STEM 101
Powered by THE STEM ACADEMY

Name: _____
Period: _____

ARCHITECTURAL DESIGNERS HOMEWORK

UNIT: ARCHITECTURE LEVEL 1

THE PROBLEM:

Design and create a floor plan of a house that meets building regulations and codes.

CONSTRAINTS:

1. All sections of the Design-Folio must be completed
2. Building regulations and codes must be followed

MATERIALS:

- ✓ Core Concepts of technology PowerPoint
- ✓ Abilities of a Technological Word Parts I-IV
- ✓ Design-Folio
- ✓ Pencils
- ✓ Graph paper

TOOLS:

- ✓ Rulers
- ✓ 3’ door templates

DIRECTIONS:

Read the directions carefully. Complete and check off each step before moving on to the next step. Check in with you teacher before moving on to the next section.

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Architectural Designers Homework

Measuring the sizes of rooms you are familiar with can provide a good way to determine if the rooms you are designing for your model house are the sizes you actually have in mind. Since you are not building a model of the place you live in, you can get the measurements anywhere that these rooms are available.

- ☐ **Step#1:** Measure the rooms listed below from a house or apartment.
- ☐ **Step #2:** Write in the measurements in the space provided.
- ☐ **Step #3:** Discuss your measurements with a partner. Talk about and listen for similarities and differences between the width and lengths of your rooms.

Required Items	Width	Length
Living Room		
Kitchen		
Dining Room		
Master Bedroom		
Full Bath		
Laundry Room		
Bathtub		
Hallway		**Not Applicable**
Front Door		**Not Applicable**
Bedroom Door		**Not Applicable**

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Homework Score: _____ / 10 Points

Design-Folio Part I: Design Process

- ☐ **Step #1:** Get a copy of the Design-Folio from your teacher (You will use this document for the Design-Folio assignments Part I-IV)
- ☐ **Step #2:** Read Abilities for a Technological World /Design-folio Part I
- ☐ **Step #3:** Write down the information requested on page 1 and write in the constraints on page 2 based on the presentation

Design-Folio Part II: Bubble Diagrams

- ☐ **Step #1:** Turn to page three of your Design-folio document and read and follow the steps for Abilities for a Technological World PowerPoint Design-process/Design-folio Part II (Small Bubble Diagrams).
- ☐ **Step #2:** Using a pencil, create at least three Small Bubble Diagrams ideas for a house that meet all criterions. Write in the labels for each space. DO NOT ERASE the bubble diagrams that are not correct. Use the extra sheets provided by your teacher if necessary.
- ☐ **Step #3:** Talk to a partner about your diagrams and listen to your partner's feedback.
- ☐ **Step #4:** Turn to page four of Design-folio and read and follow the steps for Abilities for a Technological World PowerPoint Design-process/Design-folio Part II (Large Bubble Diagrams).
- ☐ **Step #5:** Choose one of the Small Bubble Diagrams ideas and draw a Large Bubble sketch on the full page. Use the extra sheets provided by your teacher if necessary.
- ☐ **Step #6:** Talk to a partner about your diagram and listen to your partner's feedback.
- ☐ **Step #7:** Turn to page five of Design-folio and lightly redraw the Large Bubble Diagram on page five exactly as it appears on page four.
- ☐ **Step #8:** Read and follow the steps for Abilities for a Technological World PowerPoint Design-process/Design-folio Part II (Loose-Line Drawings).
- ☐ **Step #9:** Using darker lines, square off or transition the outside edges of the Large Bubbles that are on page five into shapes that resemble rooms.
- ☐ **Step #10:** Talk to a partner about your diagram and listen to your partner's feedback. Make modifications if necessary.

Design-Folio Part III: Loose-Line Drawing/Dimensioning

- ☐ **Step #1:** Read and use Abilities for a Technological World PowerPoint Design-process/Design-folio Part III (Dimensioning Loose-Line Drawings) to help you dimension your loose-line drawing.
- ☐ **Step #2:** Write in the dimensions for each room, hallway, and closet.

Dimensioning for windows and doors are not required at this point in the design process because they do not impact the overall size of the rooms. Once the Loose-line dimensioning is completed and approved, the floor plan will take into more of an account the exact width of windows, doors and archways. A building code requires hallways and doorways to all be at least 3' wide. Likewise, closets must be at least 3' deep. Any one of these areas can be larger, but not smaller than 3'.

- Begin with either the width of the house or the length dimensions first. This will allow you to work through the measurements much easier. For the purpose of the demonstration, we will begin with the width of the house. Place the dimension 30' along the edge of the house. Divide the space appropriately so the sum of the room dimensions equal 30'.
- Moving along the length of the house, stop at each wall and provide a dimension for that wall or space. Remember that the sum of the space or room must be 30' with all doorways, hallways and closets being 3'. Do not continue moving on until the dimensions all equal 30'. Continue to do this until all width dimensions are identified and are appropriate.
- Rotate and focus now on the length of the house (or the width depending on which dimension you started with).
- Place the dimension 40' along the front edge of the house. Divide this space appropriately so the sum of the room dimensions equal 40'.
- Moving along the width of the house, stop at each wall and provide a dimension for that wall or space. Remember that the sum of the space or room must be 40' with all doorways, hallways and closets being 3'. Do not continue moving on until the dimensions all equal 40'.
- Continue this until all length dimensions are identified and are appropriate.

☐ **Step #3:** Acting as building inspectors and civil engineers, you should have your work pre-inspected before going to the teacher for approval. With your partner, look over each other's work to make sure the dimensions are right. Talk about and listen for feedback. Make modifications if necessary.

☐ **Step #4:** Take your work to your teacher for approval.

Design-Folio Part IV: Floor Planning

☐ **Step #1:** Gather your Design-folio, a large straight edge and the 1/4" graph paper for this next step.

☐ **Step #2:** Read and follow the steps for PowerPoint Abilities for a Technological World; Design-process/Design-folio Part IV (Floorplan).

☐ **Step #3:** Find the first full 1/4" square on the graph paper and match that up with the same corner on the loose-line dimensioned drawing. Mark that point with a star or some other icon as a benchmark for identifying the starting corner.

☐ **Step #4:** Begin at the corner of the full 1/4" square and using a large triangle or straight edge and pencil, draw a line all the way down the length of the graph paper.

☐ **Step #5:** Begin at the same corner of the full 1/4" square and using a large triangle or straight edge and pencil, draw a line all the way across the paper forming a 90° angle.

☐ **Step #6:** Outside the lines just drawn make a mark 1/8" away from the line running the length of the house and the line running the width of the house. This represents the depth of each outside wall which equals six inches according to the 1/4" = 1' scale we are using. All exterior and interior walls will be 6"

thick to make model construction simpler.

- ☐ **Step #7:** Using a large triangle or straight edge, draw a second parallel line outside the two existing lines. The double lines should be 1/8" apart and from the starting corner be 90°.
- ☐ **Step #8:** DO NOT BOX IN THE 30 x 40 foundation plan at this point. The actual house plan may expand as walls are put on the Floorplan. It is important to hold to the 30'x 40' plan, because each interior wall will begin to erode the measurements as each wall will take up half a square or 6" of the floor space. Now you will either hold to the 30 x 40, or be allowed to close in a slightly larger house because of the number of walls their design requires. Every hallway and closet will have walls that ultimately use up one foot of floor space for the front, back and each side. So to make sure each bedroom has a closet and the house can utilize a hallway effectively, some additional space may be allocated to make the designing process less complicated.
- ☐ **Step #9:** Just like when you were dimensioning, start at the benchmark and do all of the walls from the width of the house. This is done by starting at the benchmark and looking at the first dimension, take that number and then count the number of 1/4" squares that the dimension requires the room dimension to be. For example, if the first room is 12 feet, then count 12 squares from the benchmark and place a line at that point.
- ☐ **Step #10:** Now place a mark 1/8" away from the line just drawn (or 1/8" away) and draw a second line parallel to the existing line to complete that wall.
- ☐ **Step #11:** Do this for only half the house or up to the point where a hallway is required.
- ☐ **Step #12:** Continue along that outside wall by identifying the dimensions of the next room and again count the necessary squares for that room and draw a line and a parallel line to complete that wall.
- ☐ **Step #13:** Continue doing that until all walls are drawn in place EXCEPT the exterior wall! Leave that out until all the interior walls are in place.
- ☐ **Step #14:** At this point we need to go back to the benchmark and put in all the walls that are identified for each room along the other outside wall running 90 degrees from the benchmark.
- ☐ **Step #15:** Continue along that outside wall by identifying the dimensions of the next room and again count the necessary squares for that room and draw a line and a parallel line to complete that wall.
- ☐ **Step #16:** Continue doing that until all walls are drawn in place EXCEPT the exterior walls in that direction! Leave that out until all the interior walls are in place.
- ☐ **Step #17:** When all the interior walls are in place, find the room that extends out the furthest at both portions of the house left open. The final dimensions of this corner of the house will depend upon the dimensions required in the final room(s), which will become the final exterior wall for that portion of the house.
- ☐ **Step #18:** Draw windows. Each exterior room will need at least one or more windows that are at least 3' wide to exit in case of an emergency. Widows can be wider, but not less than the 3' measurement. This is a fire code requirement and the necessary requirement of natural light for each room. Hallways, closets, and bathrooms are exempted from this regulation.
    - Erase at least three squares on the graph paper to represent the location of windows.
    - Draw a short line to close off the parallel lines of the wall.

- Draw a single line halfway between the parallel lines across the opening in the wall to represent a single pane of glass. This is the symbol we will use to represent placement of a window.

☐ **Step #19:** Share your work with a partner and talk about and listen for feedback. Make modifications if necessary.

☐ **Step #20:** Add exterior doors. Exterior doors are also required to be 3' and the swing of the doors is also determined by fire regulations. Exterior doors may swing in except for public building or residential houses that will be used for childcare or other purposes. In those cases, doors must swing out to make exiting a structure easier. Interior doors may not swing into hallways or walkways that obstruct pathways for exiting a house. Keep these regulations in mind as we begin using templates to identify placement of doors.

- Erase at least three squares on the graph paper to represent the location of exterior doors.

☐ **Step #21:** Add interior doors. Each room must have a way to enter and exit. Doors are required for each room located in the private areas of a house. Archways and hallways are permitted in public areas, but each must have a 3' opening or larger to met code. Interior doors may be smaller, but for constructing modeling purposes, the 3' rule will hold for all doorways and archways.

- Erase at least three squares on the graph paper to represent the location of interior doors or archways.

☐ **Step #22:** For exterior and interior doors, a template is used. Locate the 3'0" door symbol on the template. Be careful to draw the door in the open position and the full swing of the door. Doors are always shown partially opened and the full swing of the door is appropriate. If a door swing show contact with something in its path, it will have obstruction in the full version of the structure.

☐ **Step #23:** Share your work with a partner and talk about and listen for feedback. Make modifications if necessary.

☐ **Step #24:** Draw in the countertops, sinks, toilets, and appliances required in residential codes. This includes washers and dryers. FURNITURE IS NOT A REQUIREMENT and should NOT be added to you floor plan.

☐ **Step #23:** Share your work with a partner and talk about and listen for feedback. Make all final modifications if necessary. After this point, NO MORE CHANGES CAN BE MADE UNLESS APPROVED. Each change now affects cost and contract agreements.

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GRADING RUBRIC

Grading criteria
6th Grade - Architectural Sketching Rubric

Small Bubble Diagrams	No Diagram ***0points***	The Small Bubble Diagrams are incomplete and poor representations of bubbles, non-bubble shapes were used or simple lines were drawn. ***1points***	The Small Bubble Diagrams do not show all the lines clearly or are missing important aspects of simple lines. ***2points***	There are three Bubble Diagrams each complete and clear but are not all are labeled or are drawn correctly. ***3points***	There are at least three Small Bubble Diagrams and all are appropriately sketched, labeled and easily recognized. ***4points***
Large Bubble Diagram	No Diagram ***0points***	The Large Bubble Diagram is incomplete and a poor representation of the Small Bubble Diagram it represents or no lines were drawn or are missing ***1points***	The Large Bubble Diagram does not show all the lines clearly or is missing important aspects of simple lines ***2points***	The Large Bubble Diagram is complete and clear with all lines are mostly drawn correctly with a few minor errors ***3points***	The Large Bubble Diagram has all lines appropriately sketched, labeled and is easily recognized ***4points***
Loose-line Drawing	No Diagram ***0points***	The Loose-line Drawing is incomplete and a poor representation of the Large Bubble Diagram with missing or additional lines were drawn ***1points***	The Loose-line Drawing does not show all the lines clearly or are missing important aspects of simple lines ***2points***	The Loose-line Drawing is complete and clear with all lines are mostly drawn correctly with a few minor errors ***3points***	The Loose-line Drawing sketch is complete, good representation, correctly labeled, easily recognized and all lines are present ***4points***
Loose-line Drawing Dimensioned	No Diagram ***0points***	The Loose-line Drawing is incomplete, dimensions are off or missing and a the drawing is a poor representation of the original diagram and important lines were drawn added or left out ***1points***	The Loose-line Drawing does not show all the lines or dimensions clearly and/or there are important aspects of simple lines missing ***2points***	The Loose-line Drawing is complete and dimensions are clear with all lines mostly drawn correctly with a few minor errors ***3points***	The Loose-line Drawing is dimensioned correctly, appropriately sketched, labeled and easily recognized ***4points***