

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. 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.
  - An overhead light should be in all hallways, stairways, and porches. Large closets need a light.
  - All overhead lights need to have a switch. The switch should be near the room's entrance (on the wall near the doorknob if there is a door).
  - Long hallways need switches at each end, and they need to be three-way switches, so that the hall light can be turned on or off at either end of the hall.
5. Electrical Outlet Placement:
  - No place on a wall can be farther than six feet from an outlet. This means that one outlet covers 6 feet on each side.
  - Walls 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.

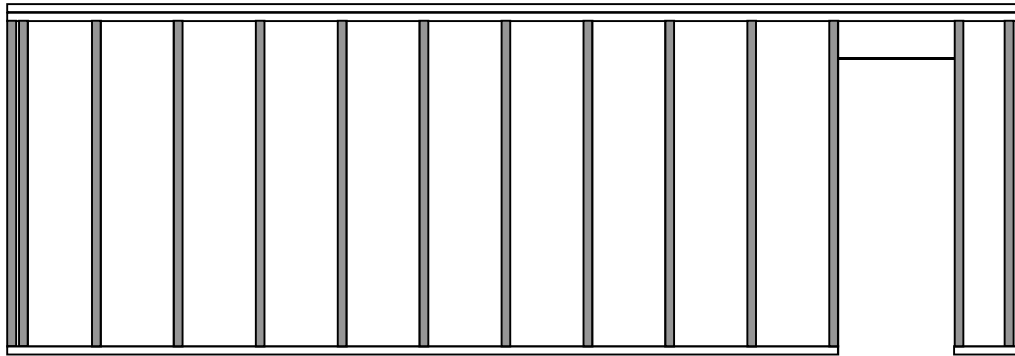
**Expense Estimates**

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

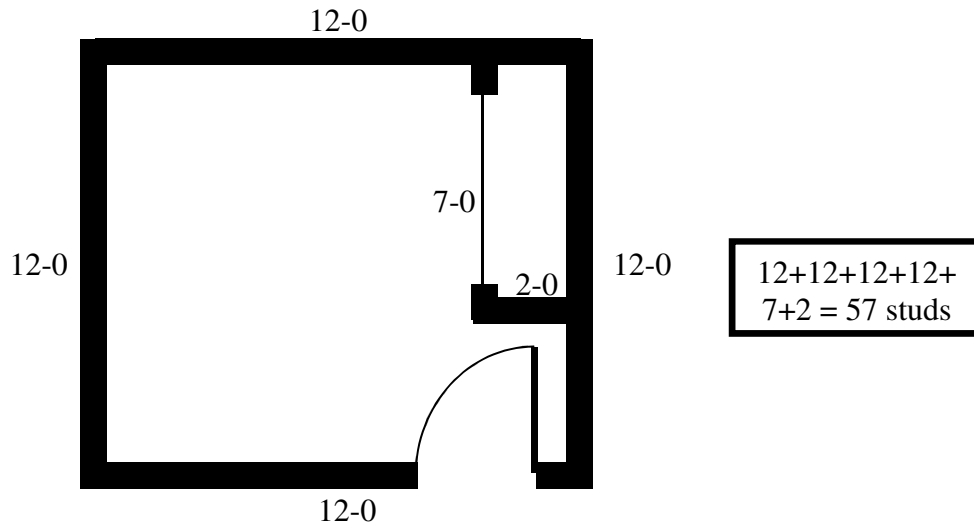
**TURN IN ALL CALCULATION WORK DIRECTLY BEHIND THIS PAGE**

\* 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? Show and include all of your work. Solve all problems using fractions.

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	$1\frac{1}{2}'' \times 11\frac{1}{4}''$		

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

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

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

**Flooring Cost Estimate for Cabin 1**

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

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

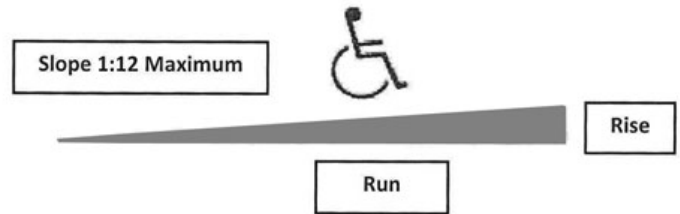
A builder must be able to communicate the size of windows needed. Windows are assigned a code number that corresponds to the size of the window. A window that reads 2846 would be 2 feet 8 inches across and 4 feet 6 inches high. The 2846 window is called a two eight, four six.

**Window Perimeters and Areas**

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

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

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



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

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

When applying this formula you may use a calculator and **round to the nearest hundredth**.

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