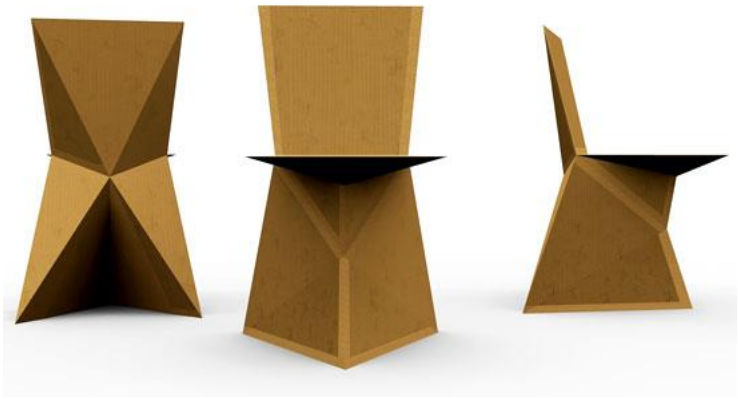


Name:_____

Date:_____ Grade:____ Block:____

Subject:_____

Mr. Kang 2014

Design Problem Statement

The year is 2030 and all the worlds resources are running low. Metal, wood and plastic have become far too expensive to harvest and manufacture. Sustainable resources such as cardboard are becoming increasingly popular. YOU have been chosen by KANG CORP. to design, create and market a new type of chair that celebrates cardboard as a material. The chair should be functional, ergonomic, and aesthetically pleasing.

Criteria

In order for the prototype to be approved by KANG CORP. all of the following design criteria **MUST** be met:

- The chair must be made completely of cardboard (NO fasteners, but adhesives are permitted).
- The chair must support a weight of 185lbs. for at least 10 seconds.
- The chair must have a working back support and a seat that is at least 16" from the ground.
- The chair must be made with the given amount of cardboard.
- The chair must be comfortable to sit in!

Components of Assignment

1. **Evidence of research**: List of sources used and images found during the research stage. Minimum of one page of research. This portion can include links to specific websites, screenshots, references, mind maps, etc. (due week 1)
2. **Design sketches**: At least 5 sketches of possible designs as well as the chosen design. Sketches should show a variety of different ideas and concepts. The final sketch should be the chosen concept and should be shown in more detail. (due week 1)
3. **Orthographic drawings**: An orthographic drawing depicting the TOP, FRONT and SIDE view of the prototype along with appropriate dimensions. The dimensions should convey enough information so that another person could build your prototype based on the orthographic drawings alone. (due week 2)
4. **Progress logs:** Weekly logs of what was accomplished and significant challenges and solutions that were presented (one paragraph). An example would be: *This week I managed to complete all the lamination of my components. The lamination proved to provide much more strength than had anticipated. As a result, I was able to begin the construction process sooner than expected. By Thursday I was assembling the back support which was unable to support the required weight. So, I asked Mr. Kang for assistance and he showed me how to use trusses to create a more rigid support.*
5. **1/5 scale cardstock prototype**: A miniature version of the prototype that proves the fit, form, and function of the final product. The miniature prototype can be made of

cardboard or the provided cardstock which may be easier to work with. The same joints and structures as the final product must be used. The purpose of this is to see if the design can be built, and to foresee any complications or modifications that may arise with the full size prototype. (due week 3)

6. **Completed full scale product**: The cardboard chair that has met all the above criteria. Evaluation for the cardboard chair will be based on function, ergonomics, and aesthetics. So, is it sturdy and stable? Does it work? Is it comfortable to sit in? Does the chair have a pleasant design? (due week 5)
7. **Piktochart:** An info graphic using Piktochart that describes your product. Information can include but is not limited to the name of the product, instructions, features, prices, economic and societal effects, pros/cons or anything else you may wish to include. The Piktochart will be printed out and attached to your final product as a description tag. The info graphic will be used to "sell" your product. (due week 5)

Evaluation

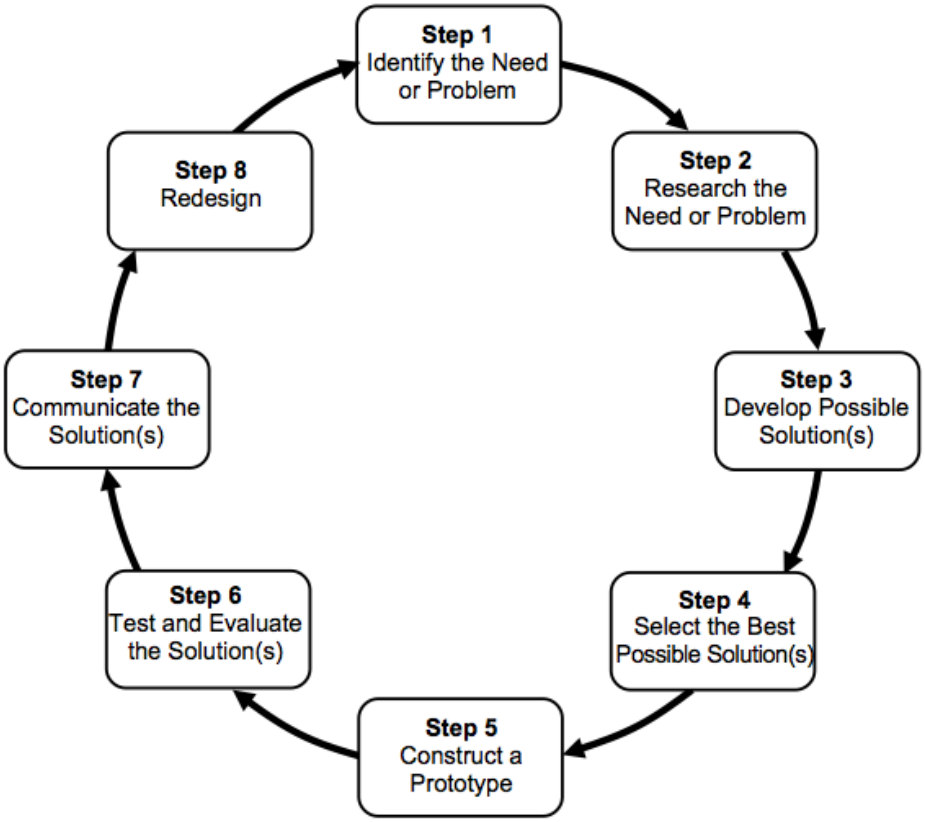
The cardboard chair will only be evaluated if all of the previously mentioned criteria has been met and all the components of the assignment have been completed. Three finalists will be chosen based on function, ergonomics and aesthetics. Then, an outside judge such as the principal will decide who the winner is.

The entire project will be evaluated as follows:

• Evidence of research	/5
• Design sketches	/5
• Orthographic drawings	/10
• Progress logs	/5
• Miniature prototype	/5
• Completed product	/40
• Piktochart	/20
• Creativity (think outside the "box")	/5
• Work ethic	/5
Total	**/100**

Design Process

The design process is a format that is followed by the greatest of designers and engineers. The continuous cycle constantly develops and evaluates solutions to specific design problems. Below is one example of many design process models available. You will follow this model throughout the entire project.



Helpful Resources to Get Started

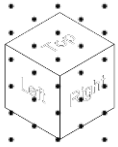
- http://www.google.com
- http://www.instagrok.com
- http://www.instructables.com/id/Cardboard-Chairs-101/
- http://www.ikatbag.com/2011/03/how-to-work-with-cardboard.html
- http://www.ehow.com/how_8661764_working-cardboard.html

There are many different joining and shaping methods with cardboard. For example, cardboard can be bent, notched, laminated, splined, etc. Ensure that you research all the different ways you can manipulate cardboard and keep track of where the information was found.

Design Sketches

Use the boxes below to draw your five design sketches. The sketches are to be done in **isometric** format.

1



2

3

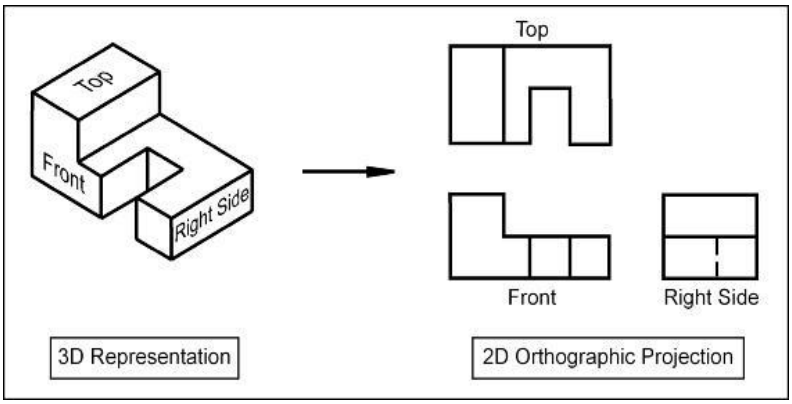
4

FINAL SKETCH

5

How to Draw an Orthographic Drawing

An **orthographic projection drawing** is a way to represent a 3D object in a 2D multi-view format. This type of drawing conveys all the information necessary in order to build the object. Typically, the views consist of a front view, top view, and side view.

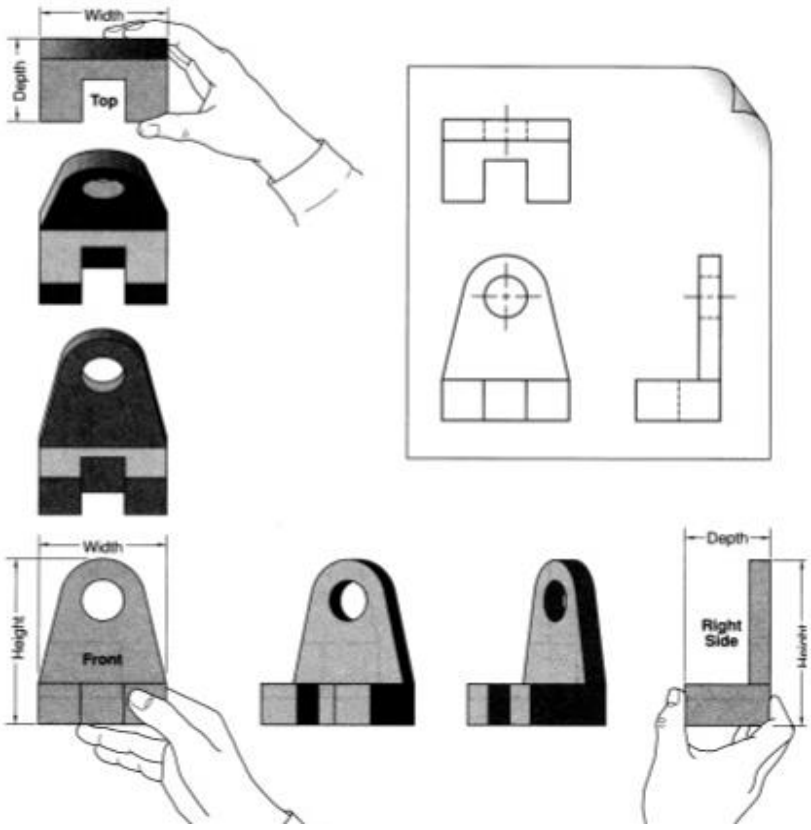


Components of an Orthographic Drawing

- Front View – The first view to determine is the front view. Imagine if the object had a face and you were standing directly in front of it, this may be an acceptable way to determine the front view. Typically, the most natural side that conveys the most information is used as the front view.

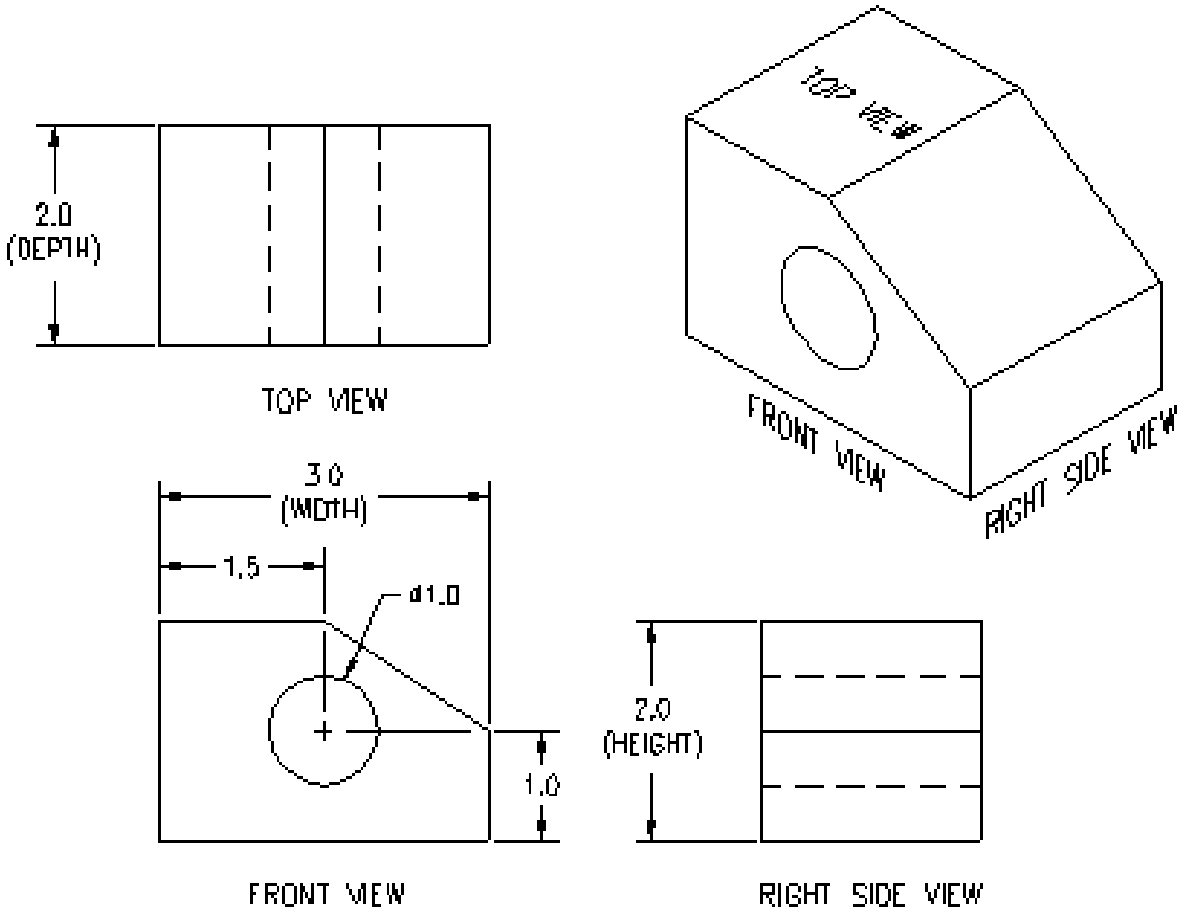
- Top View – Imagine if you were to fly directly above the object from the front view. Everything you see looking directly down at your object is considered the top view.

- Side View – Imagine if you were to go back down to front view and then step around to the right side of the object. Everything you see directly in front of you is considered the side view, or right side view.



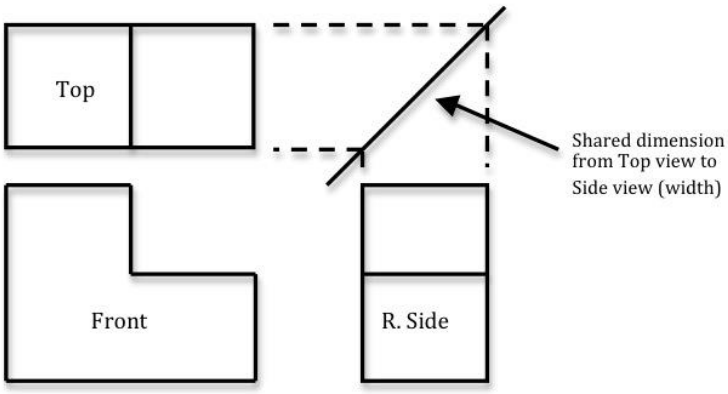
Procedure for Drawing an Orthographic Projection

1. Orient your paper in landscape style.
2. Choose the front view and begin to draw the front view in the lower left corner.
3. Draw the object using straight lines, preferably with a ruler.
4. Draw light construction lines extending from each point of the front view up to the top view. The length, width and height should be the same for all views!
5. Reset from the front view and follow the same steps to draw the side view.
6. Once all images are complete begin to dimension each view. Do no repeat information.
7. Draw extension lines and dimension lines that indicate the length of each portion.
8. Finally, add any additional information such as hidden lines, radial dimensions, etc.



Orthographic Drawing

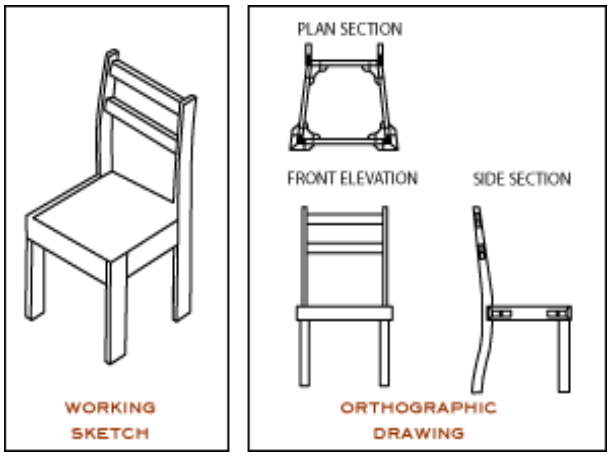
Once you have finalized your design, create the working orthographic drawings complete with dimensions. Ensure that the drawings are clear and that they convey enough information so that a person could create the product based off these drawings.



TOP

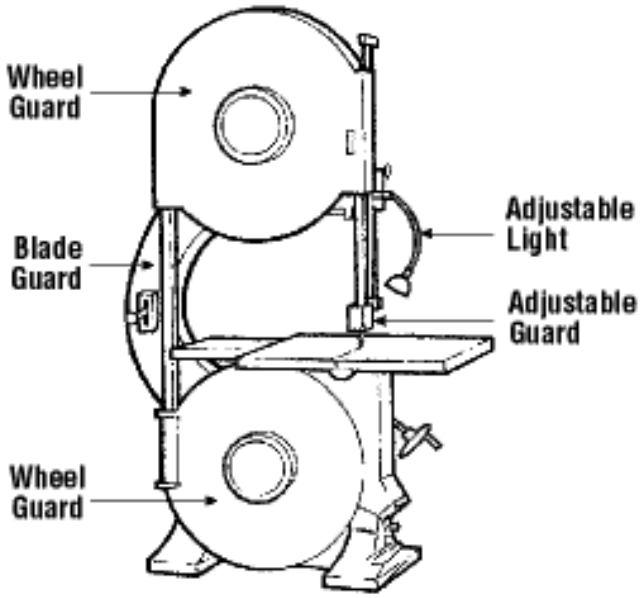
FRONT

SIDE



Band Saw Safety

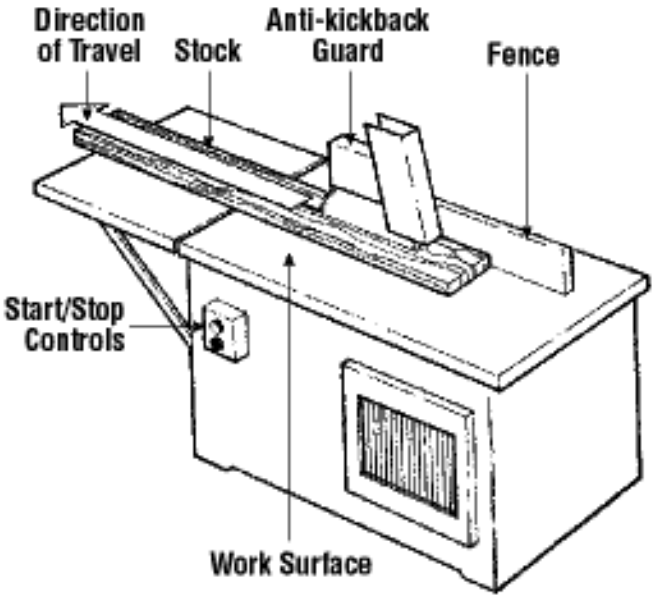
- **ASK** for permission before using the band saw.
- **ALWAYS** wear safety goggles when operating the band saw.
- **REMOVE** jewellery, secure loose clothing, and restrain long hair.
- **ENSURE** that the guard is ¼" above the material.
- **ALWAYS** keep fingers 4" away from the blade
- **USE** relief cuts when cutting tight corner or sharp curves.
- **NEVER** use your hand to remove material when the blade is running.
- **NEVER** leave the machine until the blade has completely stopped.
- **NEVER** back out of curved cuts when the blade is running, stop the machine first.
- **TURN OFF** the machine if the blade breaks and tell the teacher.



Mr. Kang 2014

Table Saw Safety

- **ASK** for permission before using the table saw.
- **ALWAYS** wear safety goggles when operating the table saw.
- **REMOVE** jewellery, secure loose clothing, and restrain long hair.
- **INSPECT** the material for defects, hardware, or any other foreign object.
- **NEVER** start the machine with the material touching the blade.
- **ENSURE** that you do not cut rough lumber on the table saw.
- **HOLD** the work piece firmly on the table and against the fence.
- **ALWAYS** use a push stick when using the table saw.
- **NEVER** make free hand cuts! Either the fence or mitre gauge must always be used. Do not use both the fence and mitre gauge at the same time, this is **DOUBLE FENCING.**
- **RAISE** the blade ¼" above the material.
- **ALWAYS** keep fingers and hands away from the blade.
- **ALWAYS** use a push stick or push block when the fence is closer than 6" to the blade.
- **NEVER** reach over the blade when it is moving.



Weekly Progress Logs

Describe in a detailed paragraph what was accomplished during the week. It is important to include challenges and solutions to problems that occurred. The purpose of these logs is to practice recording what you have accomplished and how your project has developed.

Weekly Log #1 Date:_____

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Weekly Log #2 Date:_____

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Weekly Log #3 Date:_____

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Weekly Log #4 Date:_____

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Weekly Log #5 Date:_____

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Conclusion

This reflection is to be completed after the final product has been evaluated. In order for your product to be accepted for mass production by KANG CORP. your product must be refined. In a paragraph, answer the following questions: What was successful with my design? What challenges or problems were existent with my design? How would I improve my design for future production and consumer use?

Reflection
Date:_____

_____
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_____

Cardboard Chair Final Product Rubric

Category	10	8	6	4	2
Function	The chair is sturdy and stable. There is rigidity in the seat and back support and there is no sway movement when sitting.	The chair is somewhat stable. There is minimal sway movement when sitting.	The chair is not very stable but is still able to withstand a person's weight.	The chair is not stable and may be considered unsafe to sit in.	The chair does not have a seat or back support and therefore does not function as a chair.
Ergonomics	Great comfort is provided with the chair. Extra components such as armrests provide the user with a fully conforming chair.	The chair is comfortable to sit in and provides pleasant support for the back and buttocks.	Minimal discomfort when sitting in the chair. Rough edges or poor construction quality may contribute to discomfort.	The chair is uncomfortable to sit in for more than a few minutes.	The chair causes severe back and buttocks pain.
Aesthetics	The chair has a unique design and is visually appealing. The joints are flush and there is no glue visible.	The chair has a unique design and the joints are flush.	The chair has a common or plain design. There are a few rough edges and visible glue spots.	The chair has a common or plain design. The edges are rough and there is glue seeping from every joint and the chair was not completed on-time.	The block of glue has some cardboard stuck to it.
Load Capacity	The chair can easily hold 185lbs. repeatedly and consistently.	The chair can hold 185lbs. for the required amount of time, plus an additional amount of time.	The chair can hold 185lbs. for 10 seconds.	The chair collapsed while attempting to hold 185lbs.	The chair imploded before testing began.

Total: /40

Piktochart Evaluation

The Piktochart will be graded on the following criteria:

- The info graphic displays adequate and varying content (text, charts, graphics, etc.).
- The info graphic markets the chair in a creative and appealing manner.
- The info graphic illustrates detailed information of the product

Total: /20