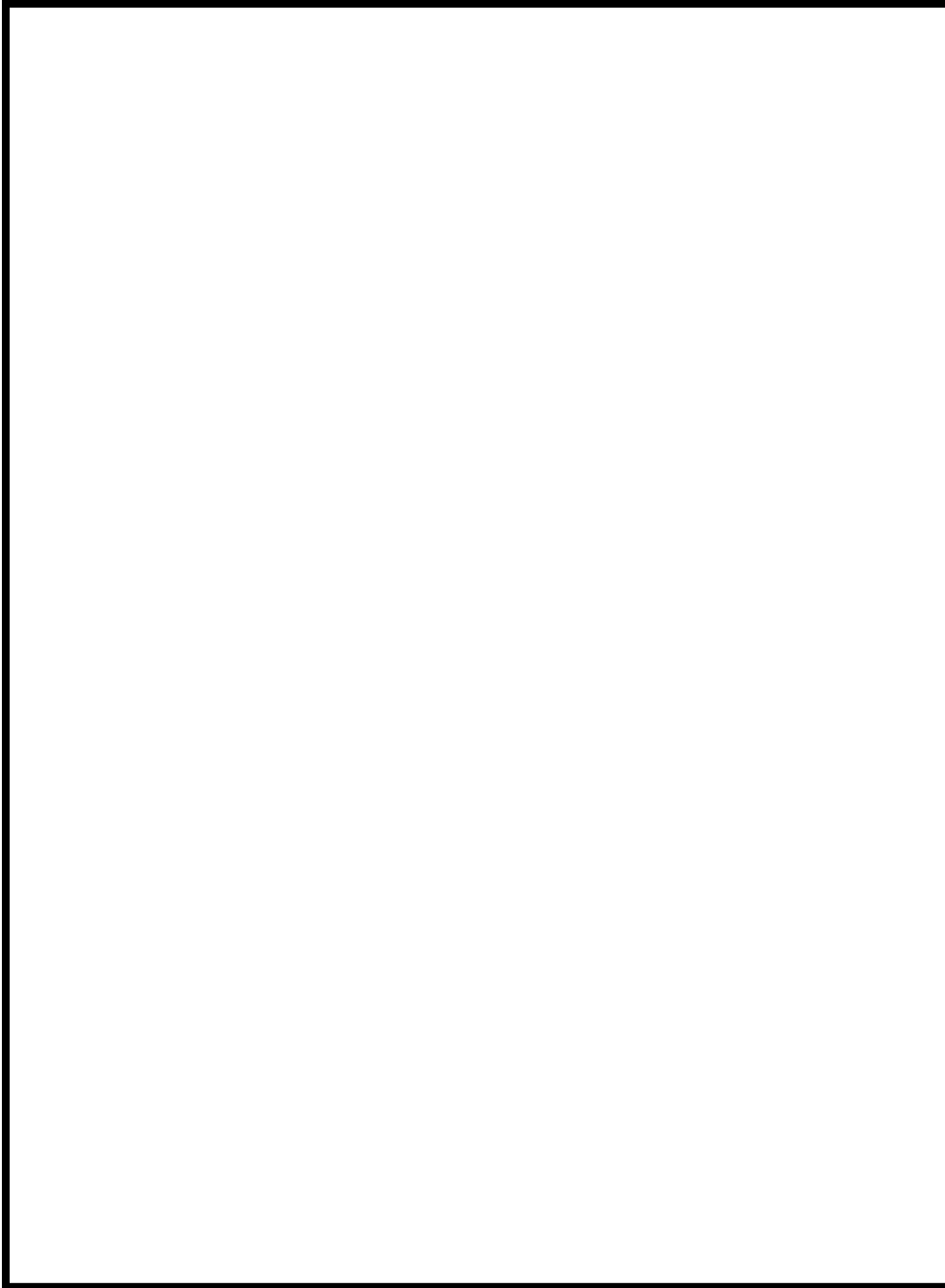
KITCHEN #

8 feet



10 feet

5 feet





8 feet

B
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#

 Standard Electrical Outlet

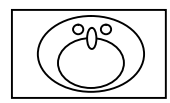
 220 Volt Electrical Outlet

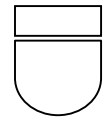
 Light Switch

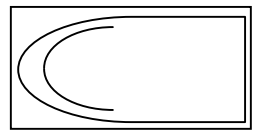
 3 Way Light Switch

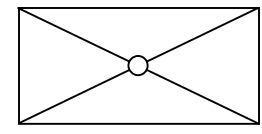
 Standard Ceiling Light

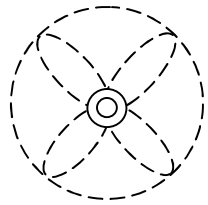
 Fluorescent Ceiling Light

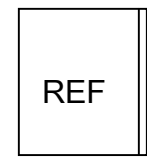
 Cabinet with Sink

 Toilet

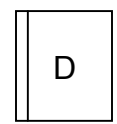
 Bathtub

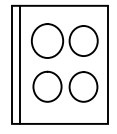
 Shower

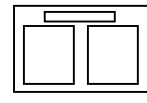
 Ceiling Fan with Light

 Refrigerator

 Washer

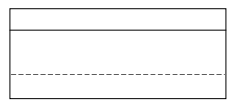
 Dryer

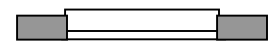
 Range

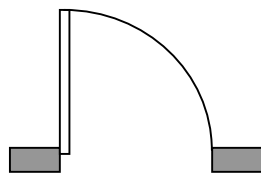
 Double-Basin Sink

 Dishwasher

 Hot Water Heater

 Cabinet over counter

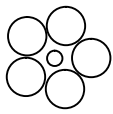
 Window

 Swinging Door

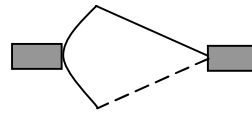
 Sliding Glass Door

 Sliding Closet Door

 represents the wall



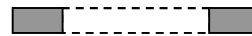
Chandelier



Swinging Door




Cable TV Hook-Up



Arched Opening

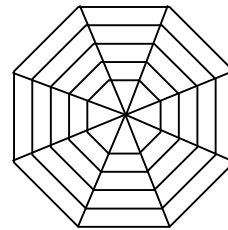


Telephone Jack

 represents the wall



Thermostat



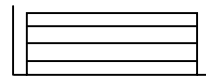
Gazebo



Door Bell



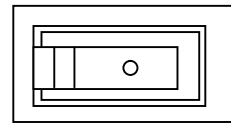
Floor Outlet



Garden bench



Exterior Light



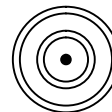
Hot tub



Wall Light



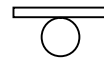
Ceiling Light with Pull Switch



Birdbath or fountain



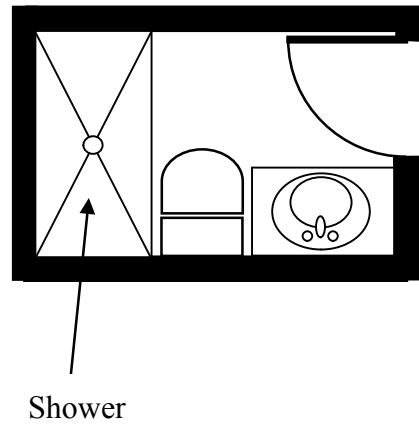
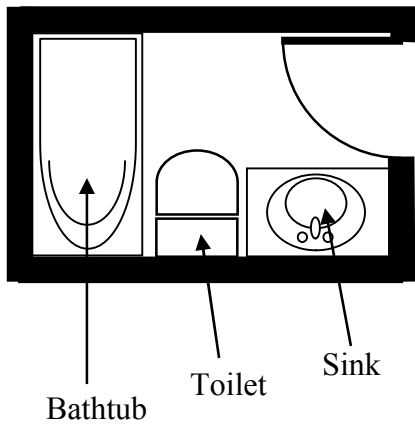
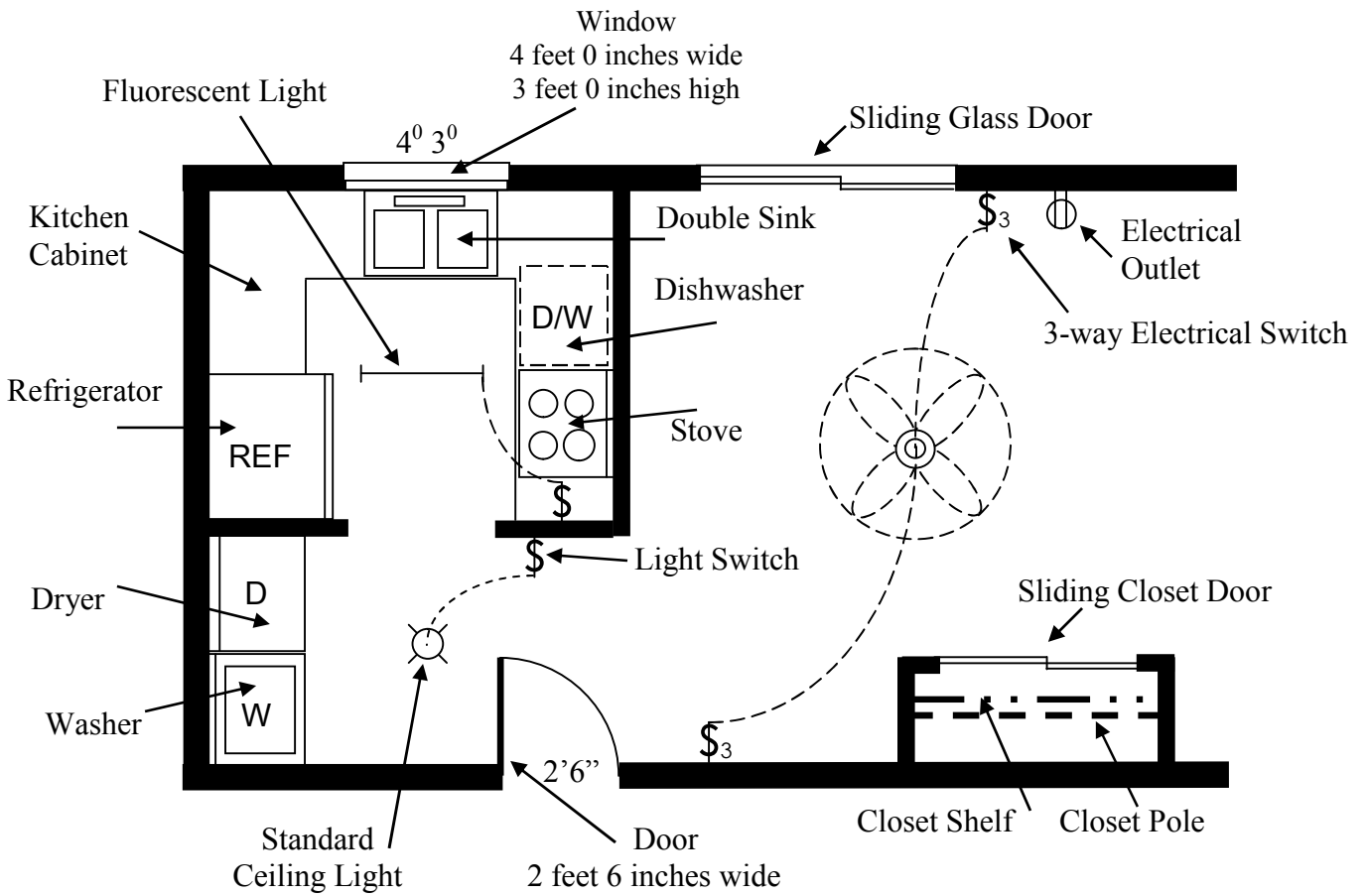
Outdoor faucets



Basketball hoop



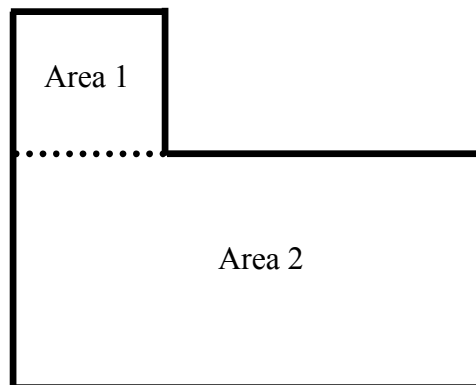
Recessed Light



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. We are basically going in the reverse order of what we did yesterday.

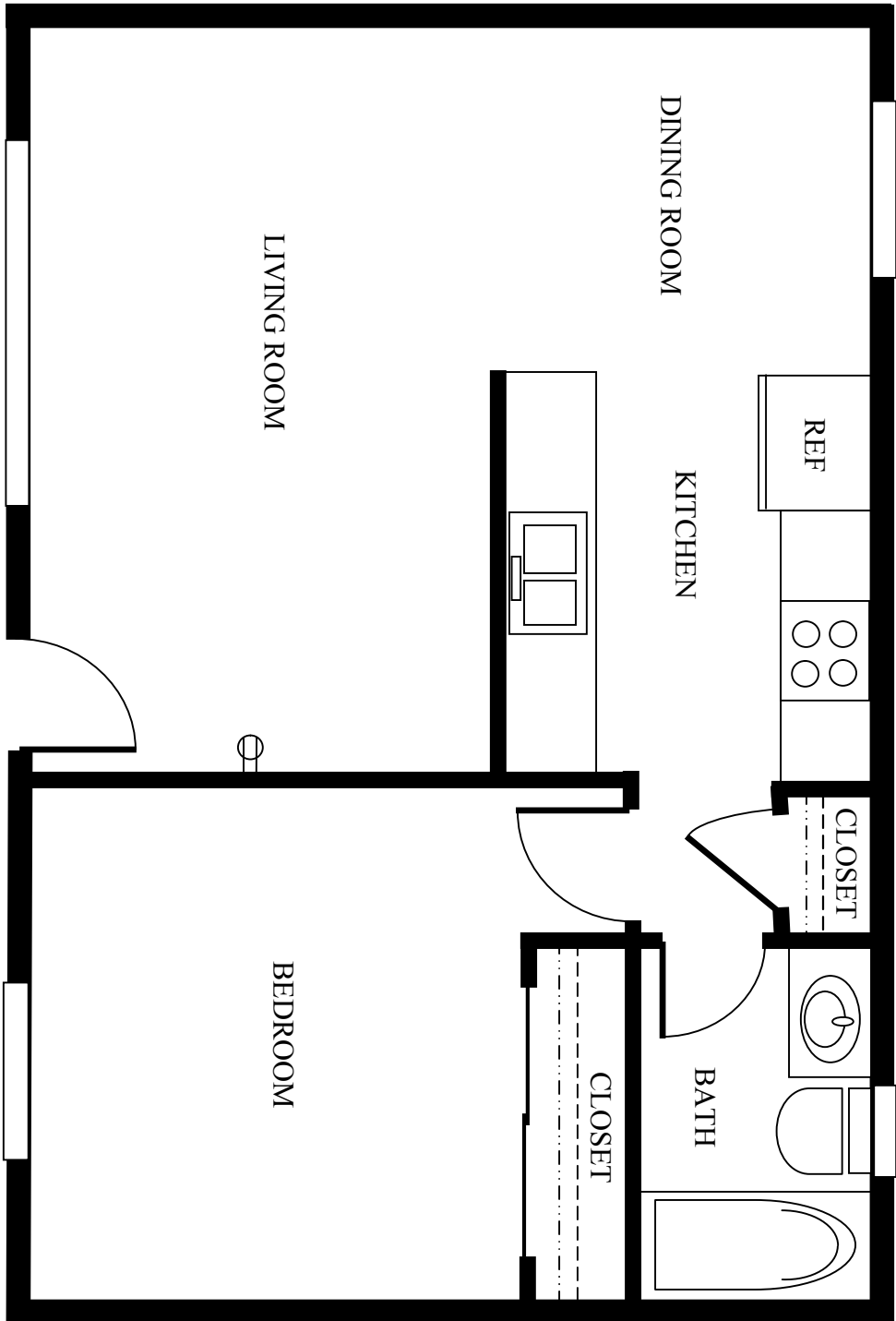
Important information to remember for today's activity:

- Width goes side to side (horizontally across the apartment), length goes up and down (vertically from front to back of the apartment)
- 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: $A = L \cdot W$
- The scale is the same as yesterday: $\frac{1}{4}$ in = 1 ft (this also means 1 in = 4 ft)
- Area is measured in *square units*. You can't compare perimeter and area as they are measured with different types of units.
- $\frac{1}{4} = 0.25$ $\frac{2}{4} = 0.5$ $\frac{3}{4} = 0.75$ $\frac{4}{4} = 1.0$
- For example with our room: 2 in = 8 ft, 3 in = 12 ft, so 2.5 inches = 10 feet
- When using your ruler, measure from the inside of the wall to the inside of the wall.
- 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:



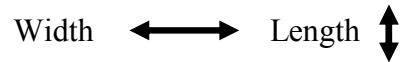
- Place all notebook paper with calculations on it in your architecture binder.

APARTMENT PLAN



Scale: 0.25 in. = 1 ft.

<i>Scale used</i>	
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ROOM	Width (in.)	Length (in.)	Perimeter (in.)	Area (sq. in.)
Living Room				
Kitchen				
Dining Room				
Part 1 (small) Bedroom				
Part 2 (large)				
Bath				
Large Closet				
Hall Closet				
***** TOTAL AREA *****				

DRAWING SIZE

ROOM	Width (ft.)	Length (ft.)	Perimeter (ft.)	Area (sq. ft.)
Living Room				
Kitchen				
Dining Room				
Part 1 (small) Bedroom				
Part 2 (large)				
Bath				
Large Closet				
Hall Closet				
***** TOTAL AREA *****				

ACTUAL SIZE

	Width (ft.)	Length (ft.)	Perimeter (ft.)	Area (sq. ft.)
Measure the entire Apartment (include outside walls)				

Does the sum of the areas of all the rooms equal the total area of the apartment? Why or why not?

Tonight and tomorrow night 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 to give you ideas when you start to design your final home.

Make the room measurements in your home to the nearest inch.

Ex. If your room is 10 ft. 6 in then write 10 in the feet column and 6 in the inch column.

Many of these measurements will be important when designing your own house for the final project.

Complete the Home Measurements Matrix Page.

Notes:

If your room is 10 ft. 6 in. then write 10 for the feet column and 6 for the inch column.

In listing overhead lights, count the total separate places there are overhead lights. A light hanging down with 4 light bulbs only counts as 1 overhead light.

List the number of outlet locations (typically there will be 2 outlets at each location).

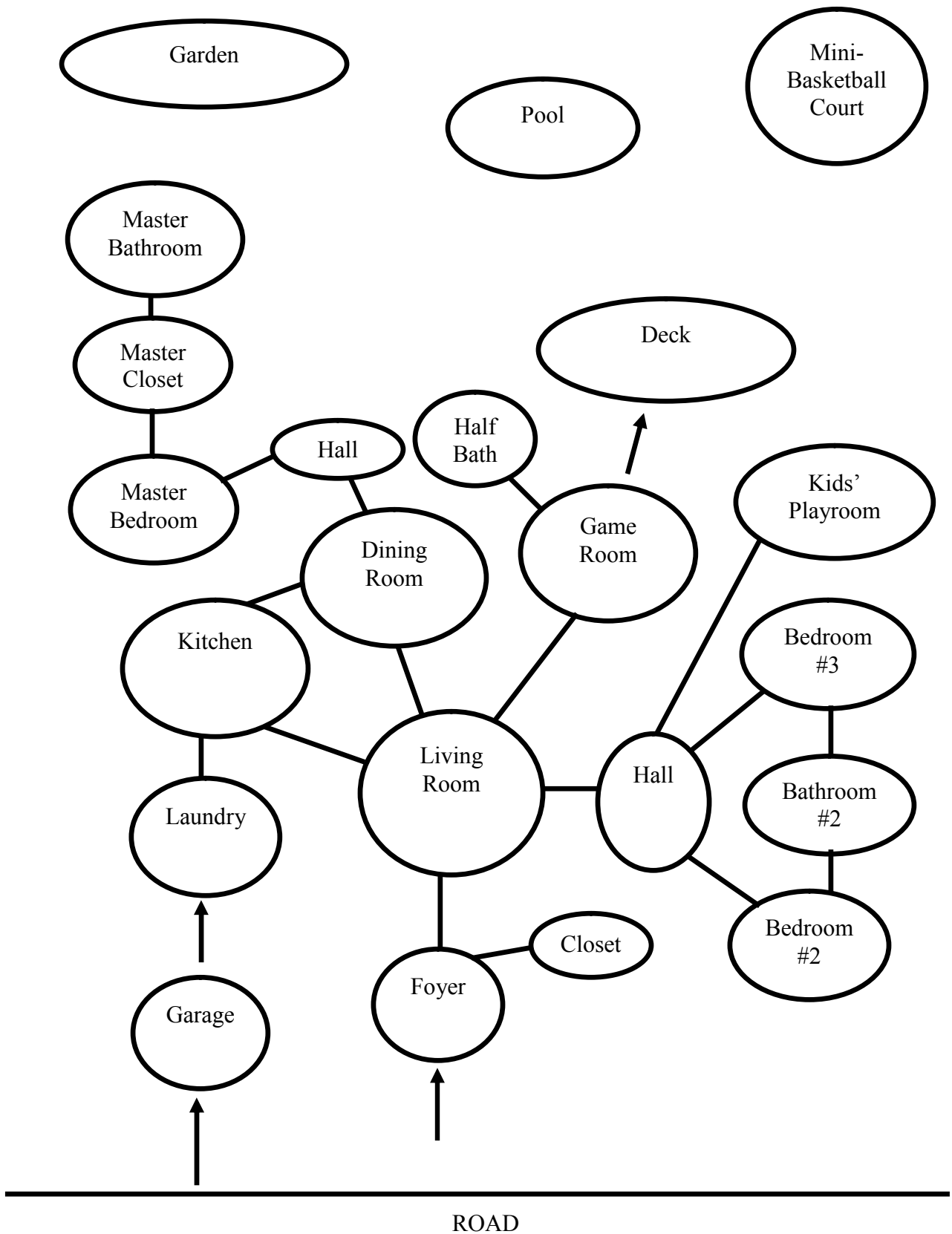
Door example for a room with 2 interior doors and 1 exterior door: I-2, E-1

For a room next to the kitchen and dining room list: A & B

Your home may have extra rooms. You do not need to include them on this table.

If your home does not have one of the rooms listed, you may leave that line blank.

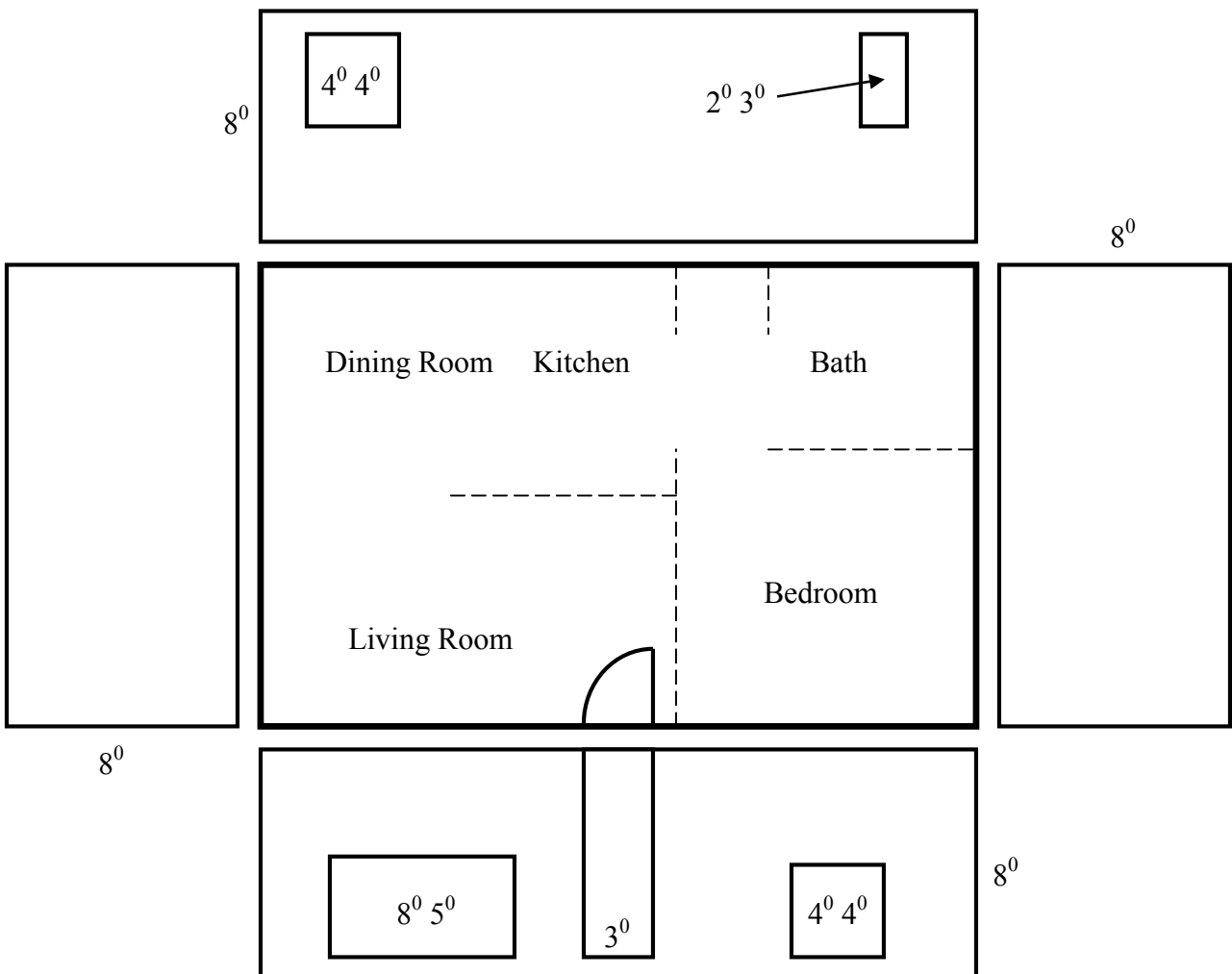
What is the height of your ceiling in most places?	
How thick are your walls in most places?	
Total number of rooms in your house:	
Are there halls in the house? If so, where?	
Which rooms of the house do not touch an exterior wall?	
<p>On a sheet of computer paper draw a bubble diagram (not to scale) 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.).</p> <p>The purpose of this diagram is to see which rooms connect to which other rooms.</p> <p>See the Bubble Diagram example which has been given to you.</p>	



Today we are going to take the apartment plan that we measured yesterday and create a 3D model with walls, windows, and a door. This model is going to use them 0.25 in. scale that we used for the first two assignments. Here are the steps for today's project:

- The drawing below provides information about the walls, windows, and doors.
- The ceiling height for the apartment is 8 feet so all walls are 8 feet high.
- All windows and doors end at 1 foot below the ceiling.
- The notation $2^0 3^0$ means 2 feet 0 inches across and 3 feet 0 inches up and down.
- Cut out the apartment plan and glue it to a piece of cardstock.
- Create walls using graph paper. Once you have the 4 walls glue them to cardstock as well.
- Draw the windows and the door in the appropriate places. Cut the door so that it opens and closes. Optionally, you may cut out the windows.
- Attach the 4 walls around the apartment making sure the door and windows line up in the right places.
- If time allows, you may draw a walkway outside your apartment, create some 3D trees to place outside your apartment, or create a roof to place on your apartment. You could also add inside walls or determine how big a person would be with this scale and make a 3D person standing somewhere on the cardstock.

Apartment Plan



Below are seven sample houses in two different cities. Find the cost per square foot of each house, **rounded to the nearest cent**. Then find the median cost for each city. You may use a **calculator** to find the cost per square foot.

SAN UNDERWOOD				MANGHAMVILLE			
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.	What is the median cost per square foot in San Underwood?	
16.	What is the median cost per square foot in Manghamville?	
17.	Which city has the lower median cost per square foot?	
18.	What is the difference between the two medians?	
19.	Which house is the least expensive per square foot?	
20.	Which house is the most expensive per square foot?	

21.	A. Calculate the mean and the median of the five homes listed below.	A.	Mean=	Median=
	B. Which of the two numbers you calculated is more realistically the typical price of these homes?	B.		
	C. Why?	C.		
	D. Why are the mean and median so different?	D.		

- \$135,000
- \$3,375,000
- \$99,950
- \$126,900
- \$119,550

Grapevine Real Estate Listings

	Address	Price	Type	Rooms	Size	Age
1	3826 Shady Meadow	\$262,000	Single-family	5 br, 4 ba	3042 sq. ft.	15 years
2	3105 Coveside	\$289,900	Single-family	3 br, 2.5 ba	3198 sq. ft.	4 years
3	3312 Marsh	\$369,900	Single-family	4 br, 3.5 ba	4031 sq. ft.	11 years
4	4319 Windswept	\$201,000	Single-family	4 br, 2.5 ba	2462 sq. ft.	13 years
5	2825 Panhandle	\$143,500	Single-family	3 br, 2 ba	1508 sq. ft.	22 years
6	1408 Clearwater	\$216,500	Single-family	3 br, 3 ba	2317 sq. ft.	3 years
7	2710 Pin Oak	\$241,000	Single-family	4 br, 2 ba	2537 sq. ft.	6 years
8	1202 Sandhurst	\$145,900	Single-family	3 br, 2 ba	1624 sq. ft.	17 years
9	2904 Harvest Hill	\$165,000	Single-family	3 br, 2 ba	1757 sq. ft.	23 years
10	2662 Pinehurst	\$232,000	Single-family	4 br, 2 ba	2402 sq. ft.	3 years
11	3430 Spring Willow	\$174,900	Single-family	3 br, 2 ba	2210 sq. ft.	18 years
12	2702 Yorkshire	\$249,900	Single-family	5 br, 3 ba	2971 sq. ft.	15 years
13	925 Wildwood	\$154,900	Single-family	3 br, 2 ba	1606 sq. ft.	16 years
14	1886 Cimarron	\$127,500	Single-family	3 br, 2 ba	1487 sq. ft.	23 years
15	2125 Sierra	\$119,900	Single-family	3 br, 2 ba	1365 sq. ft.	23 years
16	2715 Cobblestone	\$268,990	Single-family	4 br, 3 ba	2942 sq. ft.	0 years
17	2717 Cobblestone	\$257,990	Single-family	4 br, 2.5 ba	2839 sq. ft.	0 years
18	2719 Cobblestone	\$283,990	Single-family	4 br, 3.5 ba	3116 sq. ft.	0 years

Br = Bedrooms

Ba = Bathrooms

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.

Use 12 homes from the Grapevine Real Estate Listing based on the following:

Last names **A-G use homes 1-12.**

Last names **H-O use homes 4-15.**

Last names **P-Z use homes 7-18.**

Complete the following chart. You may use a **calculator**.

House #	Cost	Square Feet	Cost per square foot (rounded to the nearest cent)	Bedrooms	Bathrooms	Age

Use your data to now calculate the following items:

	Cost (nearest dollar)	Square Feet (nearest whole number)	Cost per square foot (rounded to the nearest cent)	# of bedrooms (nearest tenth)	# of bathrooms (nearest tenth)	Age (nearest tenth)
Mean						
Median						
Mode						
Range (subtract low from high)						

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 in the Metroplex.

Use a calculator to determine the price per square foot for each city. This is how much one square foot of house costs in different places. Depending where in the United States a house is located can have a major impact on the price per square foot. In New York City \$300 to \$400 (or even much higher!) per square foot is common. That same home placed in the middle of nowhere might cost only \$40 a square foot.

City	2008 Median Price	Average Size Home (Square Feet)	Price per Square Foot (rounded to the nearest dollar)
Bedford	\$155,000	1867	
Eules	\$148,500	1789	
Hurst	\$140,000	1750	
Colleyville	\$450,000	3333	
Grapevine	\$220,000	2136	
Southlake	\$527,450	3588	
Keller	\$284,950	2663	
Westlake	\$390,500	2693	
Coppell	\$260,000	2342	
Carrollton-Farmers Branch	\$159,900	1817	
Irving	\$142,500	1516	
Grand Prairie	\$126,140	1940	
Duncanville	\$108,370	1693	
Arlington	\$129,730	1802	
Median of all cities			

<p>Use the data above to make some observations and conclusions about how the price, home size, and price per square foot relate to each other across north Texas cities.</p>	
---	--

The goal today is to draw a three dimensional object on a piece of paper and have it look three dimensional. Architects use isometric paper to make drawings like these. 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.
- Draw the final two lines to create the right face.
- Draw the final two lines to create the 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.

- 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 four windows 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.)

Homework Assignment:

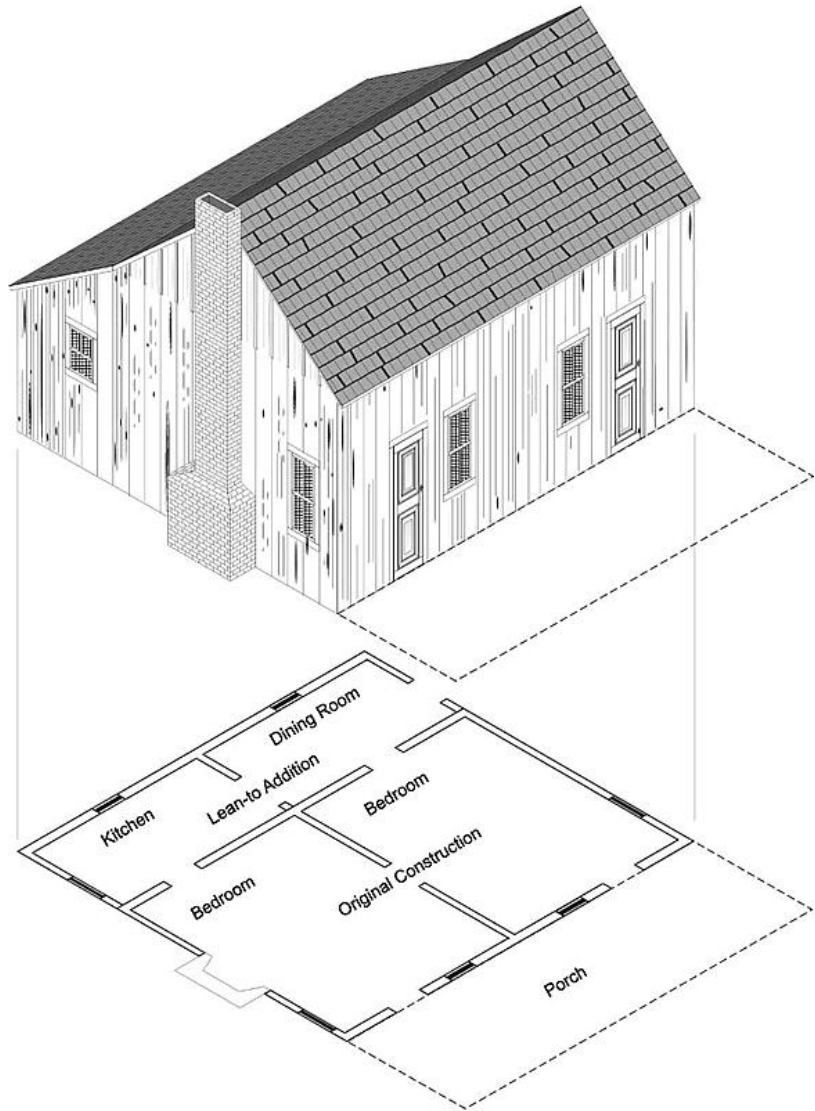
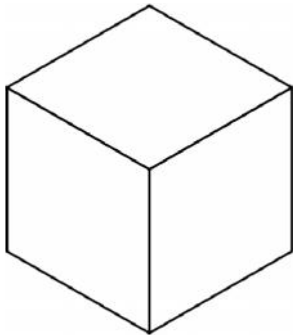
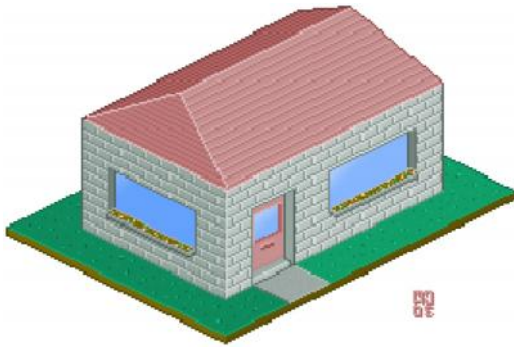
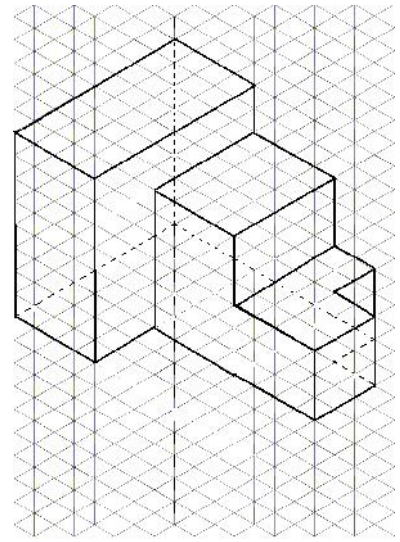
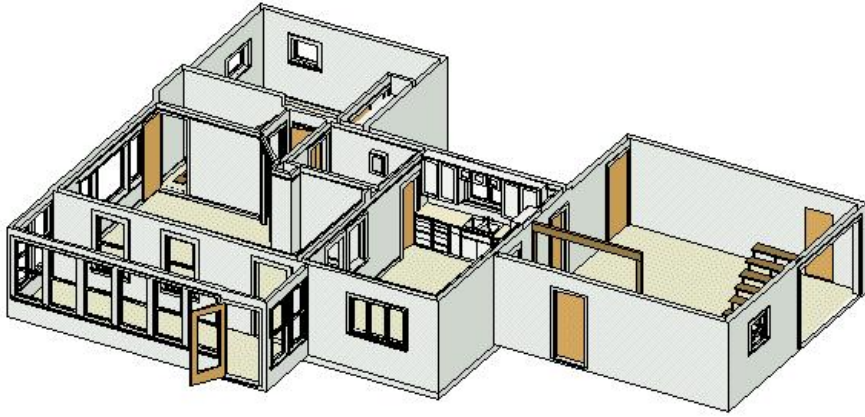
- Create an isometric drawing of three initials of your name. Use “rails” (ask your teacher) to help orient the letters correctly on your paper. Remember that you will need to create block-type letters for it to work and that you need to shade. If your 3 initials include 2 or more of the same letter OR if you have very difficult initials to draw (KMR), you may get your **teacher’s approval** to do a 3 or 4 letter word instead.

Do you want to draw isometrically on your computer?

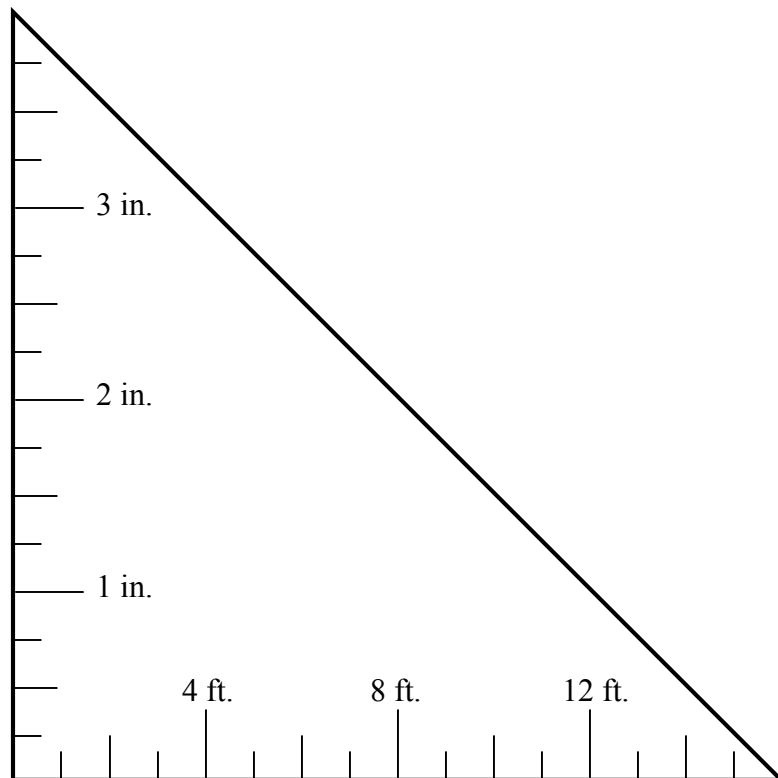
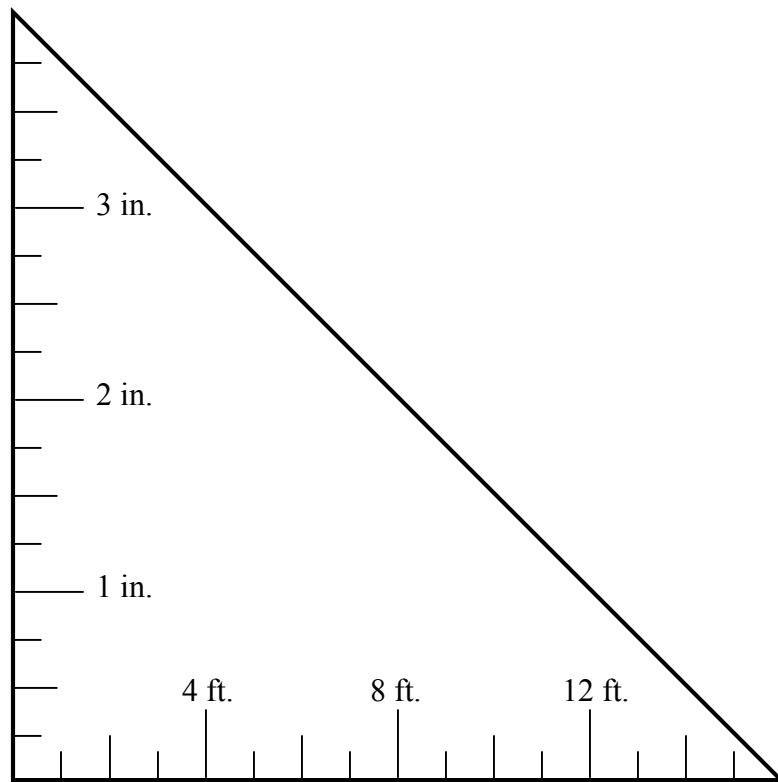
<http://illuminations.nctm.org/ActivitySearch.aspx>

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/>



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/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 2 feet 6 inches of clear space side to side.	Bedrooms must have at least one window 3 feet by 4 feet or larger as a fire escape.
All living areas must have a window. (Bathrooms, halls, closets, and garages are not living areas).	Interior doors, except for closets, 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 at least 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. (use Arch 4HW):	=
			Total cost of construction:

Check the home for all building codes. Report any violations in the comment section.	Comments:
--	------------------

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.	Comments:
--	------------------

The drawing should be neat and not crowded. Writing should be legible. Lines should be straight.	Comments:
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.	Comments:
Rooms, doors, windows, closets, and counters are the appropriate sizes. Closet space is adequate.	

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Architect: _____ **Building Inspector(s):** _____

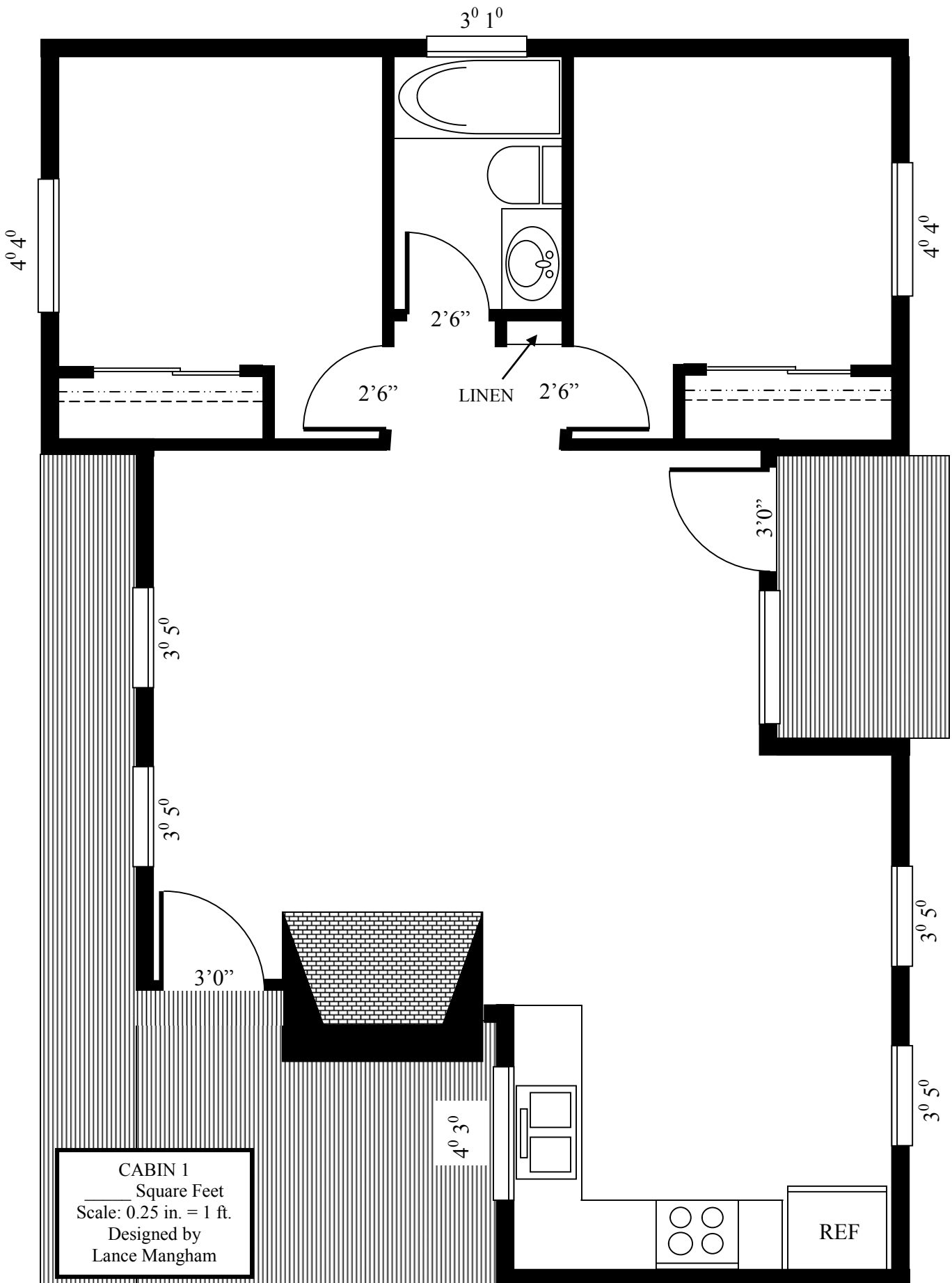
<i>Compute the square footage and cost.</i>			
Total House Area (no garage, include all calculations in binder):	x	Median cost per sq. ft. (use Arch 4HW):	=
			Total cost of construction:

Check the home for all building codes. Report any violations in the comment section.	Comments:
--	------------------

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--	------------------

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Rooms, doors, windows, closets, and counters are the appropriate sizes. Closet space is adequate.	



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 lights, switches, and outlets.
3. Dotted lines show which switch operates each light.
4. Overhead Lighting Requirements:
 - Overhead lights should be in all rooms except the living room, where an overhead light is optional. The kitchen light should be fluorescent. All others should be standard ceiling lights or fan/lights.
 - Rooms such as the living room and bedrooms usually only require one overhead light.
 - The kitchen should have an additional light near the sink and one near the stove.
 - 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).
 - An overhead light should be in all hallways, stairways, and porches. 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 ft. on each side.
 - Walls less than 2 feet 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? How you seen a 2 by 4 before? Is it big or small?

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). A contractor needs to know the cost of building a house beforehand in order to know how much to charge the buyer. Part of this process is making an accurate estimate of the lumber to build a house. 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). Thus a 20 foot wall requires about twenty studs.

Calculate the number of studs needed to build the walls of Cabin 1. When calculating the number of studs, include 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. Based on this calculation, complete the rest of the tables below. Include your scratch work in your portfolio.

1.	Total number of studs needed for exterior walls	
2.	Total number of studs needed for interior walls	
3.	Total number of studs needed	

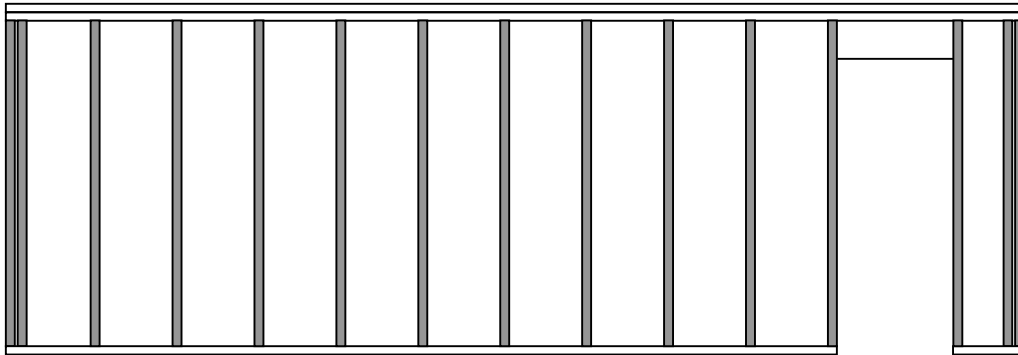
Remember that one stud is equivalent to one linear foot.

Expense Estimates

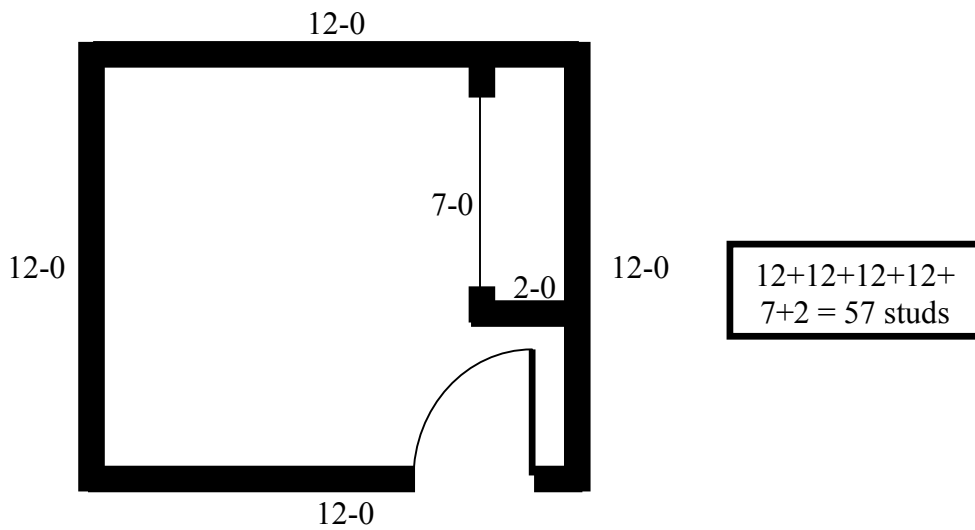
			COST
4.	Exterior Walls*	\$140.00 per linear foot	
5.	Interior Walls	\$35.00 per linear foot	
6.	Floors	\$9.75 per square foot	
7.	Roof	1.5 times the floor cost	
8.	Total Wall, Floor, and Roof Cost		

* includes the cost of foundation as well as window and door costs

EXAMPLE WALL FRAME LAYOUT



Studs are shown in gray



How much area do you lose on each piece of lumber going down to the actual size?

Nominal Size of Lumber	Nominal 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	$1\frac{1}{2}'' \times 11\frac{1}{4}''$		

A contractor needs to know the cost of building a house beforehand in order to know how much to charge the buyer. A part of this process involves making 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 bathroom will be covered with tile. The kitchen will use vinyl and the rest of the house carpet. Note that flooring will not be needed where the bathtub, toilet, sink, cabinets, etc. are located.

Carpet = \$26.50 per square yard (note that a square yard is 3 feet by 3 feet (9 square feet)).

Tile = \$4.00 per square foot

Vinyl = \$3.00 per square foot (comes in 12in. by 12in. tiles)

Complete a flooring cost estimate for Cabin 1.

Flooring Cost Estimate for Cabin 1

Room	Measurements		Area	Material	Cost per Unit	Total Cost
	Length	Width				
Living Area						
Kitchen						
Bathroom						
Bedroom 1						
Bedroom 2						
Hallway						
*** Total for of all flooring ***						

How many sheets of plywood would be needed if the cabin floor were made of plywood? Plywood is 4 feet by 8 feet.	
---	--

Today we are going to select a heating system for a house. We are going to use a forced-air HVAC (heat vent air conditioning) system for Plan A. Volume of a rectangle is calculated by the following formula: *length x width x height*. Another way to think about it is to take the area of the house and multiply it by the ceiling height (typical walls are 8 feet high).

HEATING SYSTEM CHART

	System	Volume Range
Electrical Baseboard model 8900	1	6,250 ft. ³ to 7,500 ft. ³
Floor Radiant Heat Panels model R1000	2	7,350 ft. ³ to 8,750 ft. ³
Floor Radiant Heat Panels model R1100	3	8,500 ft. ³ to 9,800 ft. ³
Heat Pump model P1300	4	9,450 ft. ³ to 10,000 ft. ³
Heat Pump model P1400	5	9,950 ft. ³ to 12,500 ft. ³
Furnace model F1500	6	11,750 ft. ³ to 14,500 ft. ³
Forced Air Heater model FA1800	7	14,050 ft. ³ to 16,750 ft. ³
Forced Air Heater model FA2000	8	15,750 ft. ³ to 18,000 ft. ³

Plan Number	Volume	Heating System
Cabin 1		
Cabin 2		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
A		
B		
C		
D		

WINDOW PERCENTAGE

Glass on the exterior walls of a house affects its energy efficiency. Windows are major source of heat loss in the winter and heat gain in the summer. A rule of thumb is that the area of the windows should be 10% of the area of the house. This provides a balance between natural lighting and excessive energy consumption. Thus a 2000 square foot house should have about 200 square feet of windows.

List the windows of the house(s) provided by your teacher and find each area. Then divide the total by the square footage of the house. Write your answer as a percent.

Plan Cabin 1

Plan _____

	Window Size	Area
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
Total window area		
Total house area		
Window area ÷ house area		

	Window Size	Area
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		
11.		
12.		
13.		
14.		
Total window area		
Total house area		
Window area ÷ house area		

(Round to two decimal places and write as a percent.)

Are the results approximately 10%?	
------------------------------------	--

Study your floor plan and compute its square footage. Certain room may need to be cut up into two or more smaller shapes.

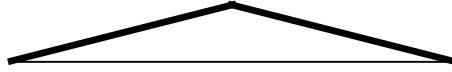
Find the four elevations that match your house. Study the placement of doors and windows. Try to picture how the roof would look on this house.

ARCHITECT'S RECORD

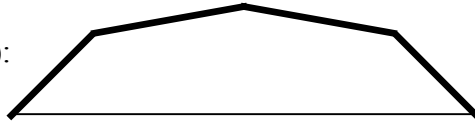
Median cost per square foot (Grapevine): _____

Plan Number	Square Footage	Total Cost	Elevations
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
Cabin 1			
Cabin 2			
A			
B			
C			
D			

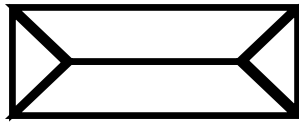
Gable roof (side view):



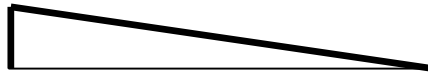
Gambrel roof (side view):



Hip roof (top view):



Shed roof (side view)



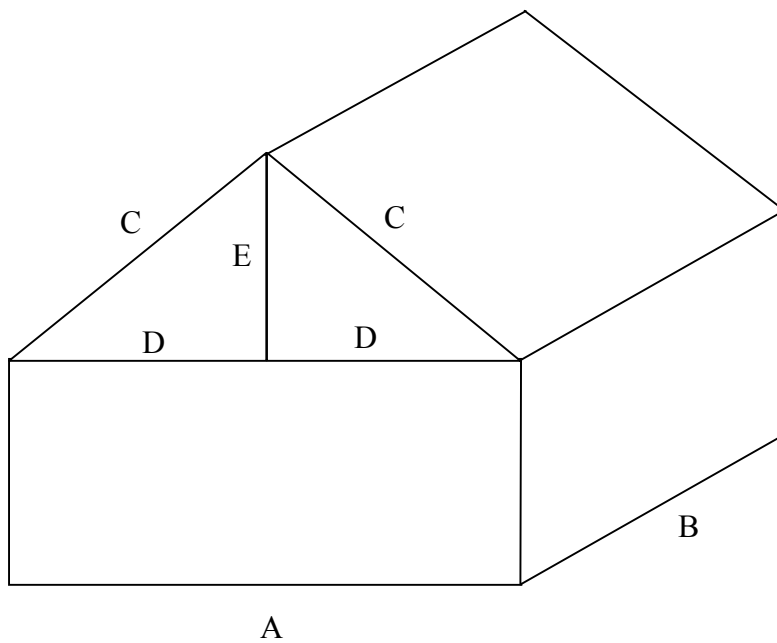
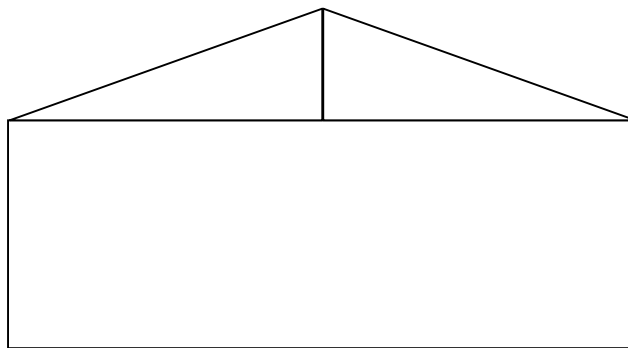
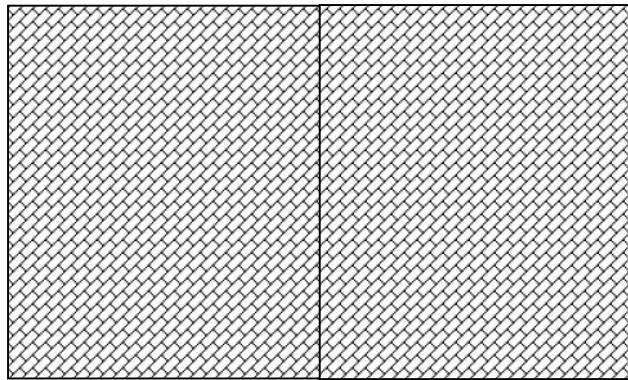
Roof pitch or slope: A measure of the rate at which the roof rises (rise divided by run)

Steep roofs are needed for snow climates. Flat roofs are good for hot, dry climates. A standard roof pitch or slope is at a ratio of 4:12.

Look at the diagram that you have for a house and its roof. The first diagram is a top view of the sloped roof. The building measures 24 feet wide and 20 feet long. How would we find the area of the roof?

A famous formula that can be used for a right triangle is called the Pythagorean Theorem. The Pythagorean Theorem states that $a^2 + b^2 = c^2$, where a and b are the two short sides (or legs) and c is the long side (or hypotenuse).

ROOF DIAGRAMS



	Length of House (A)	Width of House (B)	Height of Roof (E)	Length of half of the house (D)	Length of half of the roof (C)	Area of half of the roof	Area of the entire roof
1.	16 ft.	24 ft.	4 ft.				
2.	18 ft.	34 ft.	5 ft.				
3.	20 ft.	24 ft.	4 ft.				
4.	18 ft.	28 ft.	6 ft.				
5.	18 ft.	29 ft.	7 ft.				
6.	16 ft.	26 ft.	4 ft.				

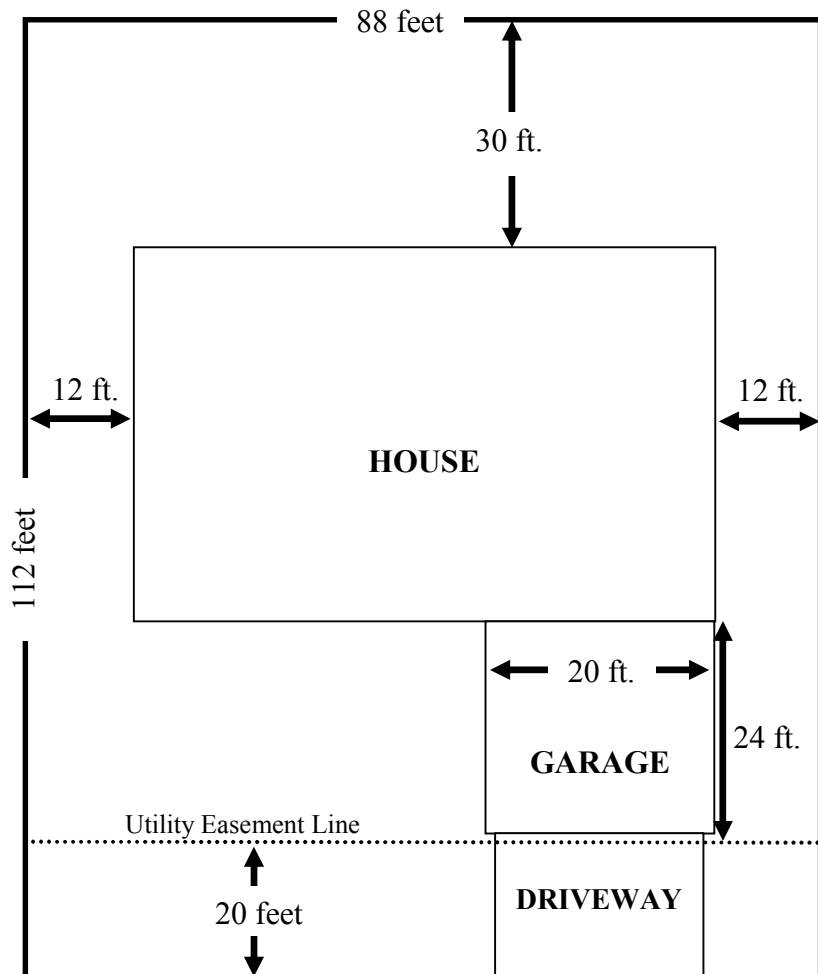
		Cost of New Roof		
	Area of the entire roof	Composition Shingles (\$250 per 100 sq. ft.)	Wood Shingles (\$450 per 100 sq. ft.)	Tile (\$1000 per 100 sq. ft.)
1.				
2.				
3.				
4.				
5.				
6.				

<p>Compute the area of the roof for Cabin 1 assuming it has a pitch of 5:12. That is, it rises 5 feet for every 12 feet of run, another name for horizontal distance.</p>	
---	--

Requirements for Final Project Design

- Each single story house must have:
 - 3 bedrooms (one of which is a master bedroom)
 - 2 full bathrooms and 1 half bath
 - 1 kitchen (with pantry), 1 dining room, and 1 living/family room
- There must be adequate **closet space** for a family of four. There should be a closet in all bedrooms as well as one near the front door.
- You must include a hot water heater (in the garage), washer, and dryer.
- The total construction cost for the house, land, garage and outside features must be under \$325,000. The cost of the land is \$20,000.
- The quality of construction to be used by the builder will cost \$100 per square foot.
- All houses must fit on a building lot of 88 feet wide by 112 feet deep.
- All houses, not including the garage, must be between 2000 and 2600 square feet.
- There must be side yards that are a minimum of 12 feet on each side.
- The house must be set back from the front at least 20 feet.
- The house must have at least 30 feet of space for the backyard.
- You must use a standard, attached two-car garage that measures 20 feet by 24 feet. The cost per square foot of the garage is half that of the rest of the house.

**BUILDING
SITE
PLAN**



Initial Design Ideas

Where do we start?

Which rooms must or should have windows? The ones you choose below must touch an outside wall.

Kitchen, Dining Room, Living/Family Room, Master Bedroom, Bedroom #2, Bedroom #3, Master Bathroom, Full Bathroom #2, Half Bathroom, Office/Study/Library, Game/Media Room, Foyer/Entryway, Laundry

What should be at the front of the house?

A front door, your garage, and your foyer (or room you walk into upon entering the house)

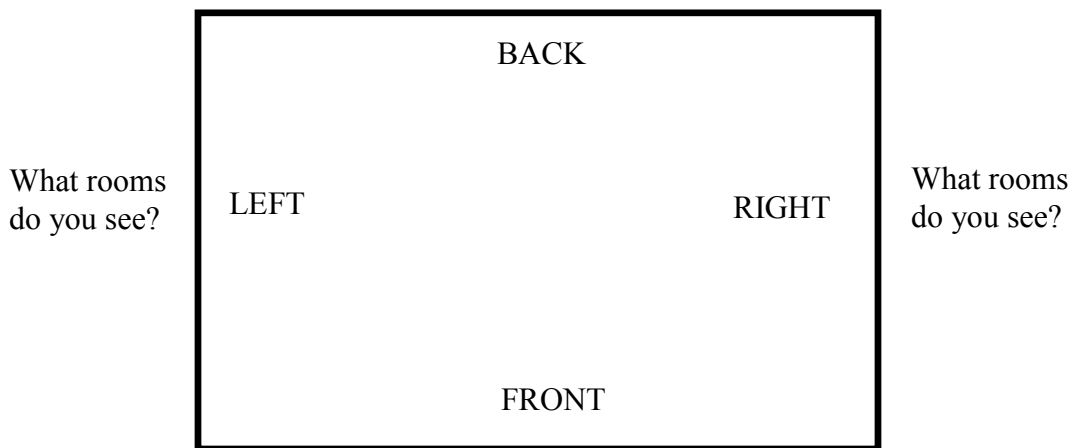
What should be at the back of the house?

A back door (What room will this be off? It needs to be a common area with easy access to all.)

Your house should be at least “two layers” thick. This means no room should be at both the front and back of the house.

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

What rooms do you see?



What rooms do you see?

ARCHITECTURE FINAL PROJECT STEPS & RULES

Bubble Diagram Layout/Rough Copy – use the One-Story Home books to assist you

Decide on the front door and back door location

Make sure that the kitchen, dining room, and living room are close to each other

Which rooms should be located on an outer edge so that they have windows?

What do you see when you walk in the front door?

Approval by teacher then pick up \$20,000 poster board

ROLES: *Select the lead person and back-up on your team for each of the following roles:*

Architect – Assumes the main role for drawing all house items on the graph paper. This person needs to be neat and precise while at the same time they are working with a limited amount of time so they must make decisions quickly. They must also listen to the inspector and contractor to make sure they follow the rules. All students should assume the architect role for at least part of this project.

Building Inspector – Assumes the main role for making sure all rules on this page are followed at all times. This person must be able to remind his or her teammates of the rules and enforce the rules.

Contractor – Assumes the main role of completing cost pages and ensures that the team is staying under budget. This person must be good at all calculations and must work with his or her teammates on designing rooms and features that meet cost guidelines.

Landscape Designer – Assumes the main role for drawing and coloring all outside items on the graph paper such as pools, trees, walkways, fences, and playgrounds.

Real Estate Agent – 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.

Graphics Designer – 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.

Video Supervisor – Leads the recording of a 60 second video highlighting your final project. This person must be good with the Flip Cameras and must plan a well-developed video of their home as if they were trying to sell it to potential buyers.

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

No part of the house within 20 feet of the road, 12 feet of either side, or 30 feet of the back

Don't draw these lines of your paper, but remember not to go over these imaginary lines

Draw driveway and garage

Your driveway can be on either the left or right side of the house.

Starting with the very first thing you draw on your graph paper: NEAT, NEAT, NEAT! You are an **architect** completing this assignment. Sloppy work will hurt your final grade just as a sloppy architect in real life will not be able to sell many of his/her designs.

Use a ruler or a meter stick for all straight lines.

Garage must be standard size (20 feet across by 24 feet deep)

Driveway must be **at least** 14 feet wide.

Draw all other rooms [End of Day 1: A few rooms have been drawn]

Do not try to draw the outside of the house and then try to draw the rooms inside!

Start with rooms close to the garage and connect each new room to an existing room.

How big do we make each room?

- Example dimensions: Look at the dimensions you determined for your real home

- Minimum and maximum room sizes are listed on calculation pages
- Draw lightly so that when you erase it won't leave much of a mark
 A room's longest dimension should not be more than twice the other dimension.
 Write names lightly in the corner to keep track of rooms.
 Use a ruler or a meter stick for all straight lines.
 Make at least one room interesting – not the same old rectangle most rooms will be.
 Front door faces towards the front (street) and back door faces towards the back.
 All bedrooms are near bathrooms.
 Very little 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.
 Needed: Laundry room, hot water heater (in garage), closet space, linen closet (near a bedroom)
 Make an initial estimate at least to determine that your house is under budget and within the correct size range.
 Building codes are met.
 The final house should be between 2000 and 2600 square feet (without the garage).

BUILDING CODES

1. No bathrooms may open to the kitchen.	5. Exterior doors must be at least 3 feet wide.
2. There must be at least two entrances to the house.	6. Closets must be at least 2 feet front to rear.
3. The toilet must have 2 feet 6 inches of clear space side to side.	7. Bedrooms must have at least one window 3 feet by 4 feet or larger as a fire escape.
4. All living areas must have a window. (Bathrooms, halls, closets, and garages are not living areas).	8. Interior doors, except for closets, should be at least 2 feet 6 inches wide.
9. 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. Code requires only one outlet in the bathroom.	

[End of Day 2]

Draw doors and eliminate walls (if necessary)

-
- Use templates to draw all doors – **see teacher for directions**
 Building codes specify the size of exterior and interior doors
 Front door opens **into** the house and back door also opens **into** the house
 Most doors open **into** the room in which you are going, except for closets
 No doors to get into the kitchen, living room, dining room (just openings)
 Doors required for bathrooms and bedrooms
 Write the dimension of each door – see teacher for examples

Draw wall thickness and windows – check examples

-
- Exterior walls are 6 inches thick and interior walls can either be 4 or 6 inches thick.
 Windows have dimensions listed next them.
 Windows must meet building codes and their area should be 10-15% of the area of the house.

[End of Day 3]

Draw sinks, toilets, hot water heater, washer, dryer, kitchen appliances, etc.

Use templates to draw all items.

Toilets must meet building code.

All items have specific sizes – if you are not sure of the size ask your teacher.

Hot water heater = 24" circle

Plenty of counter space in the kitchen in addition to the range, refrigerator, dishwasher, sink.

Fireplaces, if you want one, should be included in a common area (such as the living room).

Draw outlets, lights, switches, etc.

Use templates to draw all items

Lights are circles on the templates (use "8" circle)

Outlet circle size is shown on the template

Electrical outlets must meet building code

Follow all electrical contractor rules (Architecture 7A) for outlets, lights, and switches

Fluorescent lights go in the garage and kitchen and they are 4 feet long

Some appliances require special outlets (refrigerator, washer, dryer)

The vast majority of rooms **will only require one overhead light/fan.**

[End of Day 4]

Draw names on all rooms

All room names should face toward the street (small rooms may be written vertically)

All room names must be written neatly and in capital letters

All letters should be no more than one square high

One person should write all room names so that they look similar

List the dimensions of each room

List the width (across) first, then the length (up and down)

Example: 16 x 20 or 16⁰ x 20⁰

For rooms that are not perfect rectangles, use the dimensions for the majority of the room

Draw features outside the house

See Outside Features page for choices

All straight edges drawn with meter sticks or rulers

All items drawn using templates, when available, or very neatly

Outside features should make your final project look even better, not distract from the house

Write the name on all outside features (same name requirements as names of rooms)

A fence must be at least a foot from your official property line.

Gates must be at least 3 feet wide.

Sidewalks should be 4 to 5 feet wide. Pathways may be 2 to 3 feet wide.

All backyard pools require a fence between the pool and the front yard. Usually this is the fence on the side of your house, but you could also place the pool within a fence.

Pools are not allowed within 10 feet of the house.

[End of Day 5]

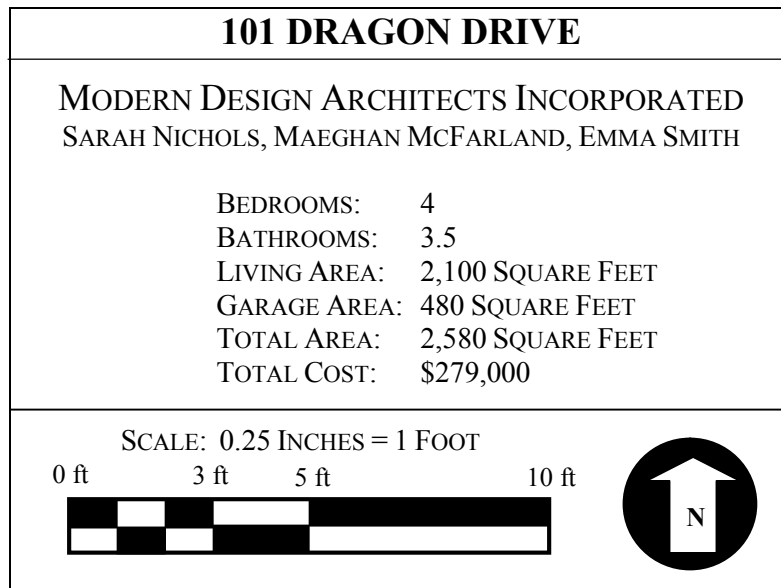
Completing recording sheets

Inside area and cost calculations

Outside calculations
Mortgage calculations
Energy/flooring/paint heating calculations
Calculations summary page

Draw summary box (see example page) – All caps and neat

The example below is of the architectural box which should be drawn near one corner of your design. This box should be drawn NEATLY (ruler) and all wording should be in capital letters. Have your north symbol point the direction you choose. Think about the sun rising in the east and which rooms will get sunlight at different times during the day.



[End of Day 6]

Final check of requirements page

Review this page to make sure all rules have been followed

Complete Home Listings Page & Design Company Logo

The home listing page is available for download from Mr. Mangham's website
The company logo should follow guidelines on the logo page.
The logo must be hand drawn on a piece of computer paper.
The page should also include the entire company's name.

Complete 60 Second Video Showcasing Your Final Project

[End of Day 7]

1.	Area of house without garage	
2.	Area of house with garage	
3.	Cost of house (without garage, land, or outside features)	
4.	Cost of house and garage (without land or outside features)	
5.	Cost of house, garage, and land (without outside features)	
6.	Cost of outside features	
7.	Final price (5+6)	

8.	Down payment on house	
9.	Monthly mortgage payment (30 years)	
10.	Monthly taxes	
11.	Monthly insurance	
12.	Total monthly cost	
13.	Yearly income needed to buy this house	

14.	Area of house without garage	
15.	Area of all windows	
16.	Window percentage (nearest tenth of a percent)	
17.	Cost of tile (bathrooms)	
18.	Cost of vinyl (kitchen)	
19.	Cost of carpet (rest of the house)	
20.	Area of all inside walls	
21.	Gallons of paint needed (rounded up to nearest gallon)	
22.	Volume of house	

Room name	Minimum Area	Maximum Area	X *	Width ↔	Length ↕	Area	Cost
Kitchen	130 ft. ²	260 ft. ²					
Dining Room	140 ft. ²	280 ft. ²					
Living/Family Room	230 ft. ²	460 ft. ²					
Master Bedroom	180 ft. ²	360 ft. ²					
Bedroom #2	110 ft. ²	220 ft. ²					
Bedroom #3	110 ft. ²	220 ft. ²					
Master Bathroom	80 ft. ²	160 ft. ²					
Full Bathroom #2	50 ft. ²	100 ft. ²					
Half Bathroom	20 ft. ²	50 ft. ²					
Office, Study, or Library	80 ft. ²	200 ft. ²					
Game or Media Room	140 ft. ²	320 ft. ²					
Foyer/Entryway	16 ft. ²	32 ft. ²					
Laundry	30 ft. ²	60 ft. ²					
Total closet space not included in other rooms							
All rooms not included above							
Total hall space not accounted for elsewhere							
Entire living area (house without garage)	2000 ft. ²	2600 ft. ²					
Garage				20 ft.	24 ft.	480 ft. ²	\$24,000
***** Total of living area and garage *****							
Land				88 ft.	112 ft.	9,856 ft. ²	\$20,000
***** Grand total inside cost *****							

* For rooms that are not rectangles, place an X in the column above. For width and length, measure the majority of the room. Calculate the exact area of the room (it will not be the listed width x the listed length).

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.

ITEM	Cost	Typical Dimensions	Our Dimensions Or Area	Cost
LANDSCAPING				
Trees/Bushes	\$3000 (all the trees/bushes you want)			
Garden	\$10 per square foot			
Pond	\$25 per square foot			
Stone or Brick Pathways or Walkways	\$1000 per every 10 linear feet	3 feet wide		
Fencing	\$25 per linear foot (Not needed on property line)			
FUN AND GAMES				
Swimming Pool	\$12,000 + \$30 per square foot	Max: 18 ft. by 36 ft.		
Tetherball Court	\$500	10 ft. diameter		
Trampoline	\$500, \$750, \$1000, \$1500	8, 10, 12, or 14 ft. diameter		
Hot Tub	\$3000, \$4000, \$6000, \$8000 + cost of deck (required) around hot tub	5, 6, 7, or 8 ft. diameter		
Horseshoe Court	\$500	6 ft. by 50 ft.		
Mini-Basketball Court	\$10 per square foot	Min: 14 by 18 ft. Max: 25 by 40 ft.		
Mini-Volleyball Court	\$6000	15 ft. by 30 ft.		
Sandbox	\$10 per square foot	12 ft. by 12 ft.		
DETACHED BUILDINGS				
Utility Shed	\$10,000	10 ft. by 12 ft.		
Trash Can Shed	\$2500	3 ft. by 5 ft.		
<i>more ideas on the back.....</i>				

ITEM	Cost/Dimensions	Typical Dimensions	Our Dimensions Or Area	Cost
ATTACHED TO THE HOUSE				
Wheelchair Ramp	\$300 per linear foot	4 feet wide		
Patio/Deck	\$40 per square foot			
Porch (enclosed with screens)	\$70 per square foot	8 ft. by 14 ft.		
Porch (open)	\$25 per square foot	24 ft. by 16 ft.		
Greenhouse	\$200 per square foot	6 ft. by 10 ft.		
Sunroom	\$250 per square foot	6 ft. by 10 ft.		
LANDSCAPE ACCESSORIES				
Garden Arbor	\$20 per square foot			
Hammock	\$150	10 feet long		
Outdoor Fountain	\$1500 \$4000	6 ft. by 8 ft. 10 ft. by 13 ft.		
Benches	\$600 for 3 linear feet \$100 for each additional foot	2 feet wide		
Picnic Table with Chairs	\$1000 for 5 feet \$100 for each additional foot	3 feet wide		
Low-Voltage Landscape Lighting	\$2500 for first 4 lights \$750 for additional 4 lights			
ADDITIONAL ITEMS				
***** Grand total outside cost *****				

BUYING A HOME - MORTGAGE CALCULATIONS

For all calculations on this page, **round to the nearest dollar.**

LOAN – A lender, such as a bank, agree to lend the home buyer an amount equal to the difference between the down payment and the full purchase price of the home. The amount of the loan is called the **principal**. If the home costs \$300,000 and the buyer pays a 20% down payment of \$60,000, the principal is \$240,000.

Home Loan Calculation

Final Price	Down Payment = 20% • Final price	Principal

MORTGAGE TERM and APR – The **term** is length of the loan. Longer mortgage terms have lower monthly payments. Shorter mortgage terms result in lower total costs. **APR** stands for Annual Percentage Rate. This refers to the amount of interest you must pay for borrowing money. For this project you will use a **fixed-rate mortgage**, meaning the rate will stay the same the entire time. While rates are currently low, an average mortgage rate over the last 20 years is about 6%.

Mortgage Payment Calculation

Principal	Loan term	Multiply price by...	Monthly Mortgage Payment @ 6% APR
	15 yr.	0.0084	
	30 yr.	0.006	

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

Final Price	Tax Rate	Yearly Taxes = Price • Tax Rate	Monthly Tax
	0.023		

(continued on the back)

INSURANCE – 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	Yearly Insur. = Price • Insur. Rate	Monthly Insurance
	0.006		

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

PITI Payment Calculation

Monthly Mortgage (30 yr.)	Monthly Property Tax	Monthly Insurance	TOTAL (PITI)

INCOME NEEDED – Banks use formulas to determine if a person qualifies for a loan based on their income. It is mostly based on family monthly 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

PITI Payment	Bank Rule of Thumb	Monthly Income = $\frac{\text{Monthly Cost}}{0.30}$	Yearly Income Needed To Buy This House
	Payment = 30% of income (Maximum)		

Energy Efficiency Study

Area of our house (not including garage)	Area of all windows	Window Percentage $\frac{\text{Area of windows}}{\text{Area of house}} \cdot 100$ <i>(round to the nearest tenth)</i>

Windows are major source of heat loss in the winter and heat gain in the summer. The area of the windows should 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

Total square footage (not including garage):								
Tile (Bathrooms)			Vinyl (Kitchen)			Carpet (Rest of house, except garage)		
Square Feet	Unit Rate	Price	Square Feet	Unit Rate	Price	Square Yards	Unit Rate	Price
	\$4.00/ft. ²			\$3.00/ft. ²			\$26.50/yd. ²	

Paint Calculation

Area of all walls (add together the perimeter of each room, then times 8 [8 ft. walls])	Area covered by a gallon of paint	Gallons of paint needed (round up to the next whole gallon)
	300 ft. ²	

Heating System Calculation

Area of house (not including garage)	Average height of ceiling	Volume of house
	8 ft.	

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

1st and 2nd period	Group
101 Dragon Drive	
103 Dragon Drive	
105 Dragon Drive	
107 Dragon Drive	
109 Dragon Drive	
111 Dragon Drive	
113 Dragon Drive	
115 Dragon Drive	
117 Dragon Drive	
119 Dragon Drive	

3rd and 4th period	Group
202 Southlake Street	
204 Southlake Street	
206 Southlake Street	
208 Southlake Street	
210 Southlake Street	
212 Southlake Street	
214 Southlake Street	
216 Southlake Street	
218 Southlake Street	
220 Southlake Street	

7th and 8th period	Group
301 Carroll Court	
303 Carroll Court	
305 Carroll Court	
307 Carroll Court	
309 Carroll Court	
311 Carroll Court	
313 Carroll Court	
315 Carroll Court	
317 Carroll Court	
319 Carroll Court	

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.



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

Big Ten Conference

From approximately 1949 until 1990, the Big Ten consisted of 10 member schools. Then it added Penn State into the Conference. The "Big Ten" name stayed the same, but a logo was crafted to reference this addition by planting a number "11" in the negative space. (Look closely at the blue space surrounding the letters "G" and "T" in the left logo.) However, the conference recently revealed an even newer logo to be used beginning with the 2011-12 academic year (shown right). The lettering includes an embedded numeral "10" in the word

"BIG" and is built on the conference's iconic name, but this time without any reference to the number of member institutions



AP

Toblerone

In 1908, in Berne, Switzerland, Theodore Tobler and Emil Baumann (Tobler's cousin), developed a unique chocolate, consisting of a special recipe and a triangular shape. But it wasn't until 1970 that the Matterhorn mountain image appeared on the packaging for the first time. Today there is a bear (symbol of the city of Berne, where Toblerone is produced) hidden in the modern version of the Matterhorn mountain logo.



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."



AP

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. The initial version of the logo had the sides oriented horizontally and vertically, but it was subsequently redesigned so as to appear to stand on one corner.



AP

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.



Getty Images

IBM

According to the IBM Archives, in 1972 the IBM international recognition logo was adopted and remains the official logo still in use. The IBM logo is easily recognized by the distinctive eight stripes that make up the letters IBM. The horizontal stripes are intended to suggest "speed and dynamism."

On your drawing place the following symbols in the door space and outside of the windows. The number you place in the symbol will relate to the number in the schedule below. From this schedule, people can determine the characteristics of your doors and windows.

Doors:



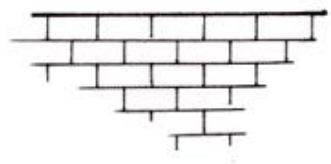
Windows:



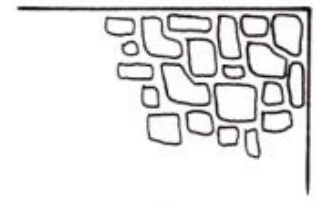
Example of a Door and Window Schedule

DOOR SCHEDULE			
Number	Description/Size	Quantity	Remarks
1	16'-0" x 8'-0"	1	Garage Door
2	3'-0" x 8'-0" x 1'-3/4"	2	Exterior Doors
3	2'-6" x 6'-8" x 1'-3/4"	10	Interior Doors
4	2'-8" x 6'-8" x 1'-3/4"	4	Closet Doors
5	3'-2" x 6'-8" x 1'-3/4"	1	Master Bedroom Closet Door
WINDOW SCHEDULE			
1	4'-0" x 6'-0"	5	Insulated Glass
2	4'-0" x 3'-0"	3	Insulated Glass
3	3'-0" x 1'-0"	2	Insulated Glass
4	5'-0" x 3'-0"	4	Insulated Glass
5	6'-0" x 4'-0"	1	Insulated Glass
6	6'-0" x 8'-0"	1	Insulated Glass
7	4'-0" x 4'-0"	1	Insulated Glass

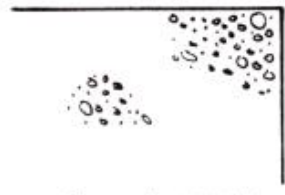
Decks and patios



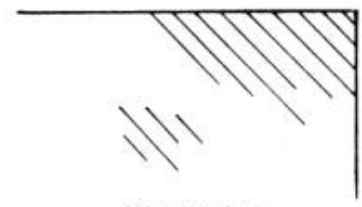
Brick



Stone



Exposed aggregate



Wooden deck



This is an example of your house flyer.
 You are to make up the "For More Information Section". Make sure it fits on one page.

**101 Dragon Drive
 Southlake, TX 76092**

\$319,930

Bedrooms	4 bedrooms
Bathrooms	3.5 Baths
Area of house without garage	2,550 square feet
Area of house with garage	3,030 square feet
Cost of house, garage, and land	\$288,600
Cost of outside features	\$31,330
Lot Size	88 feet by 112 feet

Listing Agents: Sarah Nichols, Maeghan McFarland, Emma Smith

Description

This section should include a well thought-out description of your house that matches your actual plan. It should be at least 8 sentences long. Adjust font size if it does not fit on one page.

Come and buy our finely furnished stone house with lush vegetation, a beautiful pool, an entrancing garden, incredible walkway and plenty of room for the whole family. Also a Jack and Jill bathroom for the kids, game room, and a big yard to play in. There is also a little office for the parents to work in, a quiet place, a fascinating library, or anything else you would like....

SPELLING COUNTS.

Use many good adjectives.

Describe at a minimum: the kitchen, living room, master bedroom, outside features.

Main Features

Year Built	2011	Down payment required	\$63,986
Garage	2 Car, Attached	Monthly mortgage	\$1,536
Pool	Yes	Yearly Insurance	\$1,920
Floors	1	Yearly Taxes	\$7,359
Full / Half Bath	3 / 1	Window Percentage	10.8%
School District	Carroll ISD	Coollest Room	Kitchen
County	Tarrant	Best Landscape Feature	Garden

Key Room Dimensions

Living Room	14' by 17'	Master Bedroom	28' by 15'
Dining Room	13' by 15'	Bedroom #2	14' by 13'
Kitchen	18' by 12'	Bedroom #3	15' by 14'

For more information call 817-555-1212 or
 visit our website www.houseforyou.com

**000 Dragon Drive
Southlake, TX 76092**

\$000,000

Bedrooms	
Bathrooms	
Area of house without garage	
Area of house with garage	
Cost of house, garage, and land	
Cost of outside features	
Lot Size	88 feet by 112 feet

Listing Agents:

Description

Main Features

Year Built	2011	Down payment required	
Garage	2 Car, Attached	Monthly mortgage	
Pool		Yearly Insurance	
Floors	1	Yearly Taxes	
Full / Half Bath		Window Percentage	
School District	Carroll ISD	Cooler Room	
County	Tarrant	Best Landscape Feature	

Key Room Dimensions

Living Room	14' by 17'	Master Bedroom	28' by 15'
Dining Room	13' by 15'	Bedroom #2	14' by 13'
Kitchen	18' by 12'	Bedroom #3	15' by 14'

For more information call 817-555-1212 or
visit our website www.houseforyou.com

1.	Describe your main role(s) for the final project.			
2.	What do you feel your greatest contribution was in the completion of the project?			
3.	List and give examples of three specific mathematical concepts (6 th grade or higher) that you learned/reinforced and where you used them during the architecture project.	1.	2.	3.
4.	Were you satisfied or dissatisfied with your performance as you were doing this project? Explain.			
5.	What was the major problem that your group encountered and how did you all go about solving it?			
6.	If you had the opportunity to redo the project, what are 2 specific changes that you would make?			
7.	What aspect did you enjoy the most while doing the project and why?			
8.	Do you feel you and your teammates all “pulled their weight” and made significant contributions to the final project? If you divide up 100 points based on contributions to the project, how many points do you give to yourself and your other team members?			
9.	Do you have any additional comments about this architecture project?			

House Cost:	Garage + Land Cost: \$44,000	Outside Cost:
TOTAL COST:		BUDGET: \$320,000

Final House Design (Livability, Mathematical Accuracy)			32 points
Driveway & garage	Correct architecture symbols	House flows, open spaces, etc.	Counter space in kitchen
Doors in right places and open correctly	At least one interesting shaped room without all right angles	Room names and sizes listed appropriately	Special outlets for refrigerator, washer, dryer
All bedrooms are near bathrooms	Minimum room sizes met	Correct architectural sizes used	Not too many lights in one room
Building codes followed 1 2 3 4 5 6 7 8 9	W/D, HWH, refrigerator, range, dishwasher, sinks and toilets	Lights, outlets, switches are drawn and correct sizes	Any halls you do have should be 3 or 4 feet wide after wall thickness
Very little hall space	Closet space	No doors to kitchen, living room, dining room	Walls are appropriate thickness
House built in appropriate space	Windows and doors have sizes listed	Required doors for bedrooms and bathrooms	Under budget

Landscape Design			10 points
Interesting structures	Flows well	Not too many items	Coloring is neat and enhances the landscape
Correct symbols used	All items drawn to scale	Items labeled	

Professional Final Product & Summary Scale Box			10 points
Rulers used for all straight lines	Lettering correct size and all caps	Names on all rooms facing toward reader	Dimensions listed on each room
Templates used as for all appropriate items	No major rips, tears, eraser marks or other marks	Writing is neat	Spelling is correct
Scale listed	Architect company and individual names listed	Rooms, area, and cost listed and accurate	Walls shaded neatly

Indoor, Outdoor, and All Cost Calculations			20 points
Arch 8B – Indoor (10)	Calculations correct	Neat, professional, legible	
Arch 8C – Outdoor (3)	Calculations correct	Neat, professional, legible	
Arch 8D – Mortgage (4)	Calculations correct	Neat, professional, legible	
Arch 8E – Energy, Heating, etc. (3)	Calculations correct	Neat, professional, legible	

Home Flyer			8 points
Interesting, informative paragraph	Calculations correct Address shown/Dimensions shown	Neat, professional, legible	

Team Logo			6 points
Neat, professional, legible	Architecture looking or geometric concepts	Appropriate use of color	

Dream Home Video		4 points
High quality	Shows many good aspects of the home and the overall project	

Project Analysis Page/Team Contribution			10 points
Evidence of mathematical learning	Contribution to final project	Teamwork and flexibility	

ARCHITECTURE PROJECT AWARDS

The Home Depot Best Landscape Design Award

The Marti Giffin Best Descriptive Home Flyer Award

The Kelsey Lewin Most Creative New Design Award

The Regan Klein Most Interesting Room Award

The Emily Trammell Best Use of Color Award

The Gary Brake Most Professional Final Design Award

The James Chiu Logo Award

The Stephen Hoag Best Overall Video Award

The Mangham/Underwood "I Would Buy Your House" Award of Excellence (Best Overall)

ARCHITECTURE PROJECT AWARDS

Team/Person Making this Evaluation: _____

For each award you can give up to 3 places. If you want you can just give 1st place, or 1st and 2nd place.

Write the number part of the address in the boxes below based on which home you feel deserves the award. Example: 102 or 203 or 306

	1st place	2nd place	3rd place
Landscape Design Award (Best design and outside items)			
Home Flyer Award (Most descriptive)			
Home Creative Design (Most creatively designed house)			
Most Interesting Room Design (Most creatively designed room)			
Best Use of Color Award (Neat and appropriate)			
Most Professional Looking Award (Everything is neat and precise)			
Best Logo Design (Uses architecture theme, geometry, use of color)			
Best Overall Video			
Best Overall House (Combination of all items above based on what you feel is most important)			

ONCE IN A LIFETIME OPPORTUNITY!

OPEN HOUSE DESIGN EXPO 2011

(Well, technically we should call this “Open Houses”.)

Over 20 newly built homes on display!

<u>HOME DESCRIPTIONS</u>	<u>CONSTRUCTION & DESIGN</u>
<p>Price range: \$250,000-\$325,000 Addresses: Various addresses on: <i>Southlake Street</i> <i>Dragon Drive</i> <i>Carroll Court</i> Type: Single Family Homes Square Ft: 2,000-2,600 sq. ft. Extras: Pools Basketball courts Walkways Decks and hot tubs</p>	<p>These homes have been designed by the architects of the future. They include all of the amenities that you expect plus some of which you have only dreamed. In addition, landscape designers have made the grounds around your home fit for a king!</p> <p>Our homes are thoroughly inspected to conform to all local building codes. The designs maximize your living space to give you the most for your hard-earned dollar.</p>
<u>YOUR HOME-BUYING TEAM</u>	<u>WHERE AND WHEN</u>
<p>While we have hired some of the best architects in the business, we know that you also deserve personalized attention from our real estate agents. Your personal team includes:</p> <ul style="list-style-type: none">•••	<p>Come see all the newly designed homes and visit with our team of 75 architects, building inspectors, landscape designers, and real estate agents.</p> <p>Where: Durham Intermediate School Sixth Grade Hall</p> <p>When: March 26th</p> <p>Times: 6:15pm-7:15pm</p> <p>Who: Open to parents, grandparents, siblings, and friends of the family</p> <p>Need more information: Contact Lance Mangham at Lance.Mangham@southlakecarroll.edu</p>

The Top 12 Questions To Ask Your 6th Grade Architects, Building Inspectors, and Real Estate Agents

1. Is your house drawn to scale? If so, what was the scale that you used?
2. How did you decide where all the rooms would go?
3. Where on the property were you allowed to build the house?
4. What are building codes and what are some examples of how they affected your final project?
5. Could your house be as big as you wanted?
6. How did you determine the overall cost of the entire house?
7. How did you decide on where to place things like lights, switches, and outlets?
8. How did you know how big to make each room?
9. What activities did you complete before this project that helped you design your house?
10. What would you do differently next time if were to design another house?
11. Could you put anything you wanted outside or were there rules there as well?
12. How did you decide on your team name and logo?

A note from Mr. Mangham:

The students did an outstanding job in designing their dream home while at the same time being required to follow many rules and regulations. The students completed mini-projects including:

- Sketching a scale drawing of a room at school and at home
- Converting a scale drawing to its real-life length, width, and area
- Taking a close look at their own home to determine room sizes and many different attributes such as light switches, fans, doors, etc.
- Creating a 3D model to scale of a small apartment
- Computing statistics (mean, median, mode) of real-life homes in Grapevine
- Drawing an isometric model of their 3D apartment
- Tackling the role of building inspector and looking for violations in a model home
- Analyzing a cabin to determine where electrical outlets, light switches, and lights should be placed
- Calculating the number of 2 by 4's (studs) required to build a cabin
- Completing this culminating project while incorporating all of the above!!!

Congratulations to each and every student for completing this demanding project. I hope that they were able to see a number of real-world, everyday uses for the math that we learn.

Interior Redecorating Project

Goal: To apply your geometry and measurement skills in the area of architecture. For this project, you will become an interior decorator. You will be redecorating your bedroom. You will be making many measurements, utilizing several mathematical formulas, and determining the total cost to redecorate your bedroom.

PART 1: Measuring your bedroom

This project begins by measuring the following lengths in your bedroom.

Record all answers to the nearest inch.

		Measured in feet and inches	Converted to only inches
1.	Length of floor (long side)		
2.	Width of floor (short side)		
3.	Height of ceiling		
4.	Number of windows		
5.	Height of window #1		
6.	Width of window #1		
7.	Height of window #2 (if applicable)		
8.	Width of window #2 (if applicable)		
9.	Height of bedroom door		
10.	Width of bedroom door		
11.	Height of closet door		
12.	Width of closet door		

PART 2: Making a scale model of your room

Using the same standards we discussed in class, create a scale drawing of your room. Use the scale of one-quarter inch equals one-half of a foot (2 boxes per foot). Include all important architectural symbols (lights, switches, fans, outlets, windows, etc.) Then, just as we created a 3D model in class, add the walls along with doors and windows to create a mini-model of your room.

PART 3: Finding the area and perimeter of your room

Complete the following table to determine the area and perimeter of various aspects of your bedroom. **Show all steps (including formulas directly on this page).**

1.	Perimeter and area of the bedroom floor
2.	Perimeter and area (minus any windows) of wall #1
3.	Perimeter and area (minus any windows) of wall #2
4.	Perimeter and area (minus any windows) of wall #3
5.	Perimeter and area (minus any windows) of wall #4
6.	Perimeter and area of window #1
7.	Perimeter and area of window #2
8.	Perimeter and area of front of door

PART 4: Determining the amount of materials you need

Use your calculations to fill in the measurement column. To determine some of the items you will need to visit a home improvement store such as Home Depot or Lowe's (or visit their websites).

1.	Floor Tile - Start with the area of your floor. Based on the number of tiles in a box (and their size) determine how many boxes of tiles you will need. Show all work below. Label all numbers.
2.	Carpet - Start with the area of your floor. Determine the number of square yards of carpet you will need. Show all work below. Label all numbers.
3.	Paint - Start with the total area of the walls. Determine the number of gallons of paint you will need. Show all work below. Label all numbers. If you do not have a better estimate use 1 gallon covers 300 square feet.
4.	Wallpaper - Start with the total area of the walls. Determine the number of rolls of wallpaper you will need. Show all work below. Label all numbers.
5.	Baseboard Trim – Start with the perimeter of the floor. Determine the number of baseboards you will need. Label all numbers.
6.	Window Trim – Start with the perimeter of the windows and doors. Determine the number of boards you will need. Label all numbers.

PART 5 – Filling out your order form

Complete the following order form.

MANGHAM'S DECORATING CENTER
123 Main Street
Grapevine, TX 76051

Customer Name: _____

On my floor, I wish to use (circle one): TILE CARPET

On my wall, I wish to use (circle one): PAINT WALLPAPER

Based on your selections, complete your order. Use prices that you locate online or at a store.

TOTAL COST			
FLOORING COST			
1.	TILE	Cost per box	# of boxes
.....or.....			
1.	CARPET	Cost per yard	# of yards
WALL COST			
2.	PAINT	Cost per gallon	# of gallons
.....or.....			
2.	WALLPAPER	Cost per roll	# of rolls
BASEBOARD TRIM COST			
3.	BASEBOARD TRIM	Cost per board	# of boards
WINDOW TRIM COST			
4.	WINDOW TRIM	Cost per board	# of boards
*** GRAND TOTAL COST ***			

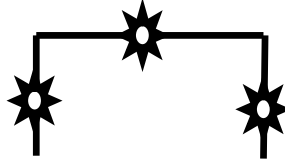
Attach the description of the materials that you used for this project. This could be a printout from a website or a handwritten description from the stores you visited. An example for wallpaper would be, "I found purple wallpaper with pink polka dots at Home Depot. The cost was \$7.69 per roll and each roll contained 50 square feet of wallpaper."

FUTURE MATERIAL

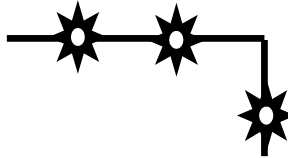
KITCHEN

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.

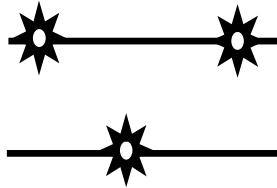
A U-shaped kitchen with the sink in the middle and the refrigerator and stove on opposite sides.



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 Details:

Sink: You need 2 ft. of work area on both sides.

Stove: You need 1 ft. 6 in. work area on either side, 3 ft. 6 in. in front.

Refrigerator: You need 1 ft. 3 in. of counter space on an open side.

Dishwasher: You need 3 ft. 6 in. in front.

A pantry is for storage off of the kitchen.

BEDROOM

Dressing area in front of closet: 4 ft.

Walking path: 2 ft. 6 in.

Twin size bed: 39 by 75

Full (Standard): 54 by 75

Queen: 60 by 80

King: 76 by 80

Chicago Architecture Handbook

<http://www.architecture.org/archhandbook/index.html>

Website with links to good resources:

<http://catalog.socialstudies.com/c/article.html?article@INT939R>

Online floor plans:

Now, look for plans:

[HDA](#) (With Free Cost to Build Feature - Using a General Contractor)

[Better Homes and Gardens](#) (With Free Cost to Build Feature - Using a General Contractor)

[Larry James Designs](#)

[Houseplans.com](#)

[Coolhouseplans.com](#)

[America's Best House Plans](#)

[Familyhomeplans.com](#)

[Associated Designs](#)

[Homeplangroup.com](#)

[Designconnection.com](#)

[Architectural House Plans](#)

[Original Home Plans](#)

[Sun Plans](#)

Maximum capacity of home (from rate unit) for big parties

Additional home costs:

Water/Trash

Phone

Electricity

Gas

Internet

To furnish a house = 10% of the cost of the house

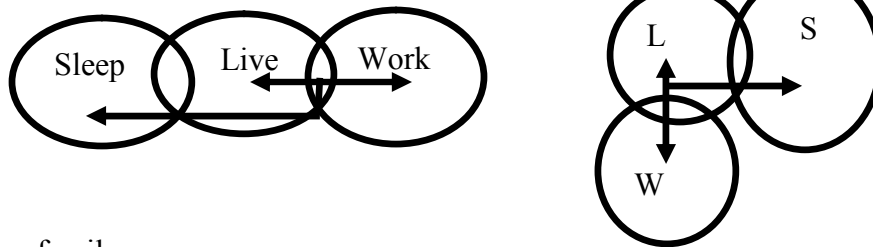
Outside: Lights and outlets

Circled number near the door that refers to a table known as a door schedule on which you will find the dimensions of the door.

Foyer closet

Walk-in closet – at least 7 feet long

Flow diagram:



Live: living, dining, family

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

Sleep: bedrooms, bath, storage, halls, utility

Entryway: like a center hallway, all 3 main areas should have access, at least 4x4, walled off or set off by room dividers

Living room: needs to be deadended, isolated from sleeping area, accessible to dining area, 300 sqft

Family room: logical extension of kitchen, watch TV, eat, drink, 240 sqft

Foyer – entryway from the front door to the interior of the house, coat closet placed along one wall

Living Room – near dining, kitchen, central location, usually on the back of the house, opens to a deck/patio,

Family Room – away from sleeping area, watch TV, day-to-day living

Den/Home Office – study, read, write, computer

Recreation Room – pingpong, pool, parties

Dining Room – near kitchen, guests can reach it without going through kitchen

Bedrooms – together in one end of the house or split plan (master bedroom some distance away)

Bedroom: two windows

Closets or storage areas are often located on halls

Footprint library: use to show how big tables, chairs, other things are on the graph paper. Measure the object and then draw it to scale on the paper. Draw the “footprint” or shadow the item would make if you shined a light directly over it. (You could start by just drawing 3 feet by 6 feet, 5 feet on each side, 2 feet by 15 feet)

Living Spaces:

Entry space: 3 ft. 6 in.

Major walkway: 3 ft.

Conversation area: 10 ft. diameter

Closet depth: 2 ft.

Stair width: 3 ft.

Review of area and perimeter

1. Take your ruler and measure the L and W of your desk in inches.
2. What is the perimeter of the desk?
3. What is the area of the desk?
4. Draw a circle with a radius of 1 inch.
5. What is the circumference?
6. What is the area?
7. It is said that from the tip of one’s thumb to the joint in the middle of the thumb is the “human inch”. How close in your inch to an actual inch?
8. A rectangle has a perimeter of 34 feet and an area of 60 sq. feet. What are its dimensions?

Determining how many square inches are in a square foot.

Creating a Beautiful Classroom

1. What are the dimensions of the classroom?
2. How high is the ceiling?
3. What are the dimensions of each of the four walls?
4. How high is the doorway?
5. How wide is the doorway?
6. If there are some, what are the dimensions of the window(s)?
7. If we recarpet the room, how much carpet (square feet) do we need?
8. If we repaint the room, what areas will not need paint?
9. If we are going to repaint the room, how much paint would we need? (A gallon covers 300 sq. ft.)
10. What other dimensions could give us a classroom with an area almost equal to our current area?

Complete the same project above with a room at home.

Cabinets are shown by a dashed line on the area which they will be placed.

Why is it called a blueprint? The blueprinting process uses sunlight to print an image onto sensitive paper and ammonia to develop the image so it is readable. The ammonia causes the blue color.

Use paper cutouts of the rooms before you draw them. Create cutouts for the class somehow?

Possibility of using black pen on final copy?

Read Goldilocks and the Three Bears to consider the architectural side of the story, with the house having doors and windows “just right,” as well as furnishings.

Read The Three Little Pigs noting the influence of architecture.

Architecture has a big influence on each of us. It is our built environment.

What are all the ways houses make you more comfortable? How many natural animal houses have you seen?

Visit the zoo. Look at habitats. Observe how architects control crowd movement and specialize buildings for people and animals. Make a diagram of such movement.

Think about city planning and how bridges, streets, fences, freeways, parks, landscaping rivers, and buildings affect those plans.

Go to an amusement park and see how architecture is necessary for fun.

According to ancient Greek mathematicians, a ratio refers to a quantitative comparison of like things, but proportion refers to the equality of those ratios – a constant relationship that exists between ratios.

A photograph of you is to scale. Even though it is small, it looks just like you.

What are all of the things you would want to handle, improve, and provide if you were the architect beginning a new city? How would you make a city that had unity, order, and harmony in design, yet interesting variations?

Concerns of city planning: beauty of spaces, water supplies, safety, recreation, entertainment, play areas, transportation, green belts, education, churches, hospitals, museums, shopping, banking, hotels, garbage removal and disposal, burial system, energy efficiency. Make a plan for a small city. Be aware of traffic flow.

Landscape architects deal with the green side of design. They specify flowers and trees, they plan for fountains, creeks, and ponds. They plan walkways and vistas. They beautify the setting for the buildings being planned. They control the natural forces at work on the property.

Good design creates value. You will find that buildings or homes with beautiful grounds – streams, ponds, trees, and flowering springs – sell first and they sell for the most money. Why? Because we are all naturally inclined to love beautiful landscape.

A dining room has dimensions of 18 by 16 feet and is 8 feet high. Find the total area of the walls, floor, and ceiling, allowing 120 square feet for windows and the door. If one gallon of paint covers

360 sq. feet with one coat, how many gallons will be needed to cover the walls, floor, and ceiling with two coats? Round your answer to the nearest gallon. If one gallon of paint costs \$9.85, how much will all this cost?

Supposed the air-conditioning system in your bedroom moves 800 cubic feet of air per minute. How long will it take to replace the air in your bedroom?

Find the volume of your refrigerator. Then build a model of it using our normal scale.

Find out the dimensions of a pool table. Then build a model of it using our normal scale.

Building a 3D model hints:

Use foil for walls to add a mirror effect

Invite art teacher to help teach how to build

Foam board as the base, glue the blueprint to the foam board

Set up the rooms before adding walls

X-acto knife for cutting

Glue walls and all other objects

Make doors that open and close

Make removable walls

Make a scale size man and woman to put in the front door

Make walls with thinner board (illustration board)

Work inside out

Utility bills (2008) – electricity, natural gas, telephone, internet, and cable TV per month.

LA	234.81
Denver	238.43
Seattle	240.63
Orlando	249.15
San Fran	260.79
San Diego	262.64
Wash, DC	267.74
Chicago	283.05
Atlanta	286.63
NY	290.38
Boston	309.35
Philadelphia	315.66
Phoenix	318.59
Baltimore	358.79
Houston	374.46
Dallas	378.27
US average	289.86

Highest Median Household Incomes for cities with a population of at least 20,000

Southlake, TX	172,945
Darien, CT	160,274
Los Altos, CA	158,745

McLean, VA	156,292
Potomac, MD	154,370
Montgomery, NJ	153,000
University Park, TX	151,418
Lake Forest, IL	150,670
Colleyville, TX	148,789
Westport, CT	147,391

National Survey

What is most important about your home?

It's comfortable	47%
It's clean and safe	22%
I like the location	16%
It's well-decorated	11%
It has great curb appeal	4%

Which of these upgrades would make you happiest?

State of the art kitchen	30%
High-tech family room	25%
Finished basement	17%
Spa-like bathroom	16%
Luxurious bedroom	12%

Which best describes your home?

Not too messy, a little clutter	75%
A total wreck	13%
Pristine, nothing out of place	12%

What percentage of your income goes toward paying the mortgage?

Less than 30%	40%
30-50%	37%
More than 50%	10%
I don't know	12%

Where would your dream home be?

Beach	26%
Country	24%
Small town	19%
City	17%
Mountains	15%

Electrical use in a house:

Heating of space	57.5%
Water heating	14.9%
Refrigeration	6.0%
Cooking	5.5%
Air Conditioning	3.7%
Lighting	3.5%
Television	3.0%

Food freezer	1.9%
Clothes drying	1.7%
Others	2.3%

Average Annual Expenditures

Housing	33.9%
Transportation	17.0
Personal Insurance/Pensions	11.1
Other	10.1
Food At Home	7.4
Health Care	5.9
Entertainment	5.6
Food Away From Home	5.3
Apparel and Services	3.6

Create a cutout kit of each room so that students can move around all of the pieces for different arrangements.

Drawing elevation and section drawings/isometric (?)

Flooring: Wood range (\$4.50-\$9.00 plus \$4.50 install per square foot)

Stone and ceramic tiles (ceramic, porcelain, marble: \$2.00 plus \$7.00 install)

Carpet: \$3.50 plus \$4.50 labor per square foot

The average American household water use is 127,400 gallons, which is about 350 gallons per day. 60 drops per minute from a leaky faucet wastes 259 gallons of water per month.

Create a tic-tac-toe of choice: isometric, walls, logo, etc.

A family would like a 40 gallon aquarium.

1. If each saltwater fish needs about two pints of water in which to live, how many saltwater fish can live comfortably in a 40 gallon aquarium?
2. If the water in the aquarium needed to be filtered every day, and the filtering process caused the loss of one cup of water each day, how many days would it be before a gallon of water was lost?
3. If each fish in question #1 needed one teaspoon of food each day, how many tablespoons of food would be needed per day? Round your answer to the nearest tablespoon.
4. If freshwater fish require about 3 pints of water each, how many fish would fit into the 40 gallon aquarium. Round your answer.

A bay window measures 57 inches on top and bottom and 33 inches on each side. If you are ordering oak molding to go around the window, how many feet would you need to order?

Your garage is 22 by 22. Your small car is 60 inches across and your large car is 84 inches across. How many feet will be left unoccupied across the garage once both vehicles are parked inside?

You want to tile the area in front of the fireplace. Each tile is one foot by one foot. The area in front of the fireplace is exactly 3 yards by one foot. How many tiles will fit across this space?

You are buying bricks to build the house. Each brick weighs about one pound. You have figured you will need 3800 bricks. How many trips will it take a truck that holds one ton?

You have a 50 gallon tank and want to fill it using a cup measure. How many cups of water will the aquarium hold.

If it takes 1 minute to put 5 cups of water into the aquarium, how long will it take to fill it?

Typical family of four uses 243 gallons of water every day.

Figure out your family's total water use. Complete the table below.

Use HIGH FLOW if your house was built before 1994. Use LOW FLOW if your house was built in 1994 or later.

Water Use	High Flow	Low Flow	Minutes per day	Gallons
Showers	5 gallons per minute	2.5 gallons per minute		
Baths	36 gallons	18 gallons		
Toilet Flushes	4 gallons per flush	1.6 gallons per flush		
Toothbrushing	3 gallons per minute	1.5 gallons per minute		
Hand dishwashing	3 gallons per minute	2.5 gallons per minute		
Dishwasher	11 gallons per use			
Laundry	48 gallons per use			
Lawn Watering	10 gallons per minute			
Other Uses				
*** TOTAL WATER USAGE ***				

Add problems regarding ratios of length:width and area:area.

“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*

Use 1 to 1.5 inches of pipe cleaner to represent a person.

Sample 1: 3 to 6 year olds

Sample 2: 3 to 6 year olds

Sample 3: 3 to 8 year olds, accommodates 18 children

Sample 4: 3 to 10 year olds, accommodates 15 children, Cost about \$8000

Sample 5: 5 to 10 year olds, accommodates 60 children, Costs about \$25,000. Weighs 7,786 pounds, takes 141 hours to install

Sample 6: 5 to 12, 70 children, weighs 9,235, 150 hours to install

Sample 7: 140 children, \$164,000

Design: Who will use the playground (age, wheelchair accessible)?, What actions will they do there?, In what types of spaces will they play (open, closed, high, low, large gathering, small, wet, nature, spinning, imaginative)?, What borders the site (busy road needs fence, next to school needs access)?, How safe is the site?, How many children can safely play there (think layout and traffic patterns)?, How much will it all cost?

Playgrounds need 12 inches of pea gravel, 12 inches of wood mulch, resilient rubber cushioning, or a combination of these. A fall of more than 5 feet onto sand/gravel or more than 8 feet onto wood mulch/rubber is considered too dangerous. Safe surfaces must extend 4 to 6 feet beyond all paly pieces. Slides need a 7 foot safety zone. Swings need a 9 foot zone.

Playground cost: \$1000 for planning and design, \$10-\$15 per sq. ft., plus 4% for shipping

You have probably seen and even made scale models of cars, airplanes, or trains. These models are much smaller copies of the real car, plane, or train. To make them, the designer used a scale. For example, if a designer created a scale of 1 inch = 1 foot, then a model of a 12-foot bicycle could fit on your desk. If the scale were 0.25 inches = 1 foot, then the model could fit in your pocket.

Test-type questions:

1. Building codes are
 - A series of numbers that a bank uses to figure out a mortgage payment
 - Rules affecting house design
 - Computer signals for building and designing new houses
 - Address numbers for buildings
2. An average American house has how many square feet?
 - 550
 - 900
 - 2000
 - 6000
3. Which room is the biggest?
 - 10 feet by 14 feet
 - 9 feet by 15 feet
 - 8 feet by 16 feet
 - All have the same area
4. The scale on a drawing is 1 inch equals 8 feet. How long would you draw a line to represent a 24 foot wall?
 - 24 inches
 - 12 inches
 - 6 inches
 - 3 inches
5. The scale on a drawing is 1 inch equals 8 feet. What are the true dimensions of a room drawn to scale that measures 1.5 inches by 2 inches?
 - 15 ft by 20 ft
 - 12 ft by 16 ft
 - 10 ft by 20 ft
 - 1 ft by 8 ft
6. What does a footprint of a dining room chair look like?

Ratios in Architecture

From earliest times the Greeks and Romans were preoccupied with building structures that were pleasing to the eye. They were convinced that architectural beauty was obtained by the interrelation of universally valid ratios. Frequently complicated mathematical ratios were used by architects to accomplish their goals.

A *ratio* is a comparison by division of two quantities expressed in the same unit of measure. The ratio may be expressed in words or in symbols. For example, if segment AB is 1 inch long and segment CD is 2 inches long, we say that the ratio of AB to CD is 1 to 2. In symbols, the ratio may be expressed as the fraction $\frac{1}{2}$, or it may be written in the form 1:2.

Example 1: The length and width of a room are 22 feet and 14 feet, respectively. Express in three different ways the ratio of the length of the room to the width in simplest form.

Solution: (1) 22 to 14 or 11 to 7.

(2) $\frac{22}{14}$ or $\frac{14}{7}$

(3) 22:14 or 11:7

Example 2: A door is 30 inches wide and $2\frac{3}{4}$ yards high. What is the ratio of the width to the height of the door?

Solution: Width = 30 inches

Height = $2\frac{3}{4}$ yds. = $2\frac{3}{4} \times 36 = \frac{11}{4} \times 36 = 99$ in.

The ratio of the width to the height is 30 to 99 or 10 to 33.

Express each of the following ratios in lowest terms:

15.	30:35		16.	$4:\frac{1}{2}$		17.	.08:3	
18.	40:280		19.	6 : .2		20.	$\frac{1}{5} : \frac{7}{15}$	

Find the ratio of the first quantity to the second (use the same units for each number):

21.	3 ft. to 6 yd.		22.	4.5 in. to $3\frac{1}{4}$ yd.	
23.	8 in. to 5 ft.		24.	$\frac{1}{2}$ ft. to 54 in.	

Measure the length, width and height of one of the largest rooms in your house. Use a room that is a rectangle or is close to a rectangle. Find the dimensions of all doors and windows in that room.

25.	Length of room		26.	Width of room	
27.	Height of wall		28.	Length of door/entry	
29.	Width of door/entry		30.	Height of door/entry	

31.	Length of window		32.	Height of window	
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Using these dimensions, write five possible ratios (all in simplest form.)

33.	
34.	
35.	
36.	
37.	

Proportions in Architecture

From earliest times men have recognized the value of good proportions in architecture. The ancient Greeks and Romans followed certain mathematical ratios and proportions to attain order, unity and beauty in their buildings. Using fixed mathematical formulas they were able to establish a pleasing relationship among various parts of buildings that have been admired for generations.

A *proportion* is an equation stating that two ratios are equal. Every proportion has four *terms*. The first and fourth terms are the *extremes*. The second and third terms are the *means*. In every proportion the product of the means equals the product of the extremes.

The fourth term of a proportion is called the *fourth proportional* to the other three terms. In $\frac{1}{2} = \frac{3}{6}$, 6 is the fourth proportional to 1, 2, and 3. When the second and third terms of a proportion are the same, they are called the *geometric mean* or *mean proportional*, and the fourth term is then called the *third proportional*. $\frac{1}{2} = \frac{2}{4}$, 2 is the mean proportional, and 4 is the third proportional.

Example 1: Is $\frac{2}{3} = \frac{5}{7}$ a true proportion?

Solution: $3(5) = 15$
 $2(7) = 14$

Since the product of the means does not equal the product of the extremes, $2/3 = 5/7$ is not a proportion.

Example 2: Find the missing term. $\frac{4}{7} = \frac{x}{35}$

Solution: $7x = 4(35)$
 $7x = 140$
 $x = 20$

The missing term is 20.

Example 3: Find the fourth proportional to 1, 2 and 3.

Solution: $\frac{1}{2} = \frac{3}{x}$

$$1x = 2(3) \quad x = 6$$

The fourth proportional is 6.

Measure the height to length of a television screen in your home. Then, find six items in your home that are proportional (or very close) to your television. Record your results below.

		Ratio of height to length
38.	Television	
39.		
40.		
41.		
42.		
43.		

A common guideline for air exchange in a school classroom is for the air conditioning to supply about 1600 cubic feet of air per occupant every hour.

Our classroom is designed to hold 30 students. Our room is rectangular, about 25 by 28 feet. The walls are 10 feet high.

1. How much air should be supplied each hour for 30 students in the classroom?
2. What is the volume of air in the classroom when it is empty?
3. How many times each hour should the air volume in the classroom be replenished by the air conditioning?

<http://www.csgnetwork.com/airexchangecalc.html>

Summer Design Your Dream Home Daily Planner

Day 1

Names

Group Intro

What is architecture?

Scale drawings:

Large to small – measure the room we are currently in and make a scale drawing

Introduce doors, windows, outlets, and other symbols

Small to large – apartment plan

Symbols page

Cabin 1

Add lights, switches, etc. and go over rule on how to add these features

Create a 3D apartment with walls

Start thinking about design ideas

Use home design books

Introduce bubble diagrams and simple layouts

HW: Home measurement page

Day 2

Isometric drawings

Inspection Record

Create a bubble design for house

Optional 7A, 7B, 7C, etc. activities

Approved rough copy

Day 3

Start final project

Introduce steps starting with driveway

Draw room to room

Day 4

Final project

Outside features

Optional: color, create a home flyer, create a company and logo

Taken from The Architecture Handbook

Sketch a map of your neighborhood (from memory or by research) label items

Title block: sheet number, drawing name, date, scale, project name and address, architect

Sketch objects found on your block in plan view (bird's eye view)

ex: fire hydrant, person walking, tree, dog, bus, garbage can, house, car, street lights

Your ideal block: You are an urban planner. You have the unique opportunity to design your ideal block plan. What types of residential, commercial, and institutional buildings will you plan for? Will you include green space? How much? Are the different types of buildings to be grouped together or mixed up?

Single-family residences (66.7%) and multi-unit buildings (townhouses, condos) (26.2%), and mobile homes, RV's (7%)

Make a list of 4 columns: daily, weekly, monthly, yearly. List the types of buildings they and their family visit daily, etc. Then include those that you want on your block.

Buildings, streets, parks, playground, trees, empty spaces.

Experiencing population density (don't mention urban, suburban, rural until the end):

Make three 8x8 squares for a class of 25 students.

Urban square = place about 50% of the class in this one

Rural square = place about 2 or 3 students in this one

Suburban square = place the rest in this one

Class of 25 = 16, 7, 2

Once all in squares – walk around, attempt to make it to the opposite corner Easy? Stretch out all arms without hitting anyone. Easy? Hard?

Proportions: determine the height of your school by measuring shadows of school and a person and set up a proportion

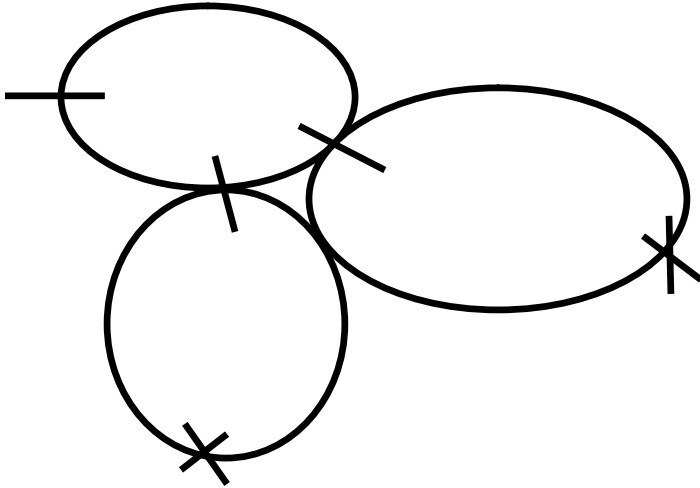
Print out an aerial photograph of DIS or a block plan in Slake from Google Earth

Bubble diagram:

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 an essay or a story you might do in a writing class. Bubble diagrams help architects visualize how the spaces are organized and which spaces are adjacent to each other.

Draw your home bubble: use the entire sheet of paper per floor. Use a bubble to represent a different room or space. It should be drawn quickly in a smooth freehand motion, be roughly oval in shape, touch another bubble at an edge, to show adjacent rooms. Don't worry about exact size, but

pay attention to the proportion of each bubble (space) and how it fits into the overall building. Label each bubble with the name of the room or space.



How do people move through spaces in a house? How do architects arrange the rooms in a house to best fit the needs of the client?

From the front door how many rooms do you pass through to get to:

Your bedroom?

The master bedroom?

The back door?

Circulation path

Guest spaces (living room, dining room) vs. family spaces (bedrooms, kitchen) in a house – color differently on your bubble diagram

Measure and record the length of the walls in your classroom. Measure the location and width of windows and doors. Total square footage, total interior perimeter, number of permanent wall outlets, number of individual sockets, average distance between permanent wall outlets, number of extension cords in use, number of power strips in use, number of individual electrical appliances, ratio of individual electrical appliances to permanent wall outlets

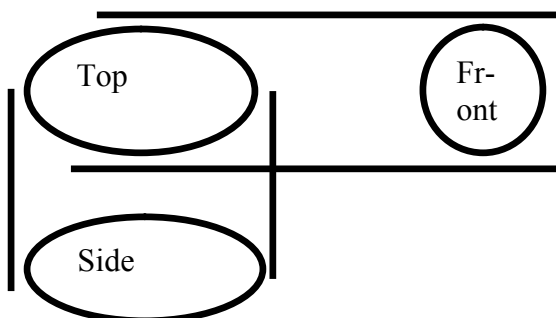
It costs \$0.28 to raise the temp 1 degree in a modest house.

It costs \$0.33 to lower the temp 1 degree in a modest house.

(Need pg. 231)

If you want a temp of 68 in the winter and 78 in the summer, how much would it cost?

Take an object and sketch the top, side, and elevation views of it (shoe, coffee mug, lamp, etc.)



Draw a scaled section (cross-section) drawing of your ideal sandwich. Draw it all full scale (1 in = 1 in). Using leader lines and arrows, label all of the items in the sandwich, hamburger, sub, etc.

A section drawing for a building allows us to see what materials are used between the walls or under the floor. Likewise, a section drawing of a sandwich reveals what is between two pieces of bread.

The minimum width of the pavement of major streets shall be sixty-four (64) feet; of secondary streets, forty (40) feet; and of minor streets, thirty-four (34) feet; all measured between the faces of curbs. The minimum width of alleys, private ways and divided streets, shall be twenty (20) feet, measured between the curbs, separating strip, or other limitations to the traveled way. The minimum width of islands or dividing strips in divided street shall be three (3) feet when no electroliers are located therein and six (6) feet when such obstructions exist. (1941 Code § 1997 (2), Ord. 541, (1953))

The typical surface street lane is 10 to 11 feet wide, while highway lanes are 12 feet wide.



Typical family of four uses 243 gallons of water every day.

Figure out your family's total water use. Complete the table below.

Use HIGH FLOW if your house was built before 1994. Use LOW FLOW if your house was built in 1994 or later.

Water Use	High Flow	Low Flow	Minutes per day	Gallons
Showers	5 gallons per minute	2.5 gallons per minute		
Baths	36 gallons	18 gallons		
Toilet Flushes	4 gallons per flush	1.6 gallons per flush		
Toothbrushing	3 gallons per minute	1.5 gallons per minute		
Hand dishwashing	3 gallons per minute	2.5 gallons per minute		
Dishwasher	11 gallons per use			
Laundry	48 gallons per use			
Lawn Watering	10 gallons per minute			
Other Uses				
*** TOTAL WATER USAGE ***				

Household Expenses

Item	1930	1960	1990	2008
Food	24%	22%	16%	13%
Housing	15%	13%	14%	15%
Clothing	11%	8%	5%	4%
Medical Expenses	4%	6%	13%	17%

Putting in a Pool

Rectangular pool vs. Circular Pool

Rect: 30 by 25 with a height of 15 feet

Circle: Diameter of 15 and a height of 15 feet

Backyard size = 729 sq. ft.

Wants to put fencing around the pool and wants cheaper water expenses

Which pool fits into the backyard?

Which will be cheaper to put a fence around?

Which will have cheaper water expense?

Determine the amount of paint needed for each room and the total house

For adequate natural light, the total window area in each habitable room should be a minimum of 8% of the floor area.

[Add worksheet with area of each room and window area of each room.]

Design a high school

Must accommodate 2000 students

Cost is \$350 per square foot

Present final products to the class and why their home/school is the best.

3 foot doors are better for the disabled community so that a wheelchair can be used.

E3801.6 Bathroom. At least one wall receptacle outlet shall be installed in bathrooms and such outlet shall be located within 36 inches (914 mm) of the outside edge of each lavatory basin. The receptacle outlet shall be located on a wall that is adjacent to the lavatory basin location.

E3801.7 Outdoor outlets. At least one receptacle outlet accessible at grade level and not more than 6 feet, 6 inches (1981 mm) above grade, shall be installed outdoors at the front and back of each dwelling unit having direct access to grade.

E3801.8 Laundry areas. At least one receptacle outlet shall be installed to serve laundry appliances.

E3801.9 Basements and garages. At least one receptacle outlet, in addition to any provided for laundry equipment, shall be installed in each basement and in each attached garage, and in each detached garage that is provided with electrical power. Where a portion of the basement is finished into one or more habitable room(s), each separate unfinished portion shall have a receptacle outlet installed in accordance with this section.

E3801.10 Hallways. Hallways of 10 feet (3048 mm) or more in length shall have at least one receptacle outlet. The hall length shall be considered the length measured along the centerline of the hall without passing through a doorway.

Selling a Home

Agent commission	6%
Property inspection	\$325
Closing costs	5%