TEXAS A&M UNIVERSITY

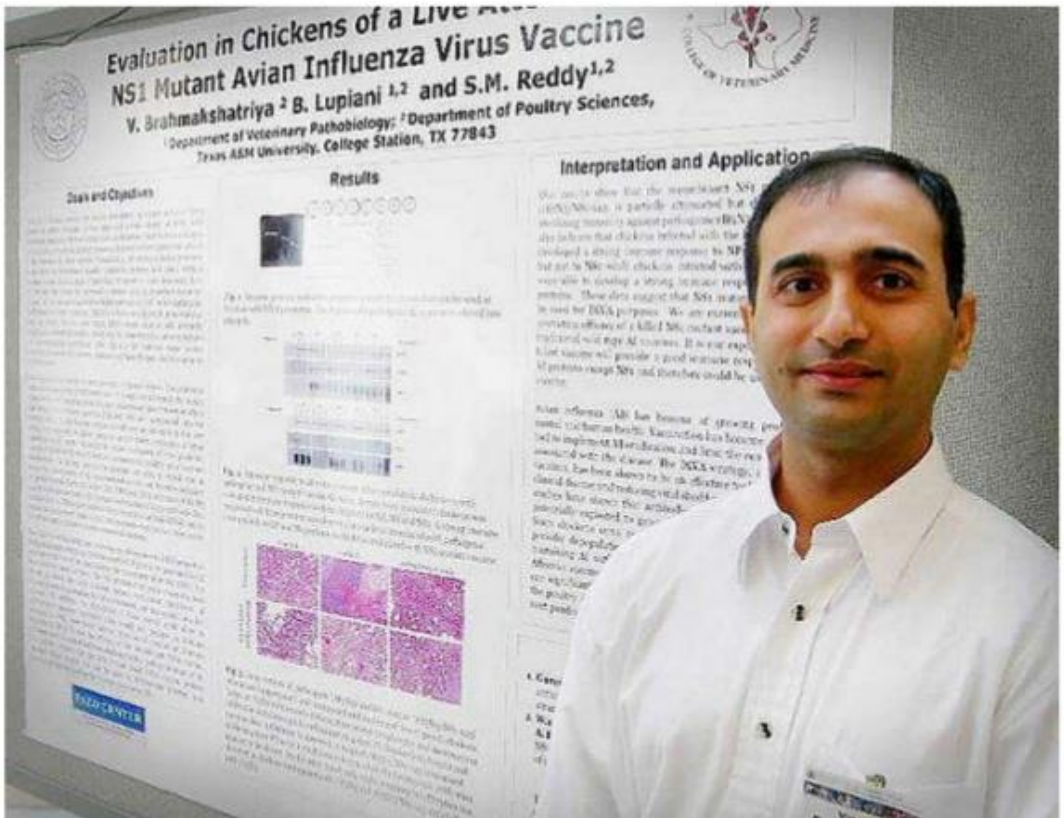
UNIVERSITY WRITING CENTER

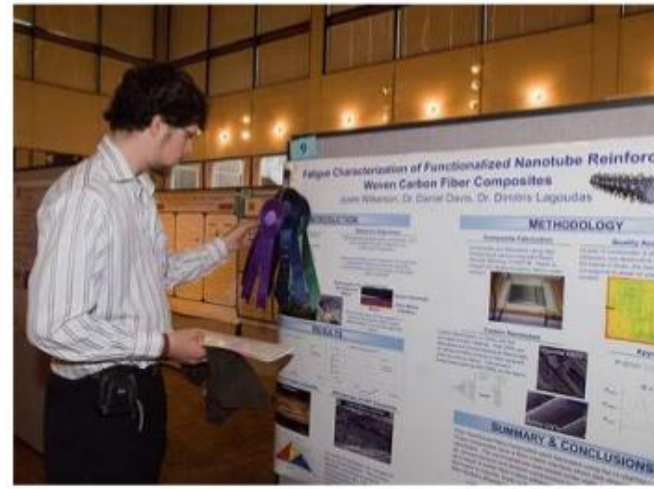
EVEN *great* WRITERS NEED HELP

Research Posters

http://writingcenter.tamu.edu/Classroom-Workshops/Graduate/Research-Posters

How Are Posters Used?





Know Your Audience

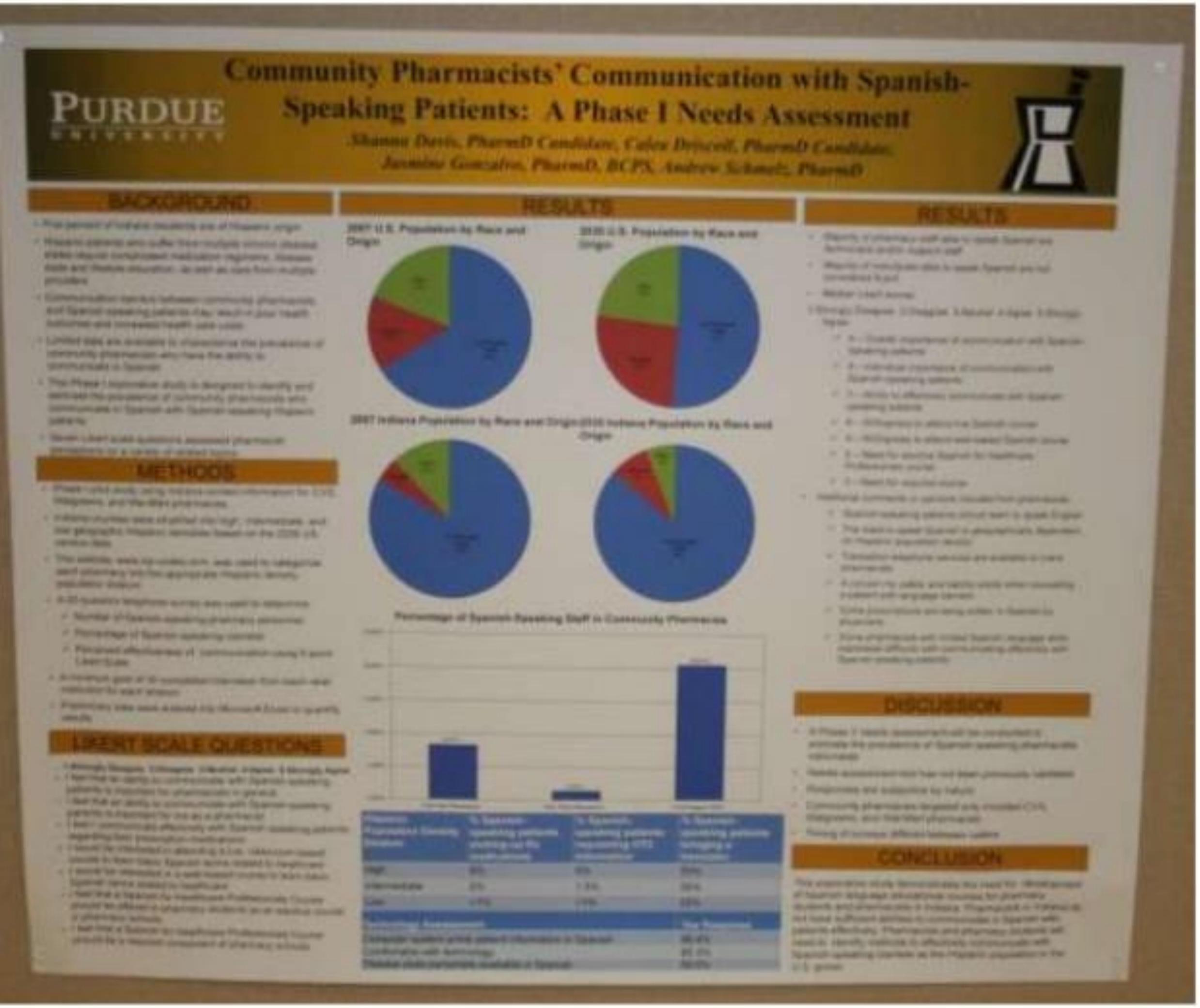
Experts:

- ✓ Facts, figures, and explanations

Non-experts:

- ✓ Results or applications

Layout: IMRaD



(Abstract)

Introduction

Methods

Results, **a**nd

Discussion

(References)
(Acknowledgements)

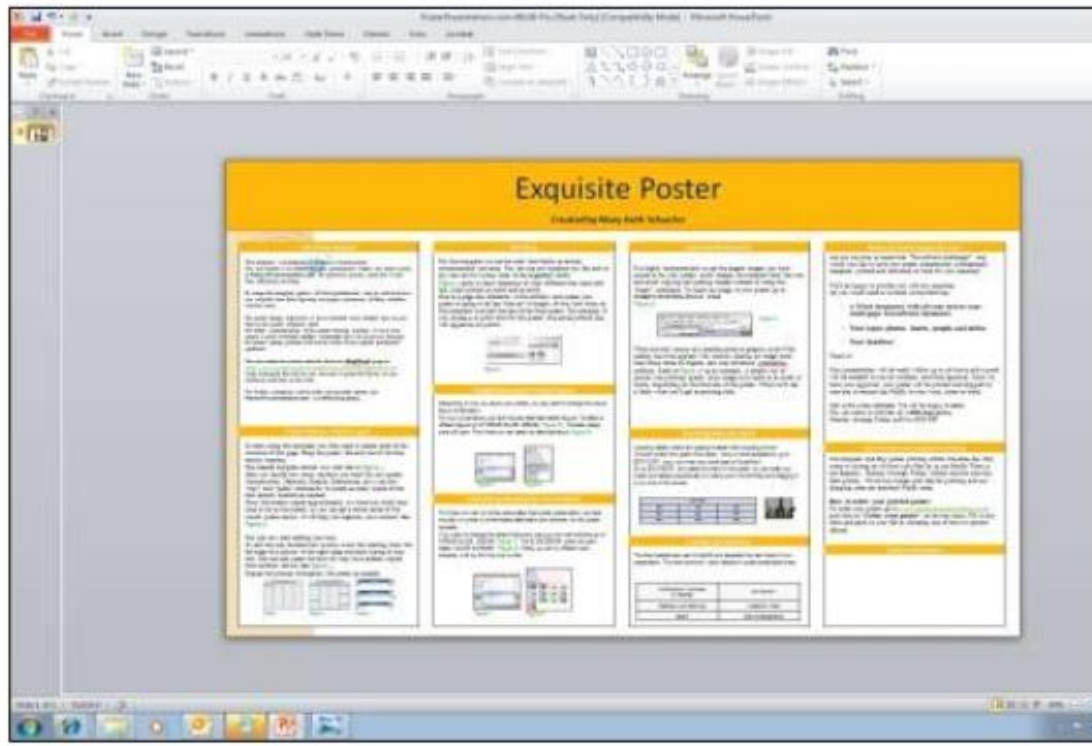
http://www.pharmacy.purdue.edu/features/2009-05-01.PosterSessions/

Style

Guide the eye with bullets, white space, *italics*, **bold**, and headings.

For text, use:

- Short paragraphs
- Concise sentences
- Parallel lists



Text: Short & Sweet

Original	Revised
The ideal anesthetic should quickly make the patient unconscious but allow a quick return to consciousness, have few side effects, and be safe to handle.	**Ideal anesthetics** • Quick sedation • Quick recovery • Few side effects • Safe to handle

Font Type	Font Size
For Headings use Sans-serif fonts: • **Calibri** For Body Text use Serif-fonts: • Times New Roman *Avoid: • Bauhaus 93 • Brush Script MT • Comic Sans	Title(96) Headings (36) Body Text (32)

Visuals Should Be…

- ✓ Decipherable from a distance
- ✓ Designed to convey the gist of your message
- ✓ Properly cited and labeled in text

Gas turbine engines run better at higher combustion temperatures

At higher combustion temperatures, these engines generate more power and use less fuel. However, these temperatures are restricted by melting temperatures of the turbine blades downstream of the combustor (see Figure 1).

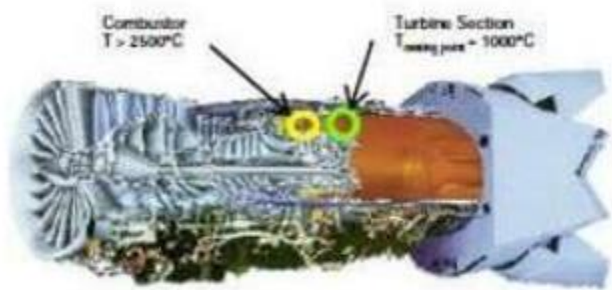


Figure 1. Pratt & Whitney F119 gas turbine engine.

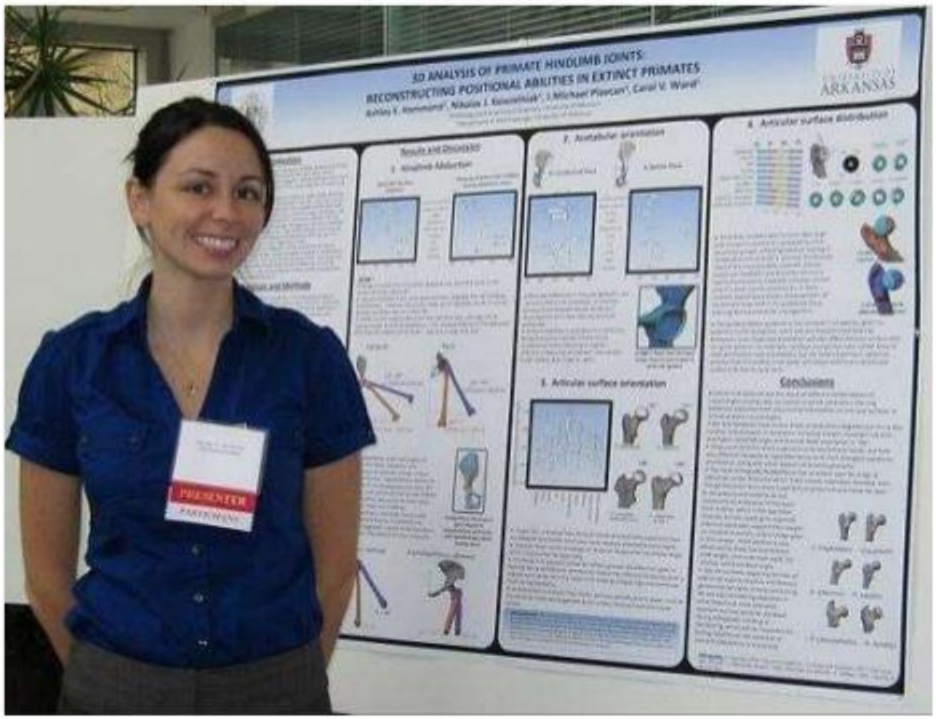
Use Color Purposefully

- Show connections
- Guide the audience through the poster
- Highlight
- Create a mood or suggest a theme

**Be careful of color choice!*

Easy-to-Follow Layouts

The layout should have a left-to-right flow with columns in horizontal rows.



Left-to-right Flow

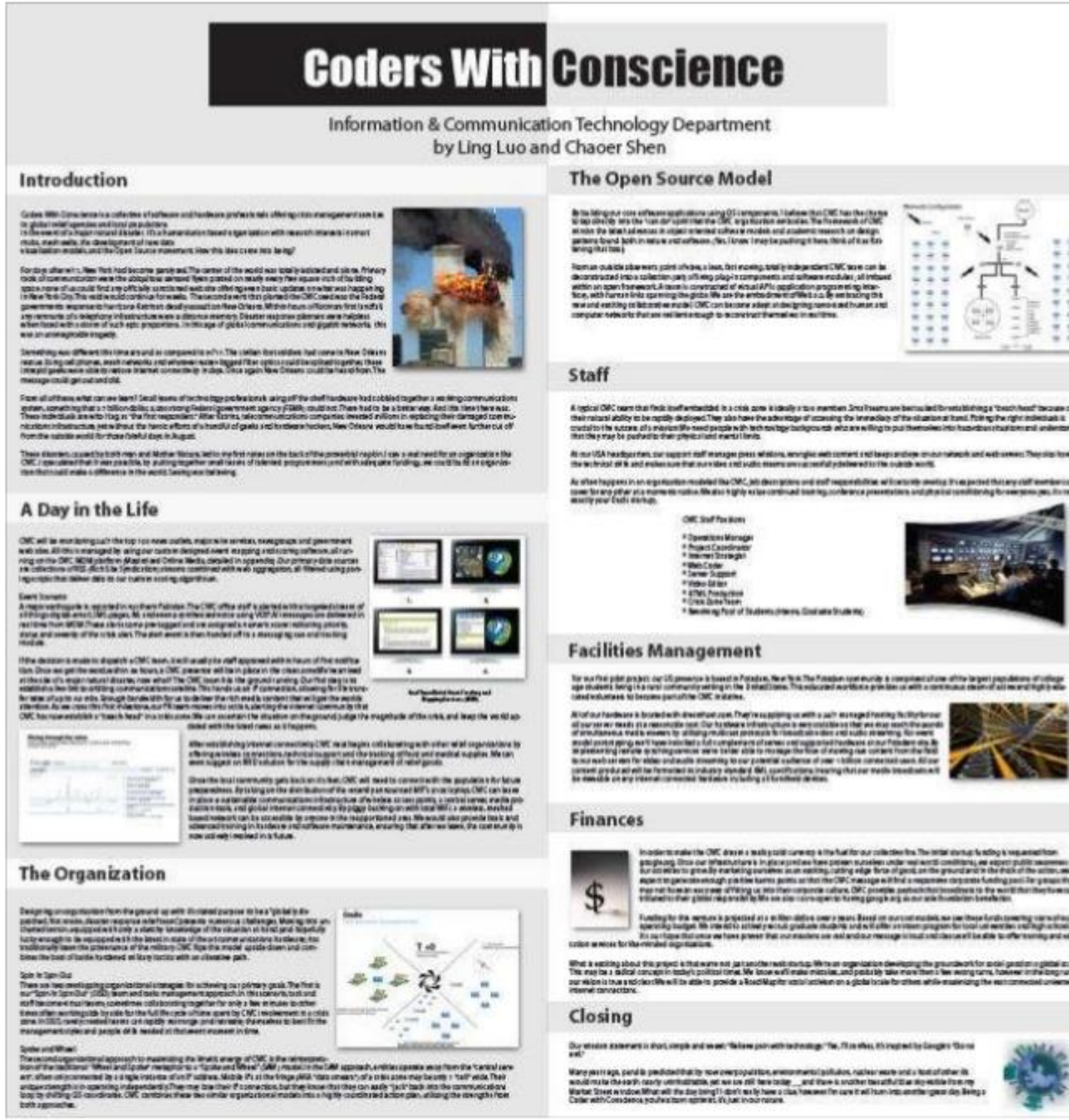
In Horizontal Rows

The evaluation of peer consultant competency as affected by gender stereotypic beliefs has been documented in the personal anecdotes of writing center directors, administrators, and consultants. Student writers judge female writing consultants to exhibit stereotypically feminine behaviors, and male writing consultants are judged to exhibit stereotypically masculine behaviors. Additionally, student writers have demonstrated a tendency to evaluate the competency of the peer tutor in a manner consistent with their own gender.

I propose that female students will rate female peer consultants to be more effective than male peer consultants, and male students will rate male peer consultants to be more effective than female peer consultants.

All peer writing consultants of the Texas A&M University Writing Center (UWC) have agreed to participate in this research. Each one has been trained to utilize a non-directive facilitative style with student writers; thus, each peer consultant will exhibit similar behaviors and give comparable help to every student writer.

Two Fields
In Contrast



http://rainelaw.files.wordpress.com/2007/10/research-poster.jpg

You critique the following posters.

Cooling Effects of Dirt Purge Holes on the Tips of Gas Turbine Blades

Eric Couch, Jesse Christophel, Erik Hohlfeld, and Karen Thole

Gas turbine engines run better at higher combustion temperatures

At higher combustion temperatures, these engines generate more power and use less fuel. However, these temperatures are restricted by melting temperatures of the turbine blades downstream of the combustor (see Figure 1).

Figure 1. Pratt & Whitney F119 gas turbine engine.

Dirt purge holes on turbine blade tips allow for higher combustion temperatures

Harmful hot gases from the combustor leak across the gap between the blade tip and the shroud (see Figure 2). Dirt purge holes expel foreign particles from the blade tip so that film cooling holes are not blocked.

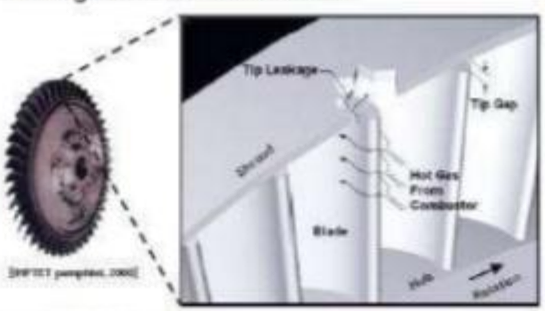


Figure 2. Flow at the tip region of a turbine blade.

The project goal was to find the film cooling effects of these dirt purge holes

To find the effects, we performed wind tunnel experiments with scaled turbine blades. The wind tunnel was low speed and low temperature, and the blades, shown in Figure 3, were scaled at 12 times their normal size. To measure temperatures on the blade tip, we used an infrared camera. Tip gap sizes and amount of coolant flow from the dirt purge holes were both varied.

Figure 3. Large-scale turbine blade in wind tunnel.

Temperature measurements were converted to dimensionless cooling effectiveness

Effectiveness $\eta = \frac{T_\infty - T_{aw}}{T_\infty - T_c}$ where T_∞: mainstream temperature, T_c: coolant temperature, T_{aw}: adiabatic wall temperature (on tip surface)

Cooling increased with blowing ratio

The effectiveness contours of Figure 4 show that cooling increased with blowing ratio.

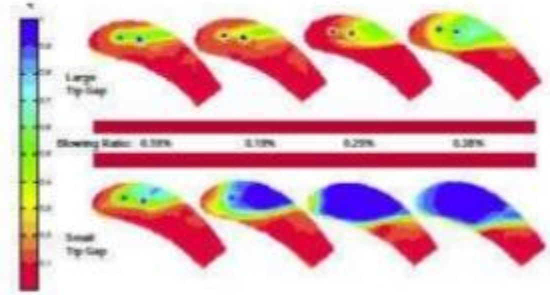


Figure 4. Measurements of film cooling effectiveness.

Tip size dramatically affected cooling

In Figure 5, the lateral averages of effectiveness plotted against the axial chord length show that tip size dramatically affected the cooling.

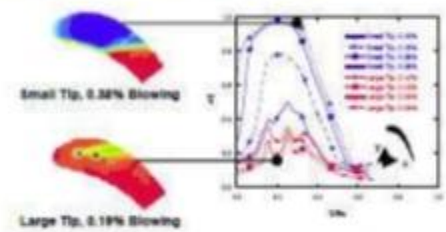


Figure 5. Laterally averaged effectiveness plotted against normalized axial chord.

In summary, dirt purge holes provide cooling to the tip surface

While intended to remove dirt from the blade, dirt purge holes also provide cooling to the tip surface. This cooling is enhanced with a small tip gap as the dirt purge floods the tip region near the leading edge with cool air.

Acknowledgments

The sponsor for this project was Pratt & Whitney.

From: http://www.writing.engr.psu.edu/samples/couch.pdf

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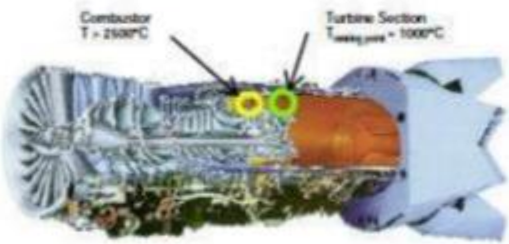

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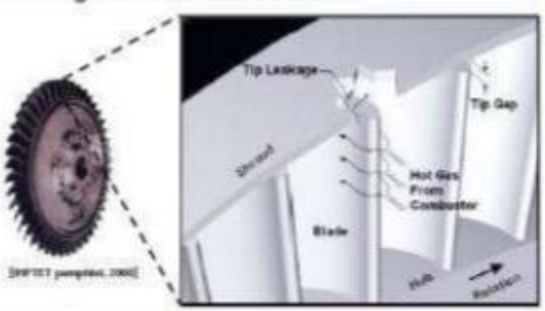

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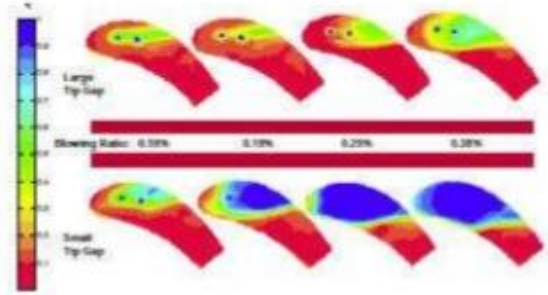

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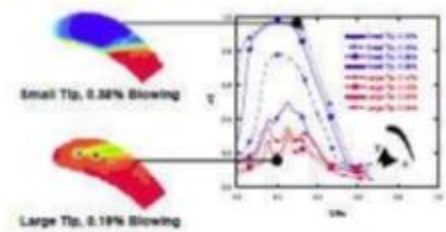

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From: http://www.writing.engr.psu.edu/samples/couch.pdf

Evaluation of Legume Cooking Characteristics Using a Rapid Screening Method.

H.S.Yeung[1], R.W.Waniska[2], J.Ehlers[3]

1. Hway-Seen Yeung, Masters Degree Candidate, Cereal Quality Lab, Texas A&M University, College Station, TX, 77843-2474. Telephone (979) 845-2925
2. Ralph Waniska, PhD, Cereal Quality Lab, Texas A&M University, College Station, TX, 77843-2474. Telephone (979) 845-2925
3. Jeff Ehlers, Department of Botany and Plant Sciences, University of California, Riverside, Riverside, California 92521-0124

roduction:

provement of legume varieties is cessary to overcome challenges of w diseases and achieve higher yields. ost legumes are consumed as cooked eds; consumer preferences for ume products should be orporated earlier in the breeding ocess. Methods to rapidly determine ese attributes are needed in order to antify consumer preferences.

e Mattson cooker, which uses ighted plungers, is used to measure e cooking quality attribute, cooking ne.

e goal of the proposed research was develop an effective, low-cost ethod to analyze the cooking quality ributes of legumes. About 25 samples re evaluated during an 8 hr period. mples were rated for aroma intensity, e number of split seed coats and yledons, turbidity of the broth, oked doneness, and hardness.

jectives:

se a rapid screening method to aluate the cooking quality attributes cowpeas *(Vigna unguiculata)*.
etermine the effect location and oking time hsve on cowpea cooking alities.

ethods:

Intact seeds were selected from 25 wpea varieties and a reference cowpea nple

2.
Samples of 5 g from each variety; placed into plastic bags containing 3 punched holes

3.
Plastic bags were filled with 60 mL of water and soaked overnight for 16 hr

4.
Bags were held by rods in a large cooking container and boiled until the majority of the seeds were fully cooked

5.
Broth was drained from plastic bags through a punched hole

6.
Seeds and their broth were placed in individual bowls

7. Sensory evaluation

Scale	Broth Aroma	Legume Aroma	Tact. Texture
1	none	none	hard, firm
2	faint	faint	slightly hard, firm
3	apparent	apparent	soft, firm
4	more apparent	more apparent	soft
5	pungent	pungent	mush

Split seed coat and cotyledon is evaluated by counting.

Splitting of the seed coat

Splitting of the cotyledon

Results:

Table 1: Undercooked Cowpeas Cooked 5 Additional Minutes

Variety	Time (min)	Cook Done	Tactile Texture	Soak Abs (%)	Cook Abs (%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa (%)	Split Cotyl (%)	Broth Opacity	Bris
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 2: Overcooked Cowpeas Cooked 5 Minutes Less

Variety	Time (min)	Cook Done	Tactile Texture	Soak Abs (%)	Cook Abs (%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa (%)	Split Cotyl (%)	Broth Opacity	Bris
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3: Fall Coachella Valley

Variety	Cook Done	Tactile Texture	Soak Abs (%)	Cook Abs (%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa (%)	Split Cotyl (%)	Broth Opacity	Bris
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 4: UC Riverside

Variety	Cook Done	Tactile Texture	Soak Abs (%)	Cook Abs (%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa (%)	Split Cotyl (%)	Broth Opacity	Bris
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Observations:

- Increasing cook time to achieve doneness improved cooking qualities (Table 1, 2)
- Two locations yielded different cooking qualities of the same variety (Table 3, 4)
- Varieties differed in their cooking attributes (Table 5)
  - The texture of cooked cowpeas showed a negative correlation with the amount of water absorbed during soaking (Sefa-Dedeh et al 1978)
  - Splitting negatively correlated with broth opacity
  - Doneness and texture negatively correlate with

Table 5. Cooking Qualities of Cowpeas

[illegible]	Cook Done	Tactile Texture	Soak Abs(%)	Cook Abs(%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa(%)	Split Cotyl(%)	[illegible]
Tactile Texture	[illegible]								
Soak Abs(%)	[illegible]	[illegible]							
Cook Abs(%)	[illegible]	[illegible]	[illegible]						
Cook Broth Aroma	[illegible]	[illegible]	[illegible]	[illegible]					
Cook Bean Aroma	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]				
Split Testa(%)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Split Cotyl(%)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Broth Opacity	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Bris	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Variety	Cook Done	Tactile Texture	Soak Abs(%)	Cook Abs(%)	Cook Broth Aroma	Cook Bean Aroma	Split Testa(%)	Split Cotyl(%)	Broth Opacity	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Note:
- Dark blue indicates values from the top 20% of samples
- Light blue indicates values from the lower 20% of samples
- Upper values are significantly different than lower values

Conclusions:

- The rapid, low-cost method allows a trained person to evaluate multiple cooking properties of 25 samples within 8 hours
- The method differentiated varieties according to cooking properties
- Seeds grown in different locations yielded different cooking qualities
- It was worthwhile to add 5 min cooking time to undercooked seeds
- But not worthwhile to cook overcooked seeds 5 min less

Acknowledgements:
Bean and Cowpea CRSP for partial financial support; Dr. Agnes Mwangwela and Dr. Amanda Minnaar for their assistance in method development; Texture Technologies Corp., Scarsdale, NY/Stable Micro Systems, Godalming, Surrey, UK).

Were Victorian Fallen Women Doomed?

LAURA GARDNER
laurag@rice.edu
RICE

The Question of REINTEGRATION

Could a Victorian woman ever transform from a

Fallen Woman into a **Respectable Matron?**

Victorian literature portrays how numerous respectable ladies become fallen women — women who have had heterosexual relations outside of marriage. Often, polite society shuns the fallen woman, leaving her to endure a disgraced, alienated life.

But could fallen women ever reintegrate into society? Could a fallen woman ever regain her former status or even marry a respectable man?

I posit that a significant number of Victorian fallen women, real and fictional, reintegrated into society. I also propose that an even greater number empowered themselves by constructing and controlling their own narratives.

Methodology

This project examines the representation of fallen women in both literary and historical accounts. I consulted Victorian handbooks on rescuing fallen women, treatises on prostitution, the annual reports of reform shelters for fallen women, and the records of rescue societies such as the Female Mission to the Fallen. In my research, I try to locate the stories of fallen women's reintegration and empowerment.

The Common View

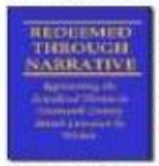
• Fallen women never reintegrated

In her study *Fallenness in Victorian Women's Writing*, Deborah Anna Logan contends that most fictional fallen women were never fully reintegrated into society.

Logan studies mostly lower-class fallen characters created by female authors. Of the fallen characters she analyzes, all are "punished by the literal and metaphorical death or disfigurement of themselves or their children; none of them marries or otherwise achieves social integration."

Logan concludes, "What was true of eighteenth-century writers on the fallen-woman theme remains true a century later: [illegible]"

• Fallen women were silent, passive victims



Roxanne Eberle's dissertation, "Redeemed through Narrative: Representing the Sexualized Heroine in Nineteenth-Century British Literature by Women," presents an even bleaker view of the Victorian fallen woman.

According to Eberle, Victorians imagined only one fate for the fallen woman, known as the "Harlot's Progress." She summarizes, "girl is seduced, girl suffers, girl repents, and girl dies."

Eberle continues, "The sexually transgressive heroine of the Victorian period is [illegible] found in Romantic texts." Although her plight is recorded in social reform literature, it only "informs us of a great 'social evil' of which she is a victim and rarely a critic." This statement implies that fallen women never thoughtfully articulated their goals and never knew any fate besides victimization.

• Reform shelters oppressed fallen women

In her dissertation, Eberle also asserts that the Magdalen reform shelters established to reintegrate fallen women were victimizing structures. She writes, "Magdalen houses are merely a literal manifestation of the growing cultural desire to police female sexuality through law, medicine, and other institutions." These reform shelters, also known as Homes, only strove to "isolate fallen women," suppress their stories, and "shut 'contaminated' female bodies up."

Eberle affirms that Victorian fallen women "tend to be acted upon; they are invariably the passive recipients of disciplinary policies."

Challenges from MY RESEARCH

• Victorian authors depicted women marrying after a sexual fall

In *David Copperfield* (1849-1850) by Charles Dickens, Martha Endell, a former prostitute, emigrates to Australia and marries a farm-laborer.

Wilkie Collins's *The New Magdalen* (1876) focuses on the reintegration of Mercy Merrick, a former reform shelter inmate. Mercy marries a clergyman and subsequently emigrates to the New World with her husband.

• 'Real' fallen women also married

The 1866 report of The Female Mission to the Fallen records how one rehabilitated fallen woman is "now engaged to be married to the son of a clergyman, with the full consent of the young man's family." Numerous other marriages are narrated in these reports.

• Not all Victorian fallen women were victims

Victorian reform writer William Tait declares that no fallen woman "ought to be given up as being beyond the reach of remedy."

In 1866, the Female Mission announced plans to employ a Missionary to deal exclusively with preventing fallen women from committing suicide. After rescuing these women, Missionaries found them employment or helped them enter reform shelters.

• Fallen women controlled their narratives

William Makepeace Thackeray's *Vanity Fair* (1846-48) portrays the adventures of Becky Sharp. After living on the margins of society for a while, Becky uses the narrative of her victimization—isolation from her son, threats of suicide, consorting with questionable company—to gain sympathy and financial support from the other characters.

Reform Shelters: A Different Perspective

• GOAL: To reintegrate women, not isolate them

Reform shelters operated with the specific intention of reassimilating fallen women into society. According to Tait, after their stay in the shelters, women did "become useful and honorable members of society."

• Making victims into agents

Susan Mumm, a scholar at York University, has documented how church-based reform shelters attempted to give their inmates increased agency by "giving them specialized training." As a higher-status servant such as "parlourmaids," women might be better able to defend themselves from the advances of others.

• Publishing the fallen woman's narrative

Each year, reform shelters and agencies published reports detailing the cases they helped. Reform workers narrate the circumstances of the women's falls. These case histories do not gloss over the poverty, assault, and exploitation faced by these women. Often the reports include letters by the fallen women describing their new lives in society.

Special Thanks

Professor Robert L. Patten, Rice University
Professor John Sutherland, University College London
Professor Helena Michie, Rice University
Rice Undergraduate Scholars Program
The British Library
The Wellcome Trust Library

Selected Sources

Eberle, Roxanne, dissertation, "Redeemed through Narrative: Representing the Sexualized Heroine in Nineteenth-Century British Literature by Women." University of California at Los Angeles, 1994.

Logan, Deborah Anna. *Fallenness in Victorian Women's Writing*. Columbia: University of Missouri, 1998.

Mumm, Susan. "'Not Worse Than Other Girls': The Convent-Based Rehabilitation of Fallen Women in Victorian Britain." *Journal of Social History* 29 (1996): 527-546.

Tait, William. *Magdalenism*. Edinburgh: P. Rickard, 1842.

The 1866 Annual Report. London: The Female Mission to the Fallen, 1866.

From: http://www.owlnet.rice.edu/%7Esainpraj/images/gallery/fallen_women_md.gif

MINE IS BETTER

How to Design an Effective Research Poster

UNIVERSITY WRITING CENTER

Written and designed by John Laky, Mercedez Hernandez, Masha Sukovic, and Sierra Mendez | With thanks to Dr. Valerie Balester and the University Writing Center

Introduction

research poster is designed to help
s compose high-quality research posters
ess of their discipline.

rch posters showcase your research to a
audience, thus be clear.

e, for a moment, the poster you are
while standing amongst a host of
hers or idling in the writing center. This
ent will impart the knowledge essential
gning a research poster to any passer-by
example while maintaining interest
uniqueness.

**IRaD Introduction should interest your
and present a clear hypothesis. Explain
earch problem you are investigating and
s significant. Avoid wordiness – you will
e reader's interest with long explanations.**

Methods

ave divided our presentation into two
sections: the actual content of our
and an analysis of the integral parts of a
h poster, including a summary of the
organization style (Introduction,
s, Results, and Discussion).

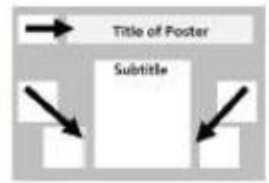
omments that annotate each subdivision
rize the associated IMRaD section – see
for an explanation of the IMRaD
ds.'

**IRaD Methods section should briefly
e the methods and materials in your
h. Often, these are better communicated
graphs that illustrate steps. A clear
tion of your methods lends credibility to
ster, and thus, your research.**

Audience

Layout

Focus on an easy-to-follow design.



Present your content in logical order (remember, IMRaD).

Align your margins and spacing the content evenly.

Avoid clutter.

A graphic should lead the viewer's eye in the right direction.

Text Formatting

Text should be left aligned.

Be wary of large chunks of text.

[avoid word art]

All
Text
Should be large
and easy to read
from one meter away

Never use decorative fonts like Ravie, Chiller, or Gigi.
You can use different professional fonts, but use a uniform style.

Graphics and Color

Color can be your ally or your enemy.

Make sure your colors fit within the same color scheme. Aesthetic color palettes can be found online for the artistically disadvantaged.

Backgrounds should provide **HIGH** contrast; low contrast is hard to read.

Be wary of pixilated graphics. UNIVERSITY WRITING CENTER

Beware of copyright infringement. We would embed a clever remark here, but plagiarism is a serious matter.

Results

This is the most important, and usually the longest, section of your poster. Describe your results in quantitative and qualitative terms and directly state whether your hypothesis was confirmed. Describe your data analysis and its relation to your hypothesis. Use as many visual tools as possible such as tables, legends, and graphs to clarify your data.

Discussion

Research posters display your project's
points to an audience; they are not mean
provide every single detail, but to convey
essential information. Effective research
require the following:

- Analyze the type of audience viewing y poster and customize accordingly.
- Create visually stimulating images and f emphasizing readability and coherence.
- Design an easy-to-follow layout to guide audience through your data.
- Be wary of overcrowding your poster wi excessive graphics or text.

Key Tips:

Data is plural. Write "data are," not "data

Underlining makes text look bulky. *Italics your poster look cleaner and whole.*

~~Grammar mistakes is bad.~~ Grammar mista bad. Double check for errors.

Use parallel lists, i.e., "test hypothesis, co data, write conclusion."

Though creating a research poster can be
daunting, following the IMRaD approach
these guidelines can make it easier.

**The IMRaD Discussion section should ta
the conclusion of your research. First,
reiterate the hypothesis without s
redundant. Clearly and quickly state
your hypothesis was supported, and w
findings are relevant and interesting.**

Title

A glance should reveal the research you'
conducted and why. **The key is an effecti**
Your title should be as clear as possible a
include the issue and your approach to re
If the audience is more general, a catchy
be effective, like ours.

Poster Presentation Tips

Practice short (2 minute) and long (10 minute) versions of your explanation.

Anticipate questions you might get and how you will answer them.

Poster Presentation Tips

Do not block or read from the poster.

Point out figures and use them in your explanation.

Summarize in 2-3 sentences.

Helpful Resources

- http://www.ncsu.edu/project/posters/
  Examples with detailed strengths and weaknesses

- http://posterpresentations.com
  Download poster templates

- http://brandguide.tamu.edu
  Download A&M logos and templates

TEXAS A&M HEALTH SCIENCE CENTER

Make the Main Title with Large Bold Type

Your Name Here

Your Department Here

Texas A&M Health Science Center

Before You Begin

Check the requirements for your meeting:

- Are there dimensional requirements for the poster?
- What is the size of the space you are going to have for presenting the poster?
- Does it need to be horizontal or vertical?
- Does the poster need to show the abstract number? If so, does it need to be part of the poster title? The abstract number for this template is in the extreme upper left hand corner above the title box.

Getting Started

1. Choose "Page Setup" under the "File" menu and define your poster size. Typical posters are 38 x 48 or 40 x 56, but they can be any size up to 40 inches for the short measurement. This poster is 38 x 56. PowerPoint's maximum width is 56 inches.
2. Under the "Format" menu choose "Background."
3. Select a color from the drop-down menu, or choose "Fill Effects," which offers many options such as gradients and textures.

Text Boxes

Be sure to make text large and easy to read. Headings for these text blocks are 60-point bold, and the body text is 32-point bold. The body text can be bold or normal, depending on the text you use and the amount of text in your poster. All the text in this poster is set up within white text blocks, so when you replace this text with yours, the block will expand to fit the length of your text. All the text blocks in this template can be modified, but it is best to keep a uniform width for each box.

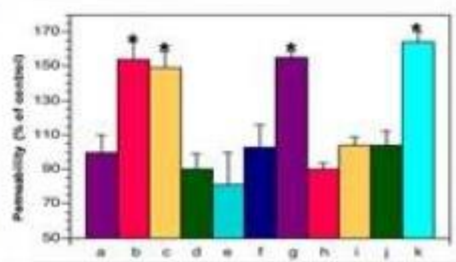
The text boxes on this stencil are formatted with a white fill, no outline and a black shadow. A variety of other combinations can be chosen. Make sure the color of the text contrasts with the box color for easy reading.

More about Text Boxes

Right-click within the text box and select the "Format Text Box" option from the popup window. Select the tab that says "Text Box." In this window you can set internal margins. These boxes have a half-inch (.5) margin around the bottom and sides, and a slightly smaller margin on the top.

Another option within the "Format Text Box" dialog box is text rotation. There is more about rotated text in the legend of the graph below.

Another way to get to the "Format Text" box is by choosing "Format" on the top menu bar. Under the "Format" menu are other helpful formatting features.



With rotated text, such as that on the left side of this graph, use only Arial or Helvetica fonts, as not all text will print out correctly when rotated. To make sure this will not happen, it is best to insert rotated text within PowerPoint once the graph is imported into your poster file. Use the rotate text feature in the "Format Text Box" mentioned above.

Figure legends can be slightly smaller than the main text.

Tables and Photographs

Tables, illustrations and photographs can be placed to match the text blocks. Draw a rectangle box where you want to insert the graphic element. Be sure to include figure legends. Line up text blocks and figures whenever possible, and try to maintain even spacing between blocks.

Illustrations, especially seals of institutions, can be tricky to incorporate into the poster with no background block included. It is best to use .png files, inserting them using the "Insert File" command. If you use .gif or .jpeg files you must customize your drawing tool bar in order to use the "Set Transparent Color" tool to set the background to the color of what is behind the illustration.

When importing photographs from another program, make sure they are at least as large as you want them to appear on your poster. Enlarging the photograph using the scaling feature in PowerPoint does not work well. The image might look fine on your computer screen, but it will not always print well.

Other Tips

1. Be sure to have the formatting and drawing tool boxes turned on. These are of indispensable help in creating posters.
   - Go under the "Tools" menu and select "Customize," then select the "Toolbars" tab and make sure the drawing and formatting tools are checked.
2. Bullets and scientific symbols are sometimes difficult to print.
   - It is advisable to use Arial or Helvetica fonts when having to use a lot of scientific symbols, and the "Symbols" font for special characters that are not included in either of the two text fonts.
   - Bullets sometimes translate as different symbols between the computer and the printer. Even if they look right on screen, they sometimes "translate" wrong in the printing stage. The best way to avoid this is to make all your bullets numbers to start with, then change them to bullets later. Sounds strange, but it works.

Conclusion

When you have all your elements on the poster, line them up and make sure they fit.

Make sure the spaces between your text, pictures and other elements are visually balanced. With the "Line" tool, draw guidelines in contrasting colors the length and width of your poster. Hold down the Shift key while drawing them to keep lines straight. Use these guidelines to line up the elements of your poster. When you are finished, just delete them.

References

PowerPoint 2007 Windows XP Version

Put your references here. They can be in slightly smaller type.

OTHER NOTES:

Only official Health Science Center logos should be used. There are a variety from which you can choose on the HSC website: http://www.tamhsc.edu/marcomm/bg/downloads/logos/

http://tamhsc.edu/marcomm/bg/downloads/posters/

For More Help…

Visit our website or call us to schedule an appointment.

We can help you with the construction, design, and style of your research poster.

Design Process

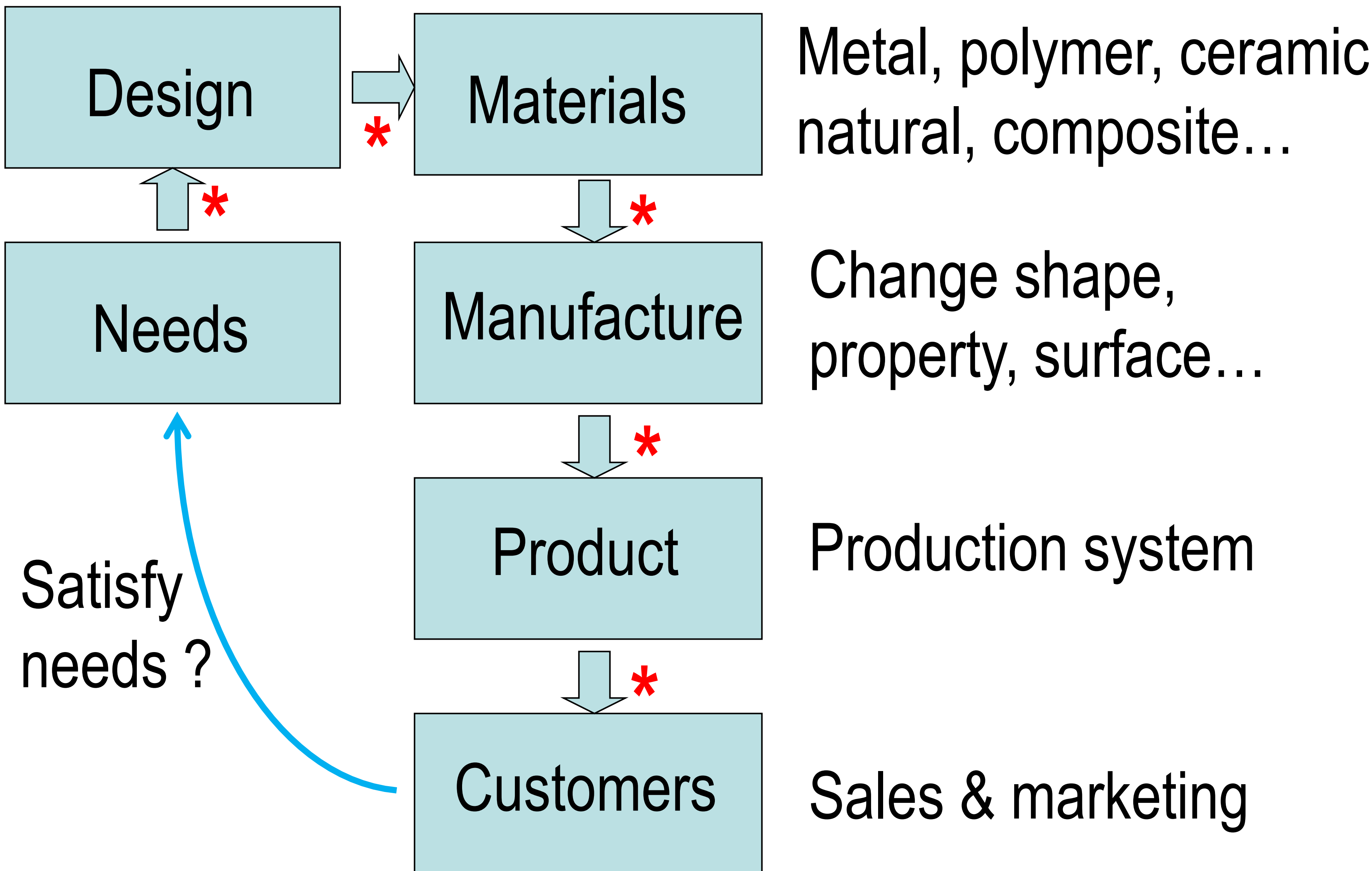
Design process can be applied to:

- ❑ New curriculum development
- ❑ Product design
- ❑ Problem solving

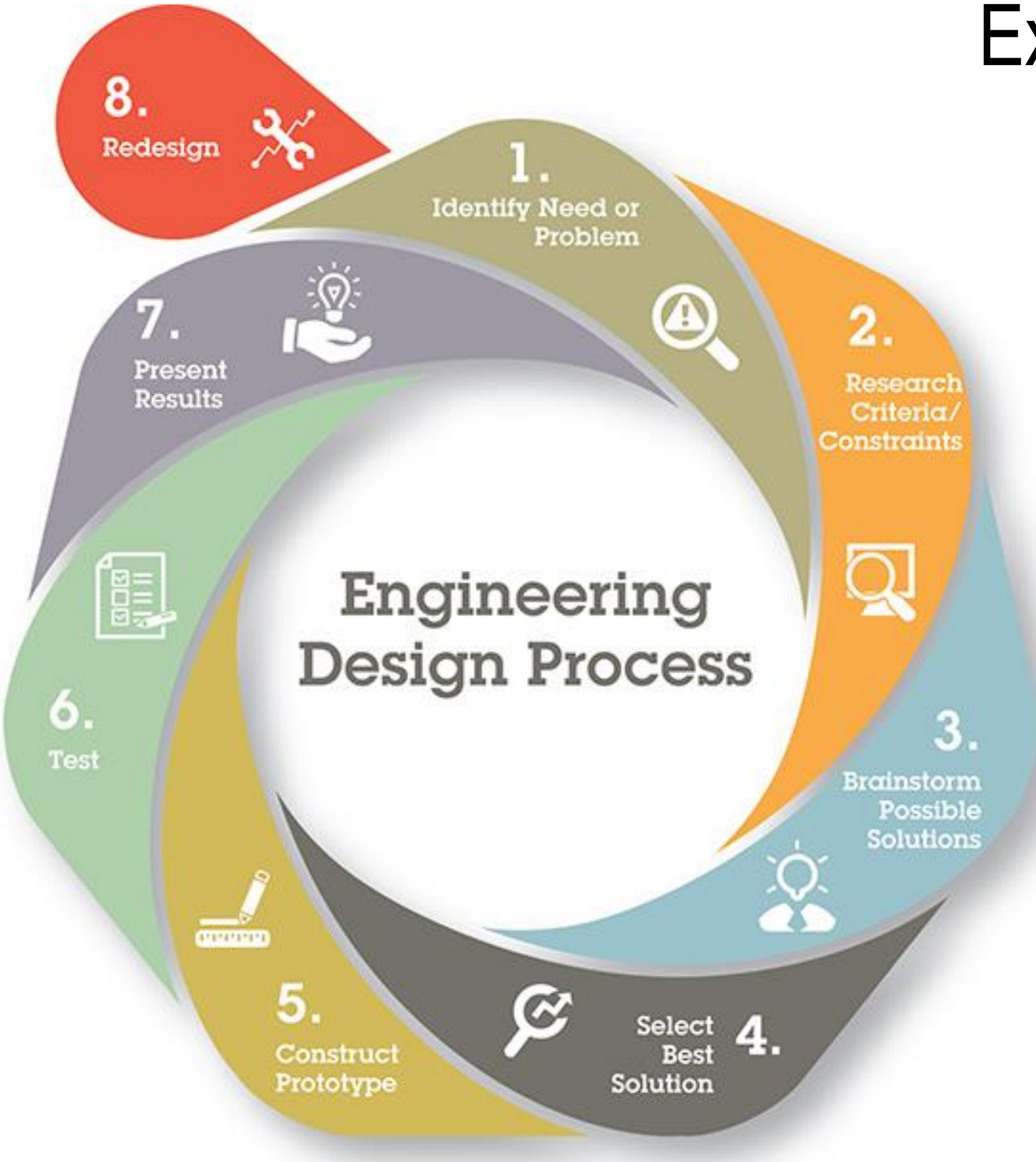
References:

- Nigel Cross, Engineering Design Methods: Strategies for Product Design, 2nd ed. Wiley, 1994.
- Edward Lumsdaine and Monika Lumsdaine, Creative Problem Solving: Thinking Skills for a Changing World, Mc Graw-Hill, 1995.

Engineering Product Design



** Communicate via drawing and document*



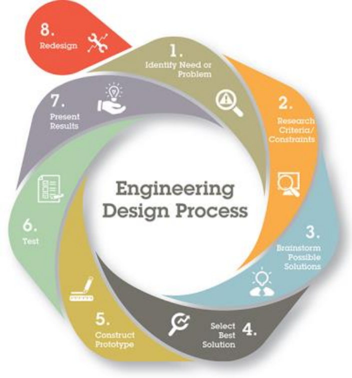
Examples

- Lack of manufacturing talents in Texas
- Cheating in exam
- Computer virus
- Traffic jam during peak hours
- Universal tool for metric and imperial fasteners
- Changing watch battery
- Etc …

https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

More examples:

- Find a solution for student cheating in exam
- Design new robot for state competition
- How to motivate students for STEM?
- A product to replace/block cell phone
- I want to improve my GPA
- Modify my program to attract underrepresented students
- …

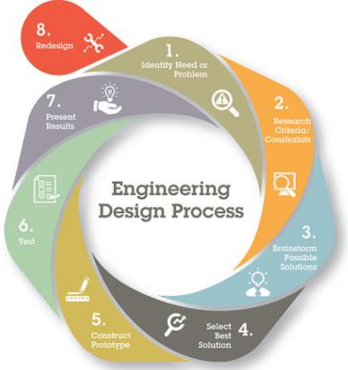


Step 1: Identify need or problem

"Find a solution for student cheating in exams"

Step 1b: Clarify objectives

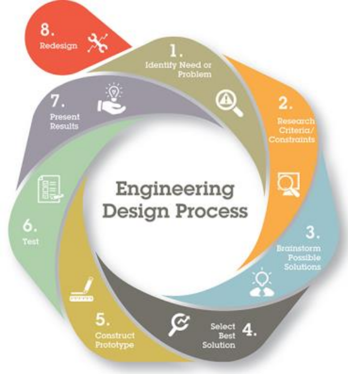
- Test type: quiz, midterm, final, entrance exam, national exam…
- Result: preventive solution, disciplinary or punishing procedure…



Step 2: Research criteria and constraints

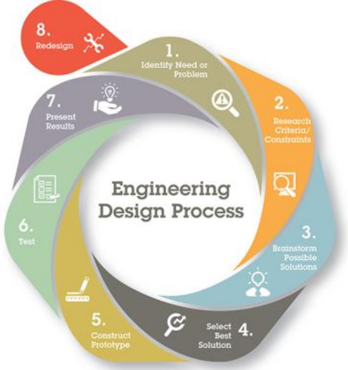
Obtain specific /relevant information…

- Exam types: final, entrance exam, quiz…
- No large classroom available
- Cannot change schedule
- Limited funding to implement
- …



Step 3: Search for possible solutions (Ideation)

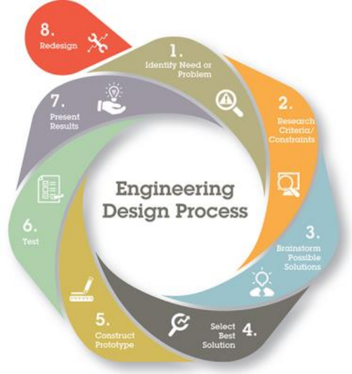
- *Brainstorming:* look for lots of ideas from a group
- *Synectics:* find possible solution using analogies
- *Removing mental block*: Find new direction, think outside of a box
- *Morphological chart:* idea for functional requirement
- *Fishbone diagram*: cause and effect



Step 3: Search for possible solutions (Ideation)

❑ ***Brainstorming:*** look for lots of ideas from a group

- Quantity, not quality
- No criticism
- Avoid prejudice
- Combining ideas
- …



Step 3: Search for possible solutions (Ideation)

- *Synectics:* find possible solution using analogies
  - Similar issues from different fields
  - Solutions to similar problems

Step 3: Ideation
Synectics

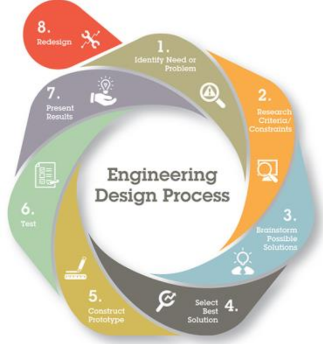
"Find a solution for student cheating in scheduled final exams"

https://wellnessmama.com/15510/cheat-system-diet/

http://waterfordwhispersnews.com/2017/12/08/irelands-final-dole-cheat-to-be-publicly-executed-later-today/

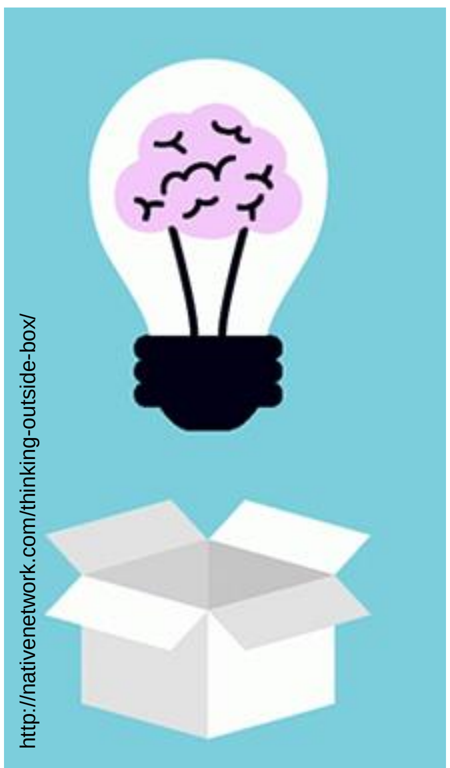
http://www.avonotakaronetwork.co.nz/blog/page/I-cheated-on-my-boyfriend

http://www.searchquotes.com

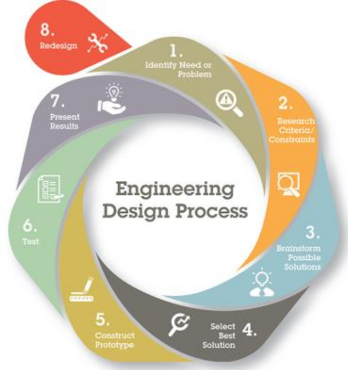


Step 3: Search for possible solutions (Ideation)

- *Removing mental block*: Find new direction, think outside of a box



- Ignore constraints
- No criticism



Step 3: Search for possible solutions (Ideation)

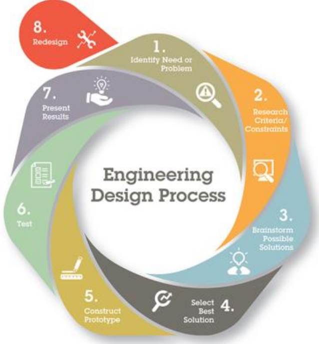
- *Morphological chart:* idea for functional requirement

Morph (verb): to undergo transformation from an image of one object into that of another

- Change shape, support structure, boundary, rule… based on the required function
- Quantity not quality

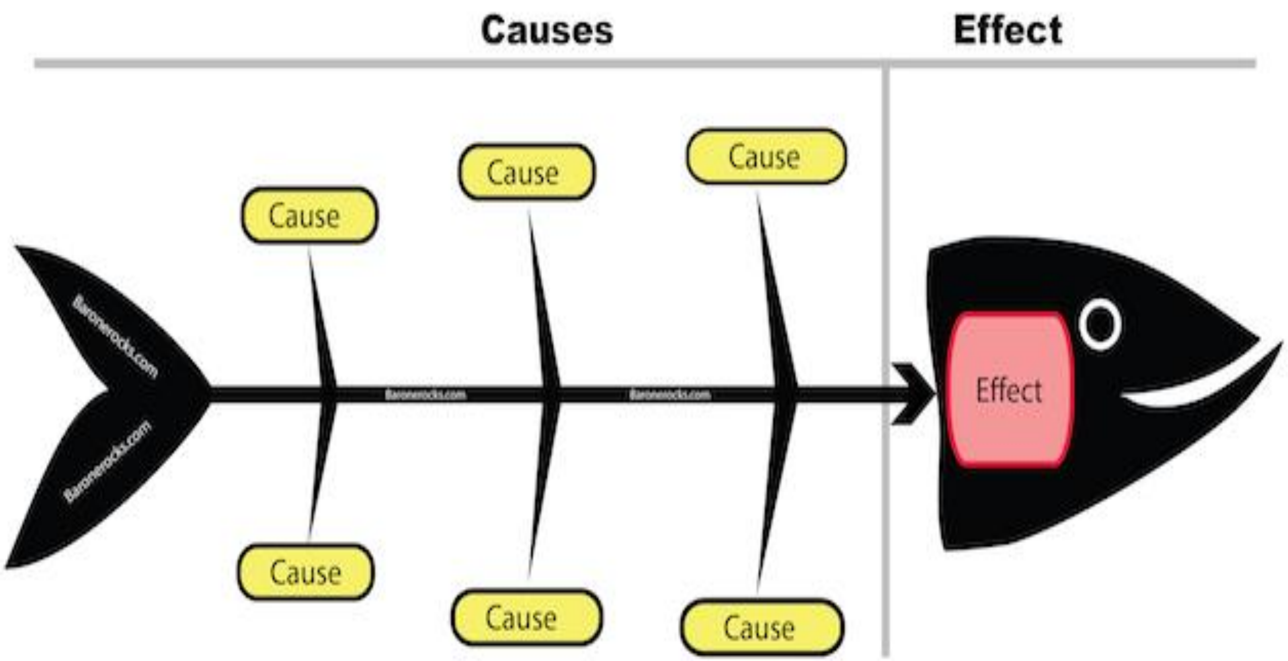
Morphological chart for chair design

Chair components	Physical solutions – S_k				
	1	*2*	*3*	*4*	*5*
Seat	 *S_1 - Square*	 *S_2 – Half round*	 *S_3 - Rectangle*	 *S_4 - Round*	 *S_5 - Ellipsoidal*
Back	 *S_6 - Square*	 *S_7– Trapezoidal_a*	 *S_8 – Trapezoidal_b*	 *S_9 - Round*	 *S_{10} - Ellipsoidal*
Armrest	 *S_{11} – "L" shape*	 *S_{12} – "T" shape*	 *S_{13} – "J" shape*	 *S_{14} - Ellipsoidal*	 *S_{15} - "U" shape*
Stand	 *S_{16} – Straight_a*	 *S_{17} – Straight_b*	 *S_{18} - Round*	 *S_{19} – Slant_a*	 *S_{20} – Slant_b*



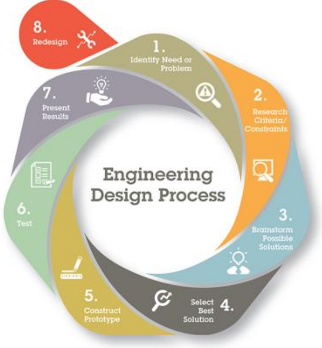
Step 3: Search for possible solutions (Ideation)

❑ *Fishbone diagram*: cause and effect



- Brainstorm for causes
- Graphical presentation

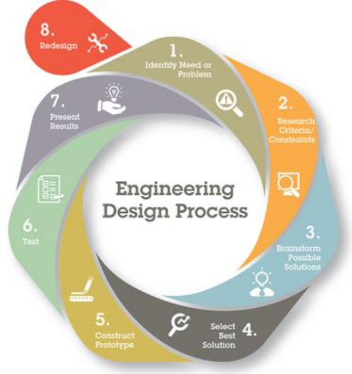
baronerocks.com



Step 4: Select the best solution

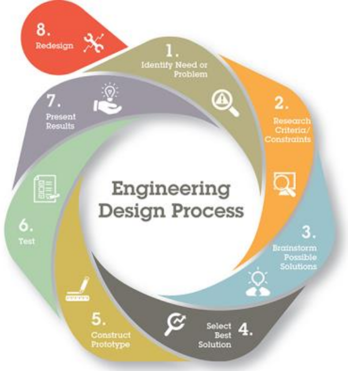
[satisfying all constraints/criteria]

- Top-down instruction
- Weighted criteria



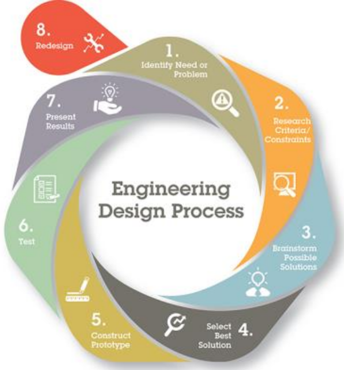
Step 5: Construct prototype

- Draft curriculum
- Fabricate nonfunctional prototype
- Manufacture functional model
- Sketch of solution
- …



Step 6: Test prototype

- Preliminary functional /reliability tests
- Survey
- Professional feedback
- Alpha vs beta tests
- …

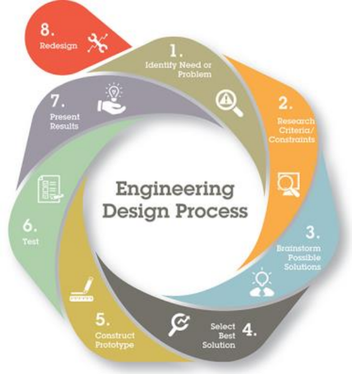


Step 7: Present solution/result

- Submit report
- Presentation of concept
- Show a physical /working model

Step 7b: Implement solution/result

- Contingency plan
- Regular feedback. Collect data.



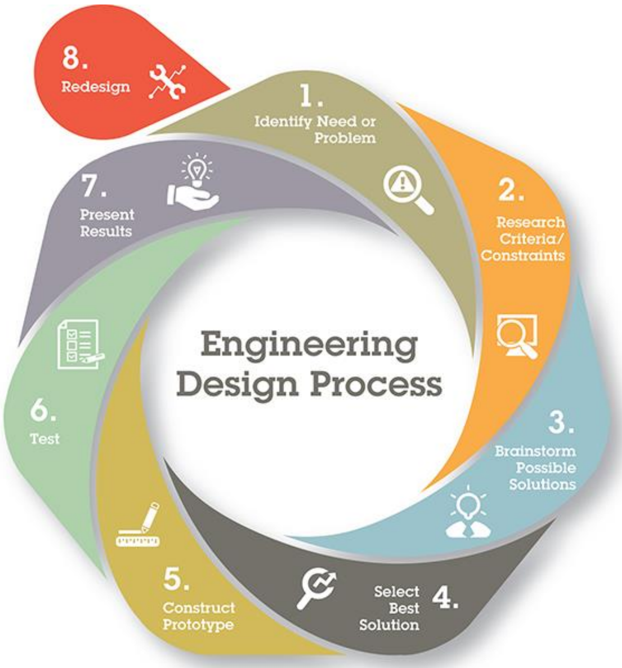
Step 8: Redesign. Modification. Justification.

- Cut cost
- Simplify device
- Automate steps
- Change rules
- Increase effectiveness
- Differentiate Musts vs Wants
- Consider different market /culture
- …

- Examples of exam cheating

https://www.youtube.com/watch?v=_5GLG1C0DCs

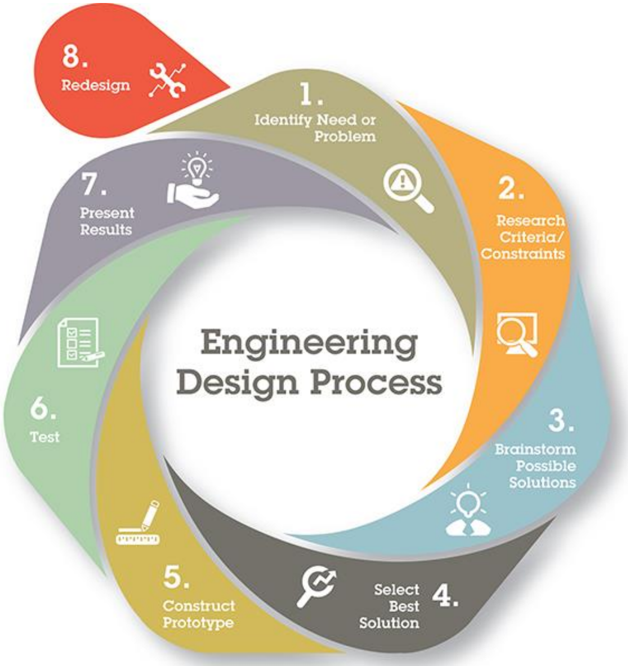
- Solutions for exam cheating



https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

Program outcomes:

1) Redesign and fabricate a component to enhance a Stirling engine
2) Design a new curriculum, or
3) Propose plan to implement a new concept/exercise to existing curriculum



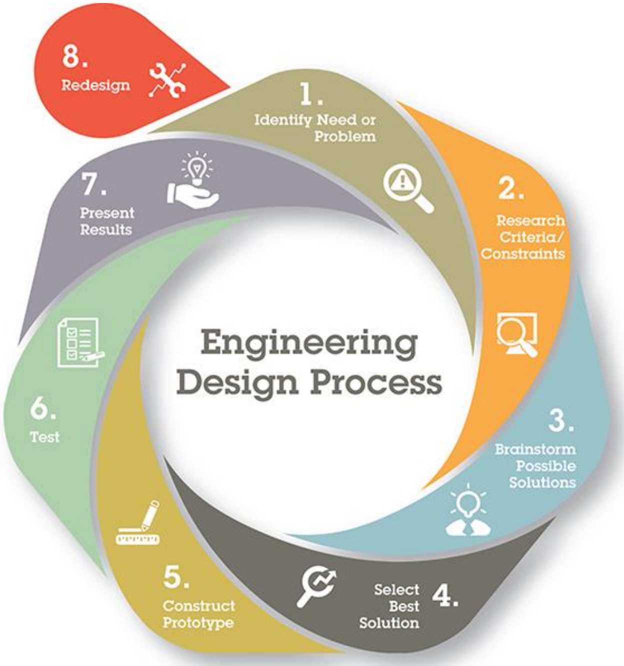
https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

Program outcomes (1/2):

Design and fabricate a part/system to enhance a Stirling engine

1) Show steps of Design Process
2) Present your final design

- Group
- Technical drawing: multiple views+ dimensions
- Manufacturing plan
- Schedule
- Expected results



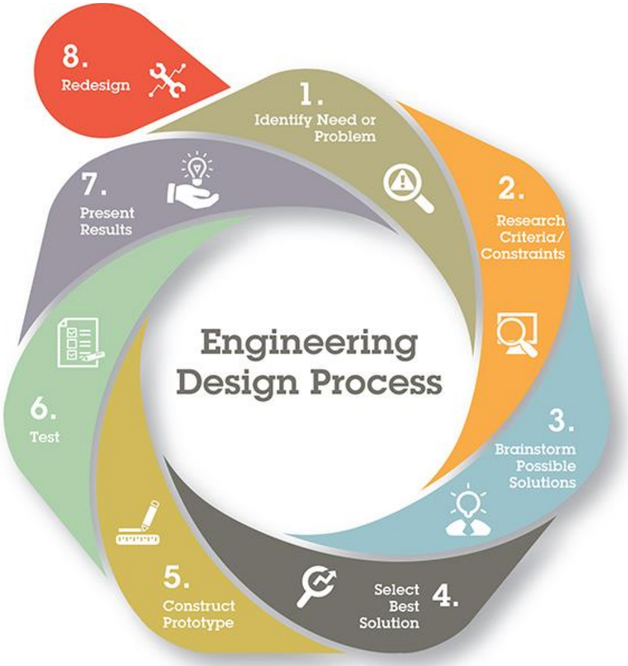
https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

Program outcomes (1/2):

Design and fabricate a part/system to enhance a Stirling engine

Manufacturing training and facility

1) Traditional manufacturing
2) Computer-aided manufacturing
3) Laser machining
4) 3D printing
5) Surface engineering

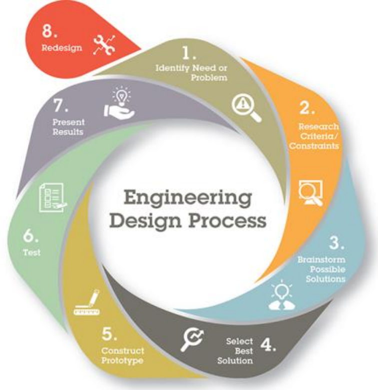


https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

Post-program outcome:

Measureable success of new implementation in your class:

- Number of students, certificates, field trips, STEM clubs …
- Participation in competition and awards (if any)
- Additional funding, equipment
- Conference presentation
- Inter-school activities
- …



https://www.teachingchannel.org/blog/2015/09/29/rube-goldberg-machines-and-the-engineering-design-process/

Question from the external evaluator:

- Manufacturing and other STEM concepts, state curriculum objectives that will be addressed?
- List of materials and equipment needed and how they will be acquired an maintained?
- Support that the teacher will need from RET team, school administration, or industry

- Reflection component for success after the project is implemented
- How students involve in the various stages of the process, from discovery to evolution?
- How the students' designs, process approaches and products will be assessed?

Pen Holder with Logo Engraved

The steps described allow you to practice 'Pen Holder' design shown below. The pen holder has two parts, namely the base with a logo/design engraved on it and a press-fit structure on the base to hold a pen. The instructions require the use of Autodesk Fusion 360, which can be downloaded for free at https://www.autodesk.com/products/fusion-360/overview for students. This material is divided into two sections; section one will detail the steps to create the CAD model of the pen holder in Autodesk Fusion 360 and section 2 will focus of creating drawings, section views etc. and dimensioning them in Autodesk Fusion 360.

Section 1: CAD Model of Pen Holder.

This material is divided into three parts; modelling the base, modelling the pen holder and assembly of the parts.

The basic layout of the Autodesk Fusion 360 is shown below.

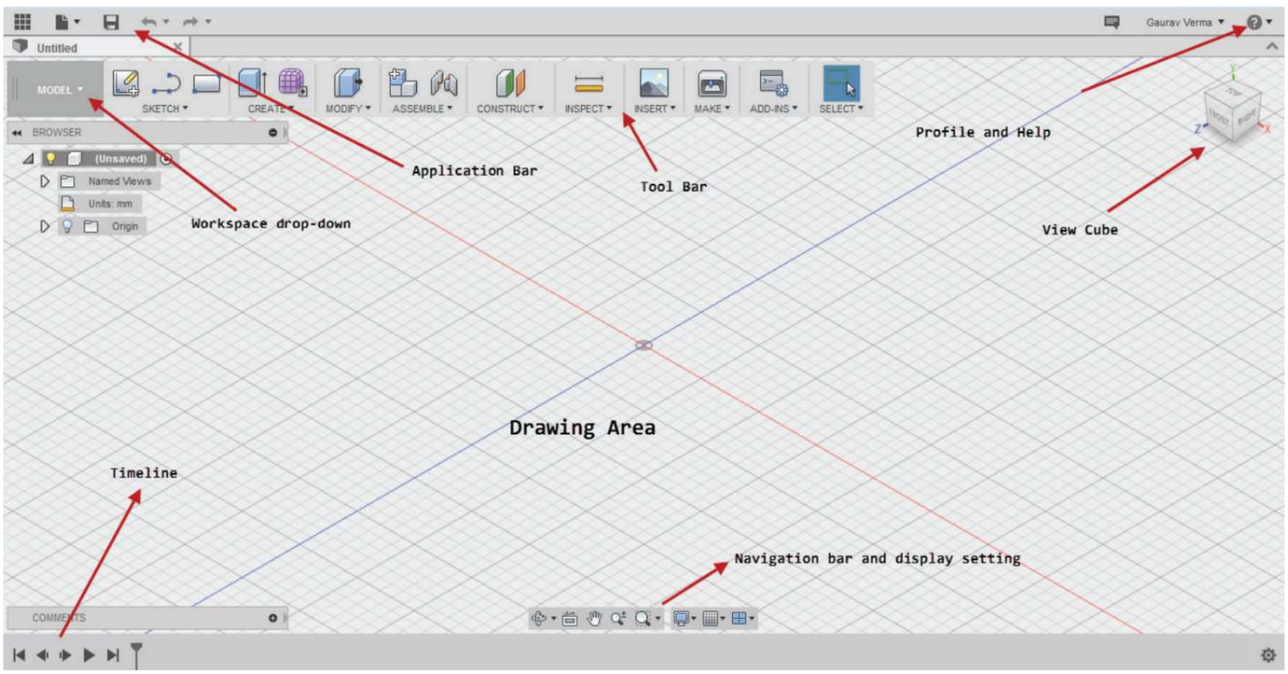


Fig 1. Source: CADCAMCAE Works, Autodesk Fusion 360 Book.

In the steps below; when it is mentioned to select the X-Y plane or similar instructions are given, use the view cube on the top right of the screen to manipulate the sketch plane appropriately.

In Autodesk Fusion 360, there are a lot of single key shortcuts that significantly reduce sketching time. Some of the shortcuts are mentioned throughout the instructions, but, from increased use you would gain a better understanding of the shortcuts.

Part 1: Base

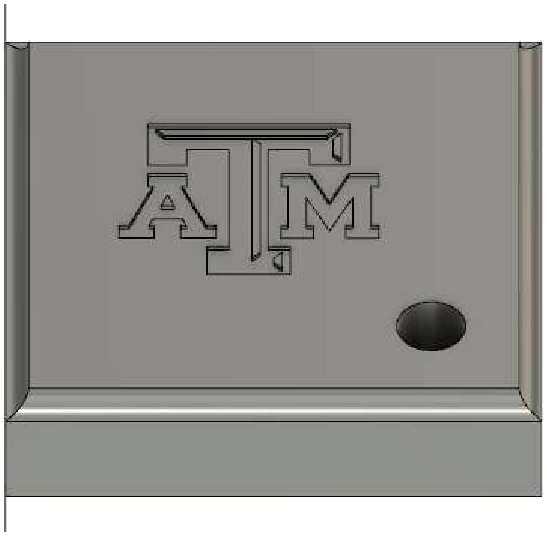
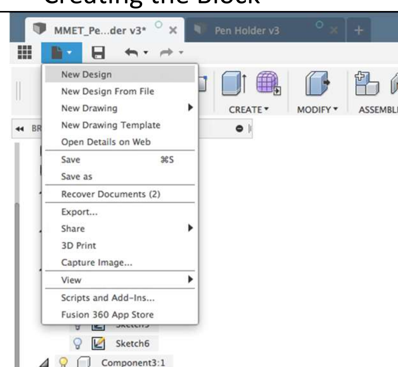
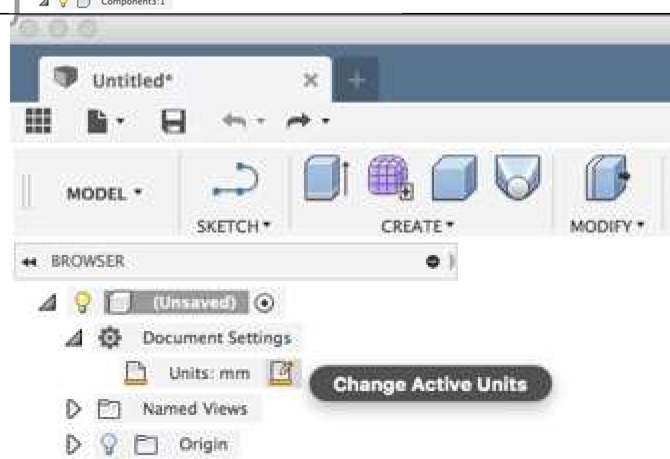
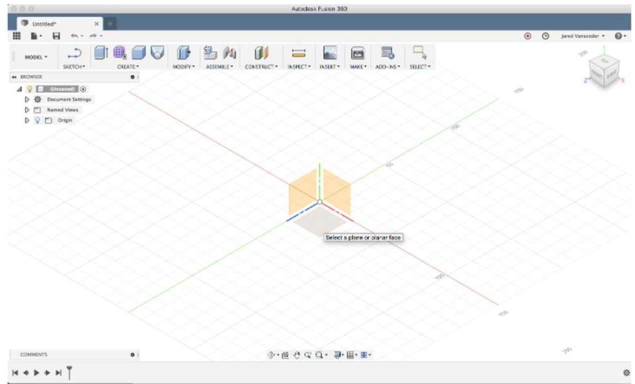
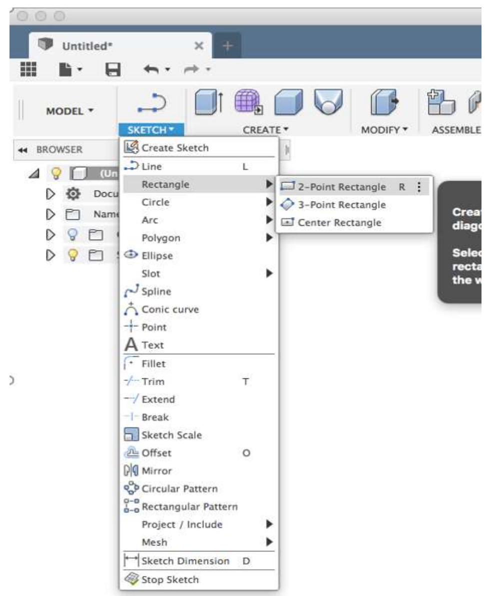
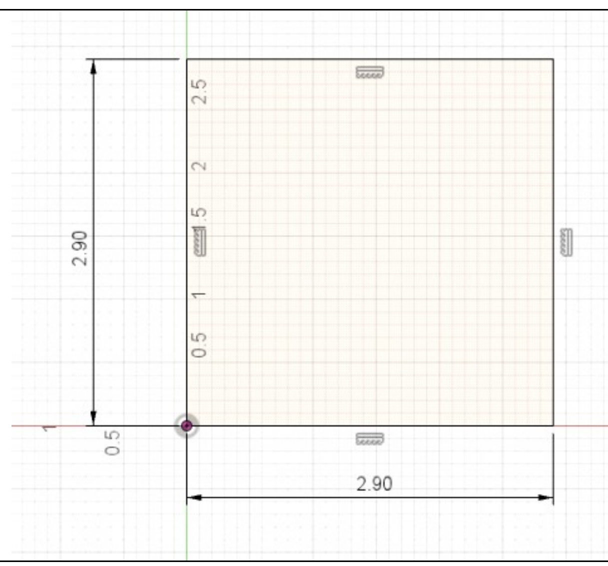
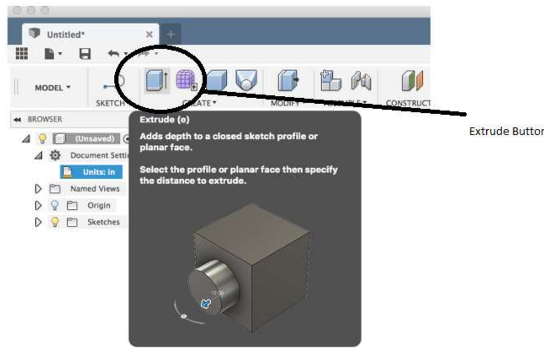


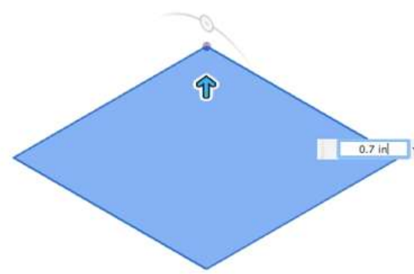
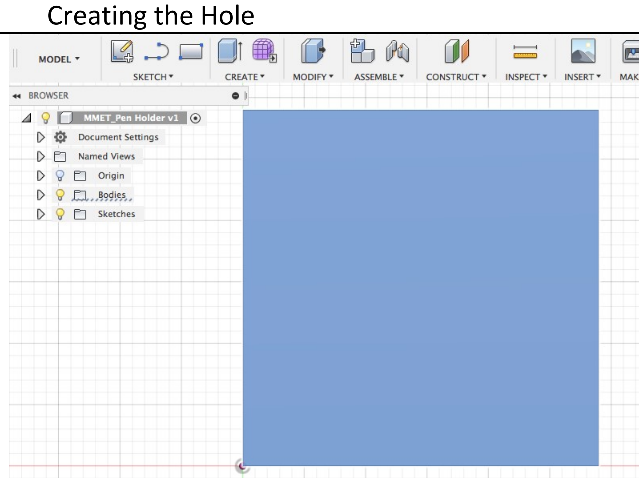
Fig. 2: Completed picture of the Base of Pen Holder.

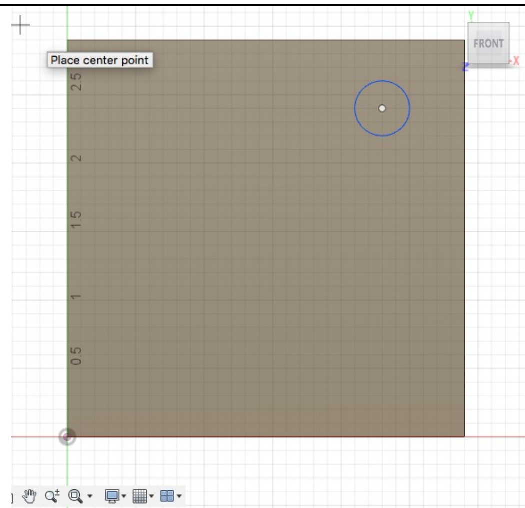
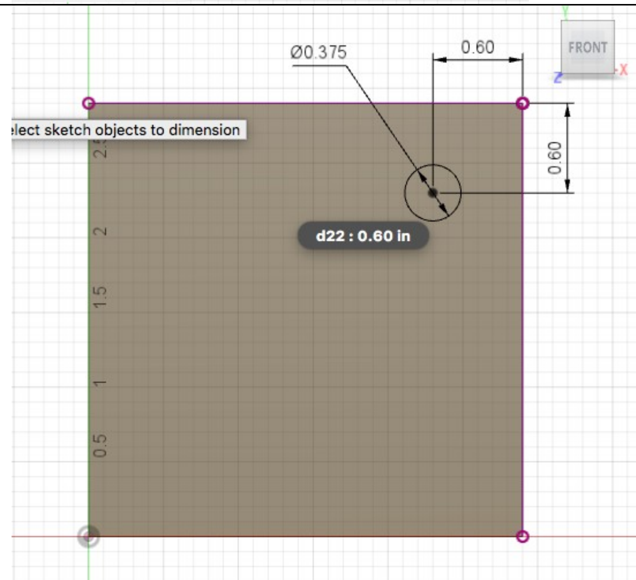
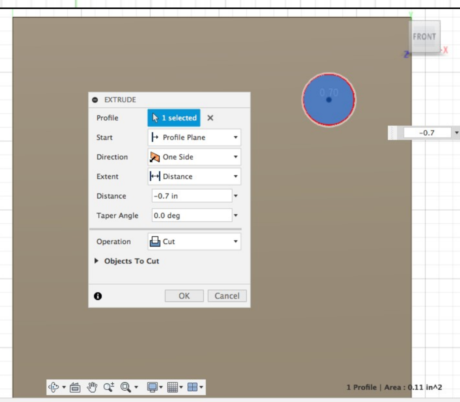
Creating the Block	
Create a new model by selecting file, then new design.	
Step 1: Setting up the correct units. Go to Document Settings, and change the unit type to inches.	

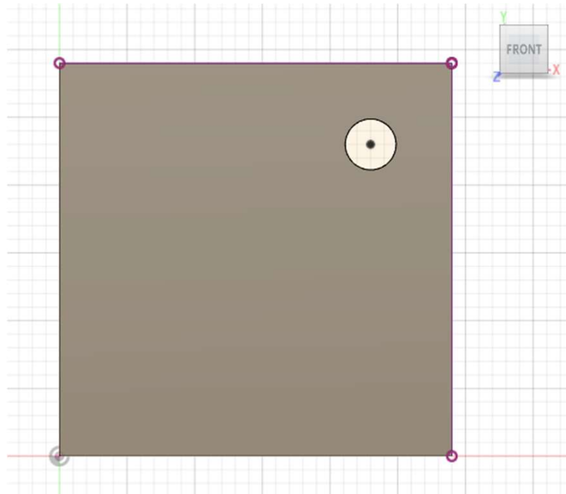
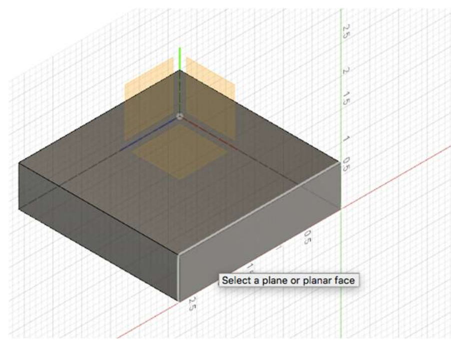
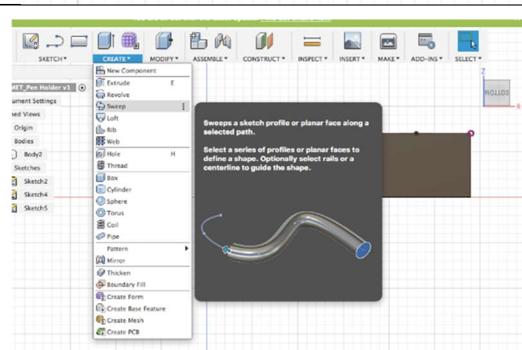
Step 2: Create a new Sketch Plane. Click the Sketch icon and pick the XY (Horizontal Plane).	
Step 3: Create a 2-point rectangle. On the Sketch drop down, click on rectangle. And in the following menu, pick 2-point rectangle.	
Step 4: Click on the sketch drop down menu and select 'Sketch Dimensions' or press the letter D to dimension the sketch. Dimensions of the rectangle are 2.9" X 2.9".	

<table>
<tr>
<td>Step 5: Stop Sketch. Click on the Stop Sketch icon on the right side of the ribbon menu.</td>
<td>
</td>
</tr>
<tr>
<td>Step 6: Extrude. Click on extrude button (next to the Sketch button). Select the Rectangle dimensioned and dimension the height at 0.7”.

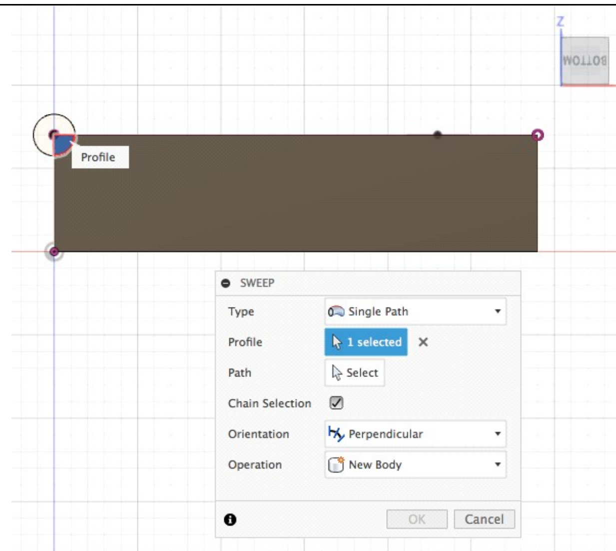
After Clicking the extrude button, click on the sketch of the rectangle. The rectangle bull turn blue and you can type in the extrude height.</td>
<td>

After clicking extrude, click on the rectangle as shown below.

</td>
</tr>
<tr>
<td colspan="2">Creating the Hole</td>
</tr>
<tr>
<td>Step 7: Select the front surface of the block and click sketch when the required surface is blue.</td>
<td>
</td>
</tr>
</table>

Step 8: Draw a Center Circle by pressing C and then click on desired position to place the circle.	
Step 9: Dimension the position and diameter of the Circle of the circle. Press D, then click on the Circle. This allows you to define a diameter to the circle (diameter is 3/8”). Then dimension the center of the circle to 0.6” from the top and right side of the block as shown in the diagram.	
Step 10: Creating the Hole. Click on extrude, then select the profile of the circle. Dimension the height to -0.7” and press enter.	

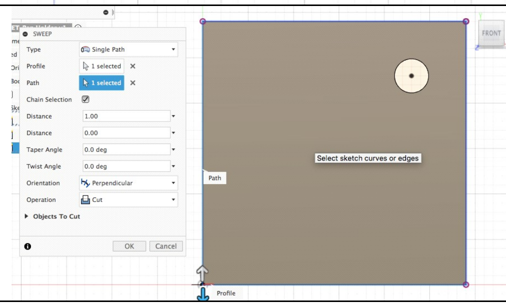
<table>
<tr><td>The block with the hole.</td><td>
</td></tr>
<tr><td colspan="2">Creating the Edge Sweep</td></tr>
<tr><td>Step 11: Select the bottom plane (as highlighted) and click sketch when the required plane is blue.</td><td>
</td></tr>
<tr><td>Step 12: Draw a center circle with one of the corners as the center. The diameter of the circle is 0.250”. When done, click on stop sketch.</td><td>
</td></tr>
<tr><td>Step 13: Click on the ‘Create’ drop down menu and click sweep.</td><td>
</td></tr>
</table>

Step 14: Set the profile as the part of the center circle occupying the body.

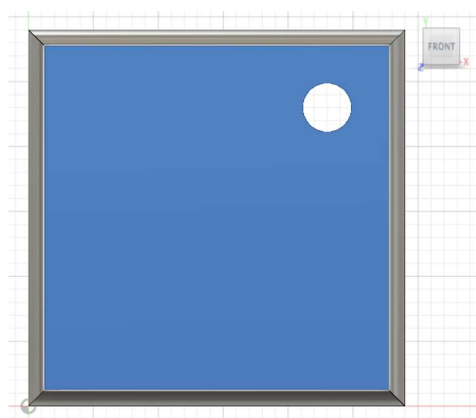


Step 15: Select the edge of the block along the front of the block as the 'Path' for the Sweep command.

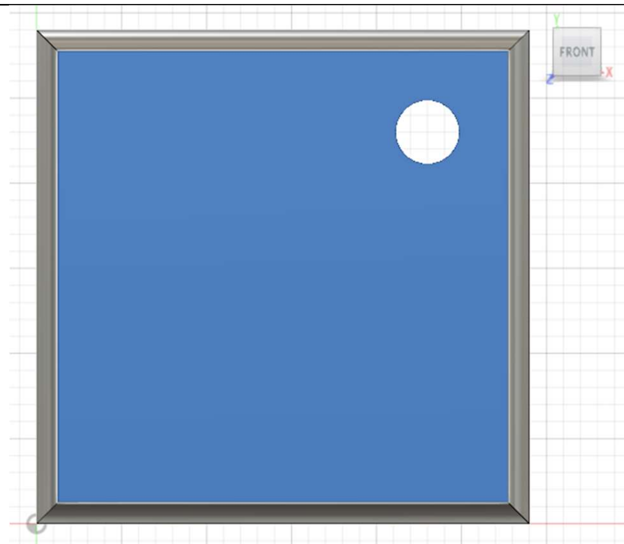
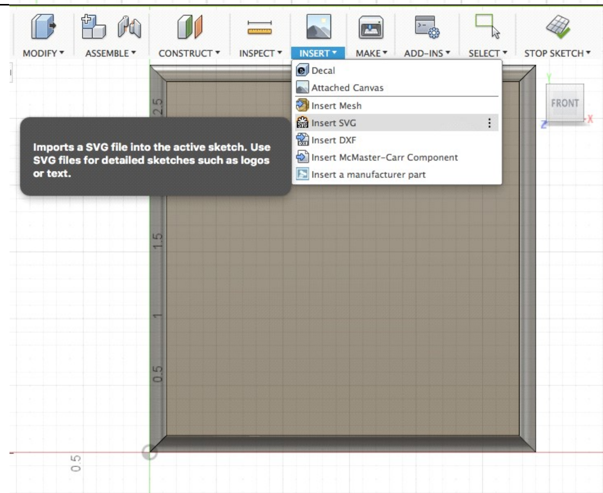
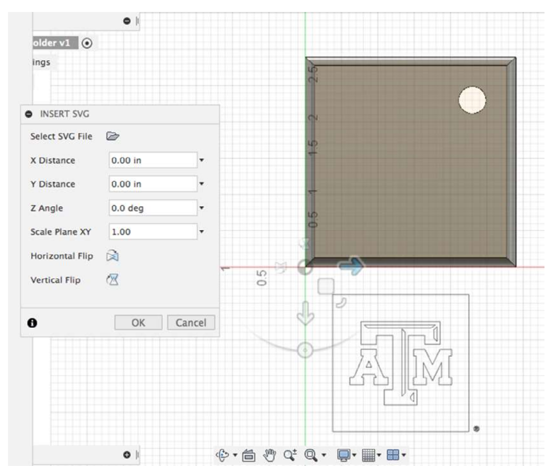
Set operation as cut, as highlighted in the figure. Click OK when done.

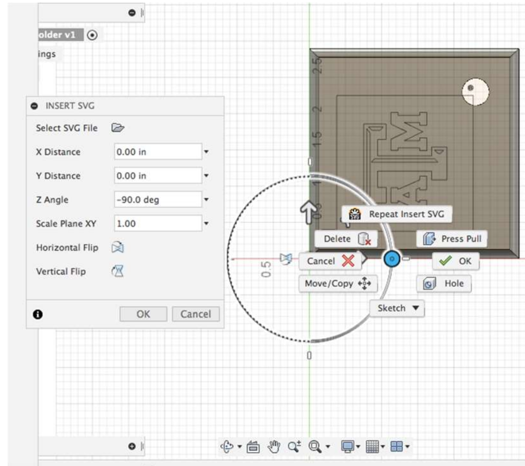
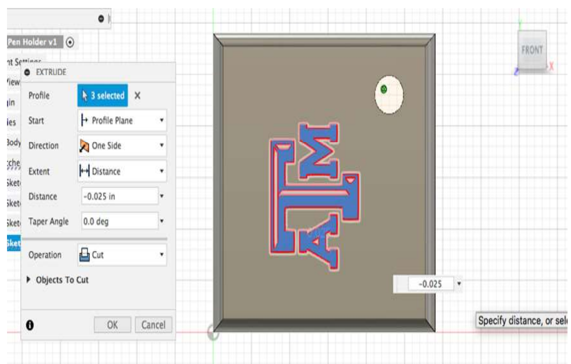


The resulting Block will look as shown.



Inserting Logo. This can be any logo you want it to be, but the logo/symbol must be of '.svg' format. The TAMU logo used in this example can be obtained from: https://drive.google.com/file/d/1n82-DXvze0RYjgpzivJ2I5PZFeT7tp-P/view?usp=sharing

Step 16: Select the front surface of the block and click sketch when the required surface is blue.	
Step 17: Select 'Insert' and select 'Insert SVG'. A File Selection window will be prompted. Select the .svg file with the desired logo.	
Step 18: Orient the logo as desired using the 'control' provided.	

Tip: Use the arrows and the control options to orient the logo as desired.	
Step 19: Select 'Stop Sketch' and select 'Extrude'. Select the inner portions of your logo as shown. Set the depth to '-0.025'.	
The Base of the pen holder should look similar to the block shown in Fig. 2.	

Part 2: Pen Holder.

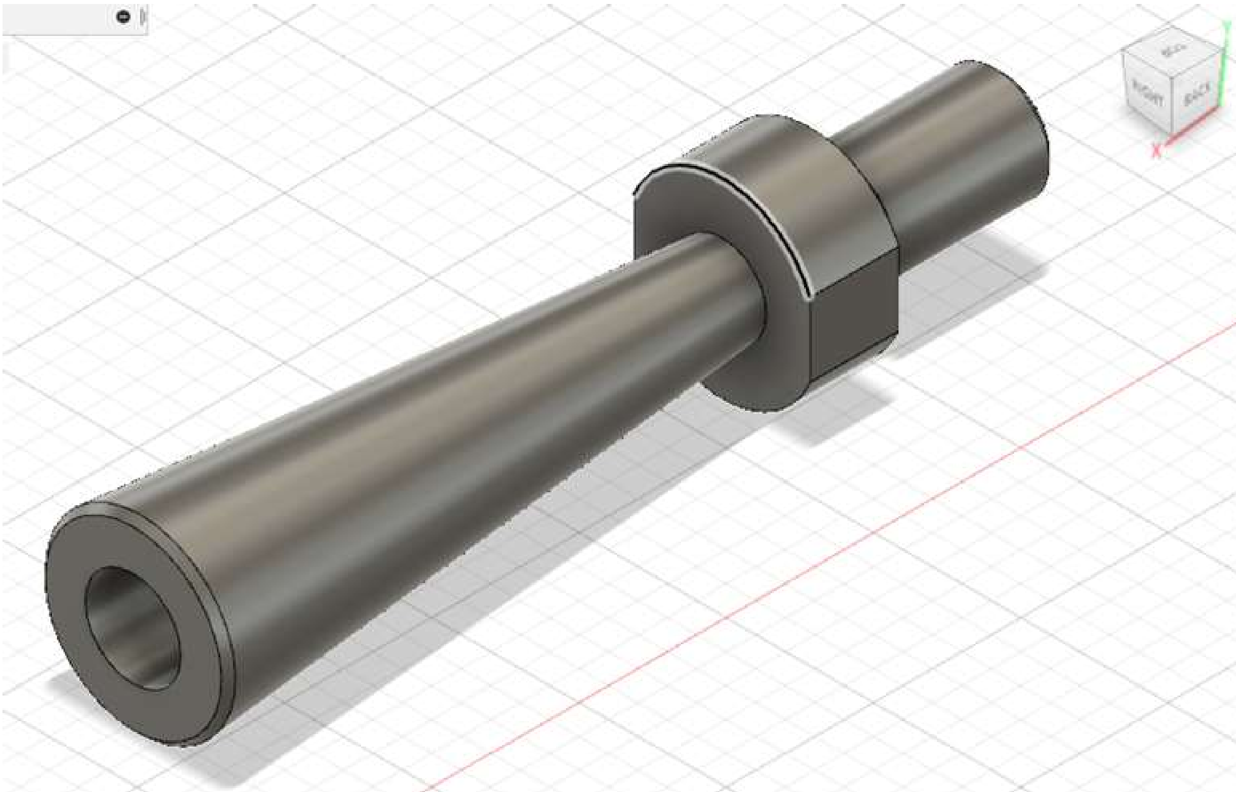
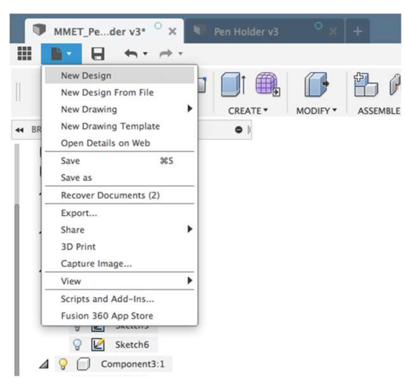
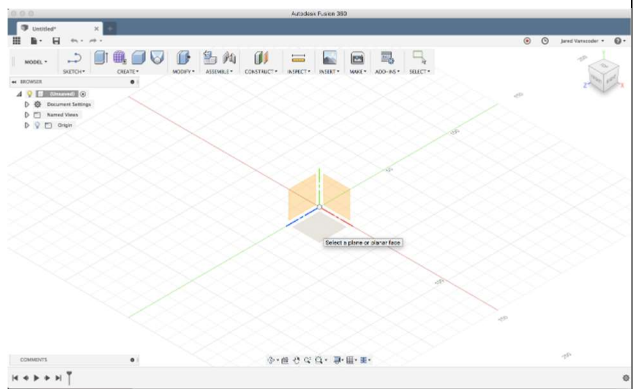
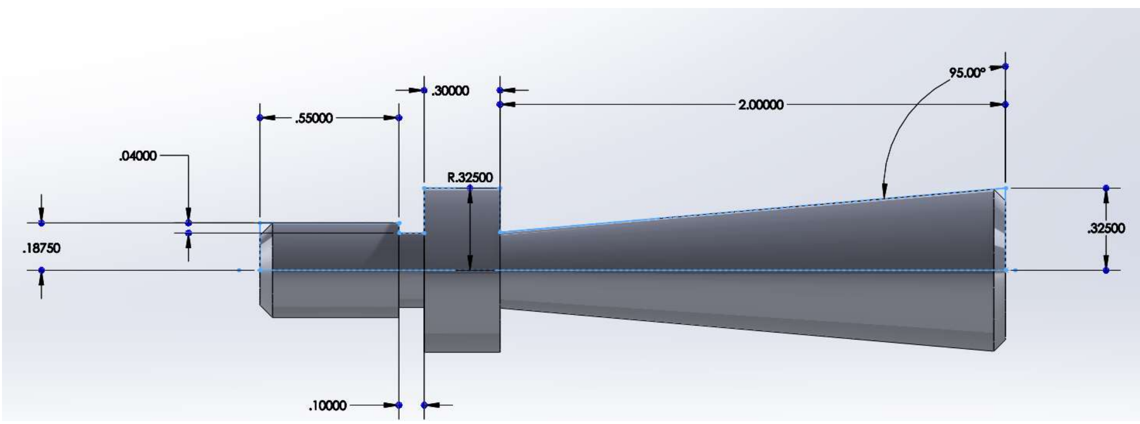
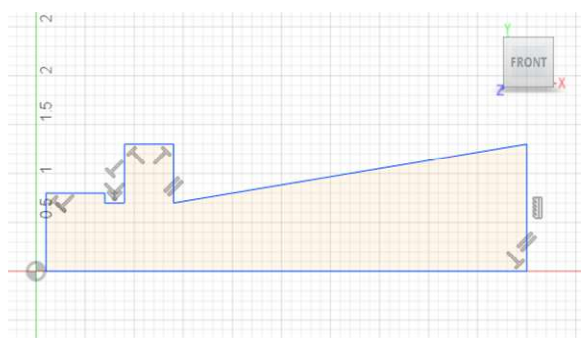
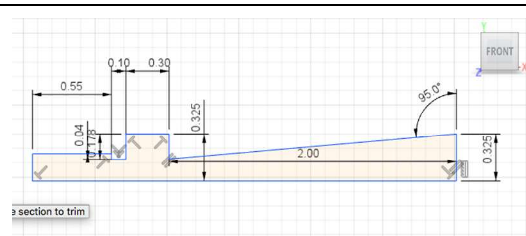
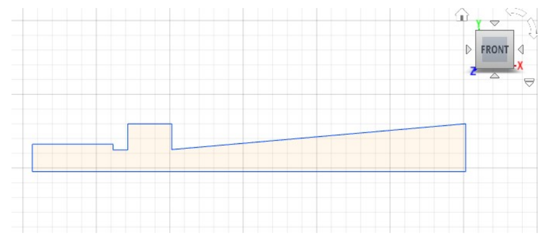
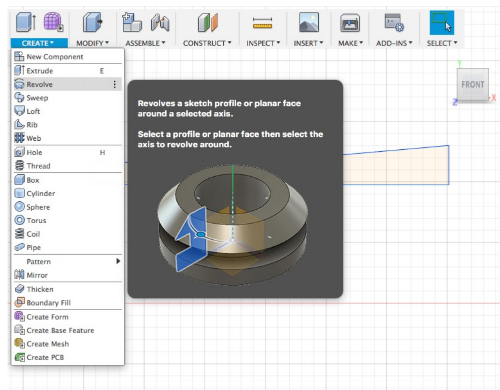
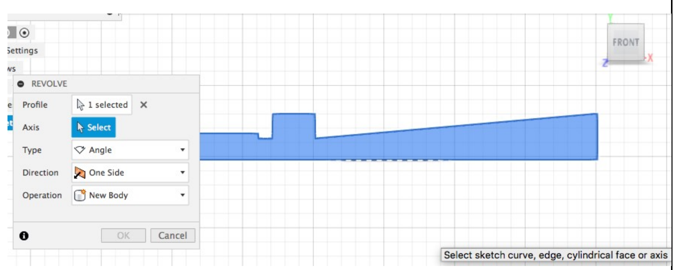
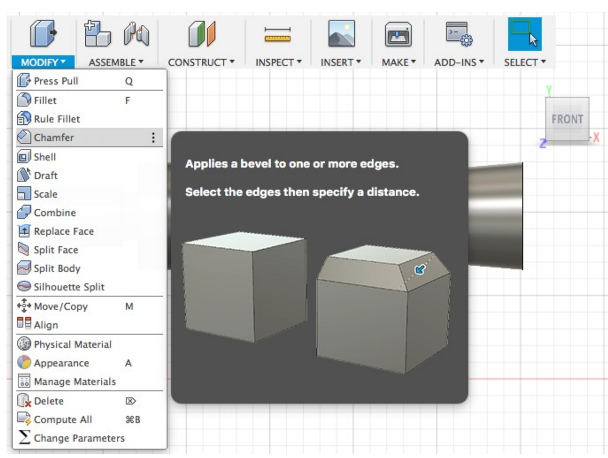


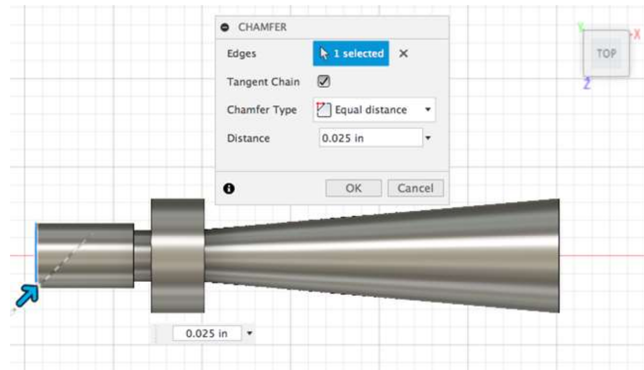
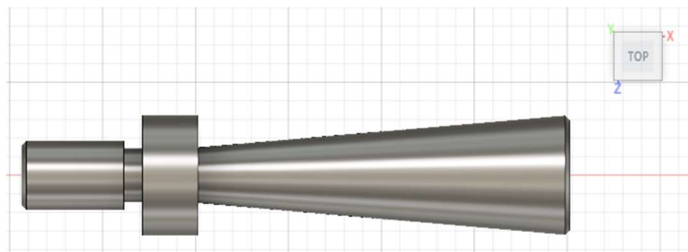
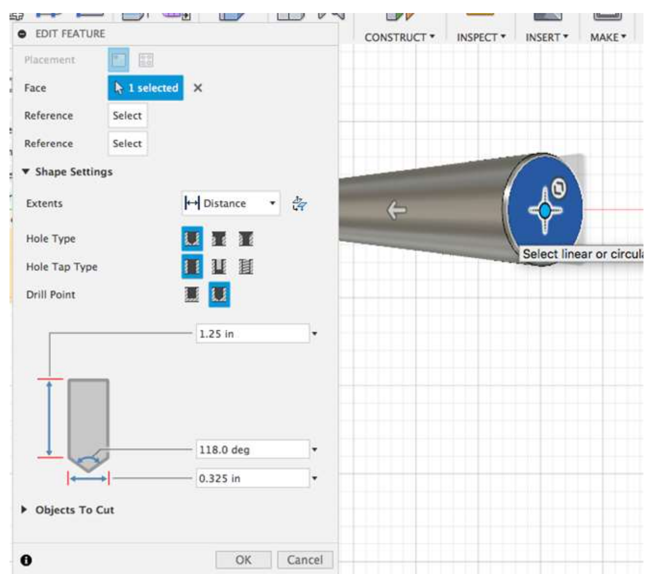
Fig. 3: Completed picture of the pen holder.

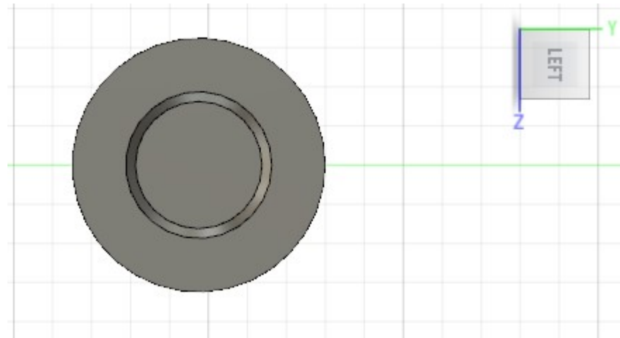
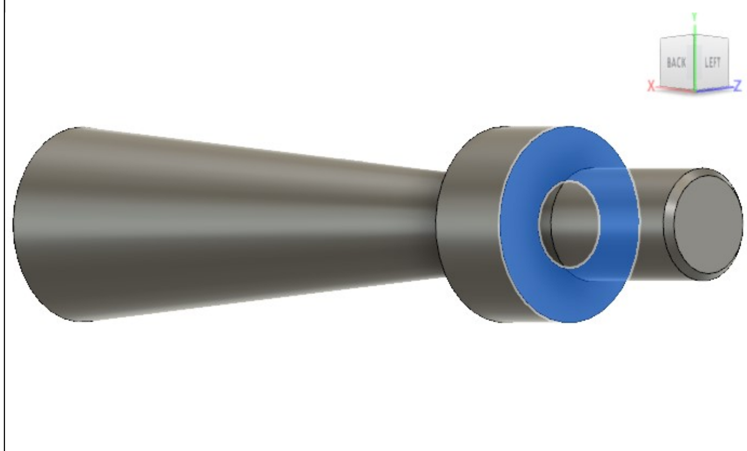
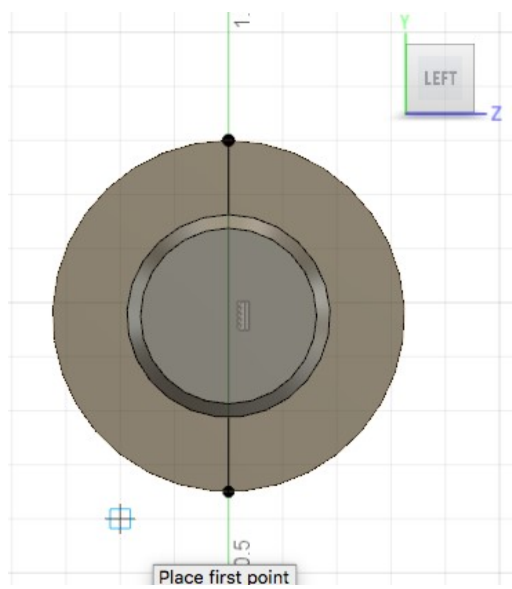
<table>
<tr><th colspan="2">Sketching the Profile.</th></tr>
<tr><td>Create a new model by selecting file, then new design.</td><td>
</td></tr>
</table>

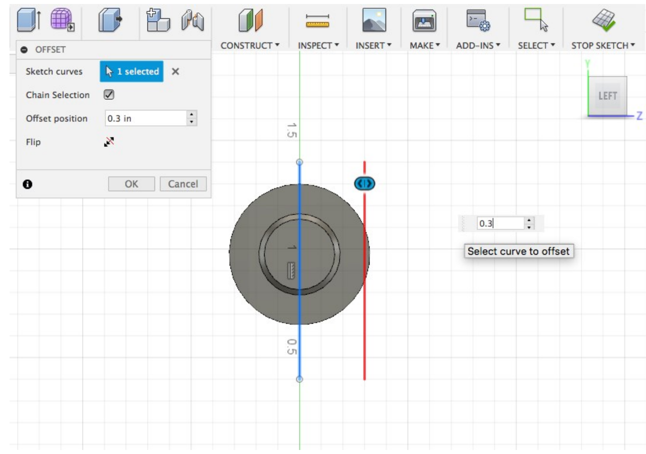
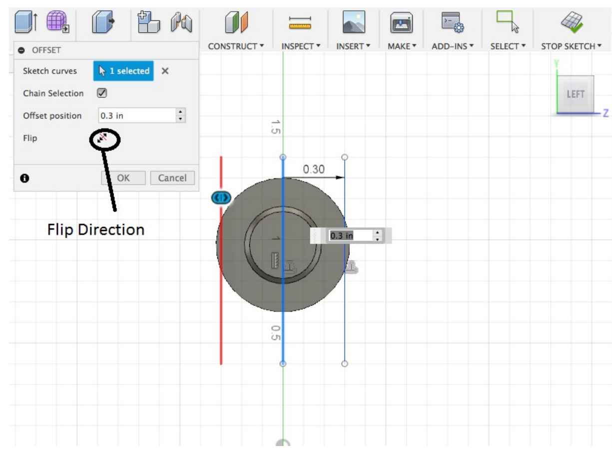
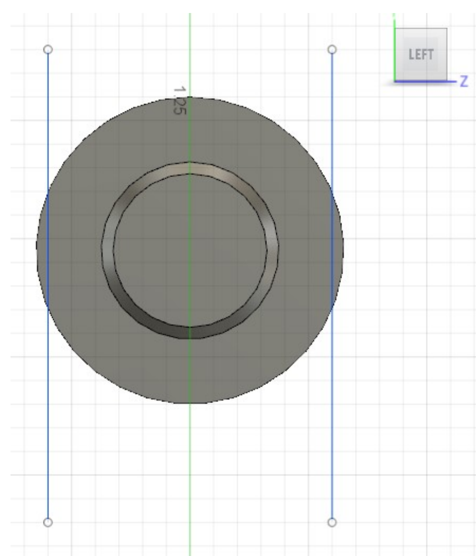
<table>
<tr><td>Step 1: Select the front plane and click on ‘Sketch’.</td><td></td></tr>
<tr><td colspan="2">The dimensions of the pen holder is shown in the figure.

</td></tr>
<tr><td>Step 2: Sketch a rough profile of the pen holder from above, to get a similar shape.

Once you complete the sketch, the profile will turn blue. If not, i.e. if the sketch remains black, it is an indication of discontinuities in your sketch. Ignore the chamfer until step 7.</td><td>
</td></tr>
<tr><td>Step 3: Dimension the profile according to Fig. X. When done, select ‘Stop Sketch’.</td><td>
</td></tr>
</table>

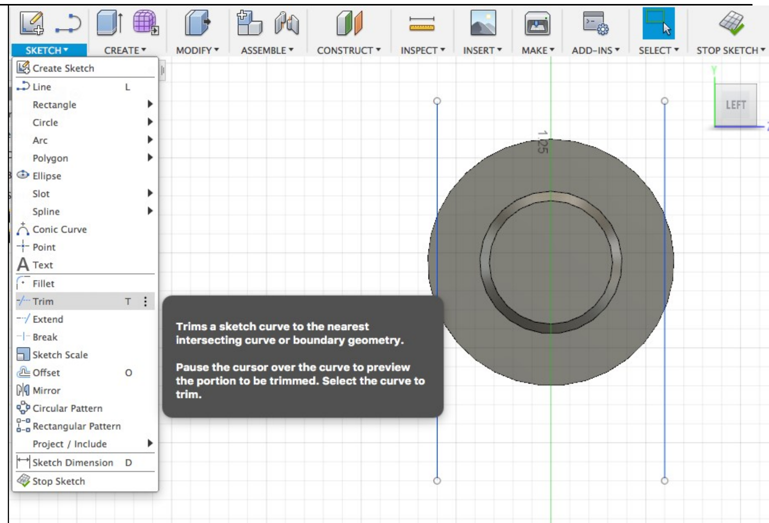
Step 4: Your profile should look similar to the one shown in the diagram. Ignore the Chamfer in Fig. X.	
Step 5: Select 'Create' and then select 'Revolve'. Select the sketch as the profile and the horizontal line as the Axis. When the correct Preview is shown, click OK.	
Step 6: Click Modify, and select Chamfer. Select the edges as shown and set the distance to 0.025". When done, select OK.	
Step 7: Select 'Modify' and then select 'Chamfer'.	

Step 8: Select one edge and set the Chamfer distance to 0.025”, and select OK. Repeat the step for the other edge.	
The part at this point should be similar to the picture shown.	
Creating the Hole.	
Step 9: Press H and the ‘Hole’ prompt is displayed. Select the face shown as the picture, and the outer edge as the reference. The length of the Hole is 1.25” and the diameter of the hole is 0.325’. Press OK, when done.	
Creating Slot	

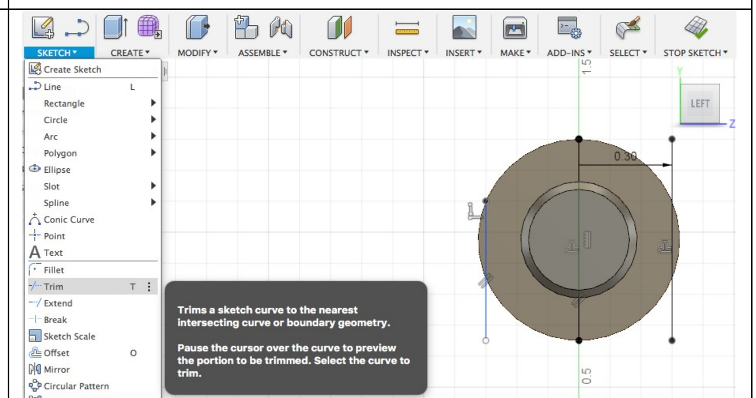
<table>
<tr>
<td>Step 8.A: Select the Left plane (or configure your part as shown).</td>
<td>
</td>
</tr>
<tr>
<td>Step 8.B: Select the surface shown and, press sketch.</td>
<td></td>
</tr>
<tr>
<td colspan="2">Creating Slot on the Neck of pen holder.</td>
</tr>
<tr>
<td>Step 9: Draw a line along the diameter, select sketch and Offset (or press O).</td>
<td>
</td>
</tr>
</table>

Step 10: Select the line drawn and offset the distance by 0.3".	
Step 11: Select the line drawn and offset the distance by 0.3", but select flip direction.	
Step 12: Delete the line in the middle drawn along the diameter. Select Sketch and then select Trim.	

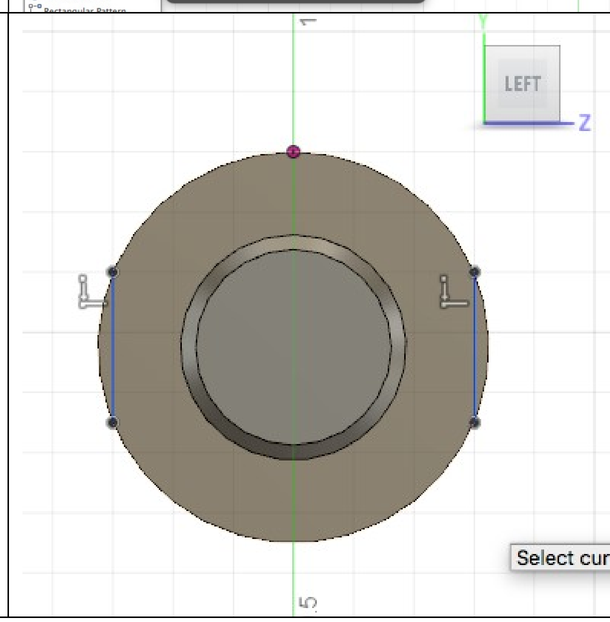
Step 13: Click and drag the cursor over all the overhanging lines as shown in the diagram.



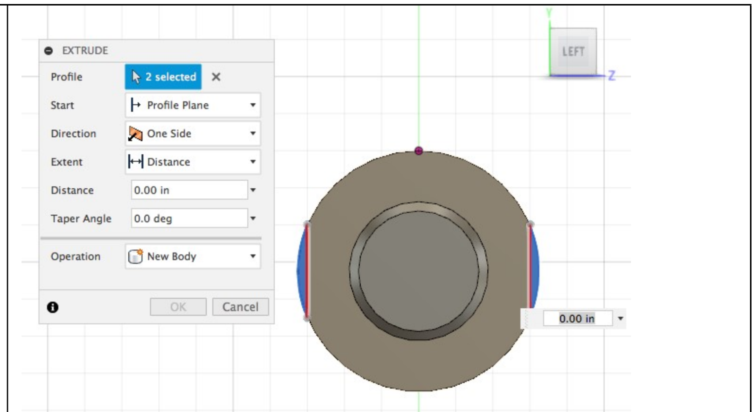
Step 14: Select 'Sketch' and the select 'Trim' – alternatively press T. Drag the cursor while holding down on the left mouse button to clean the overhanging lines.



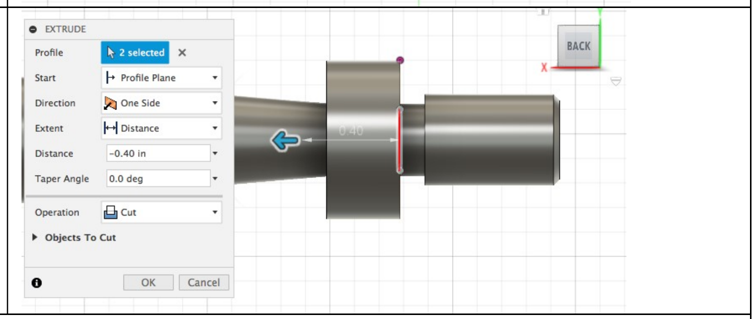
Step 15: Once all the lines are trimmed, the sketch should look like the picture shown.



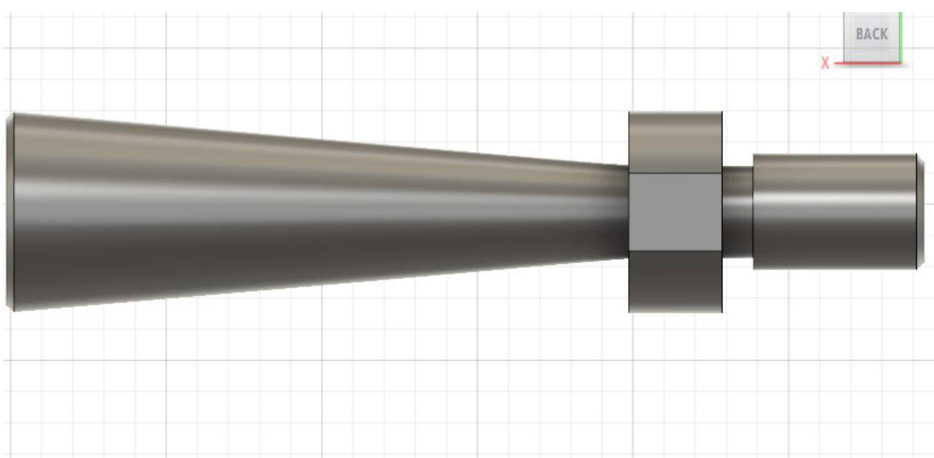
Step 16: Select extrude and highlight the regions shown.



Step 17: Drag the 'Depth' arrow as shown, such that the entire depth of the neck is cut. Select OK.



This is a side view of the completed 'Pen Holder'.



Part 3: Assembly.

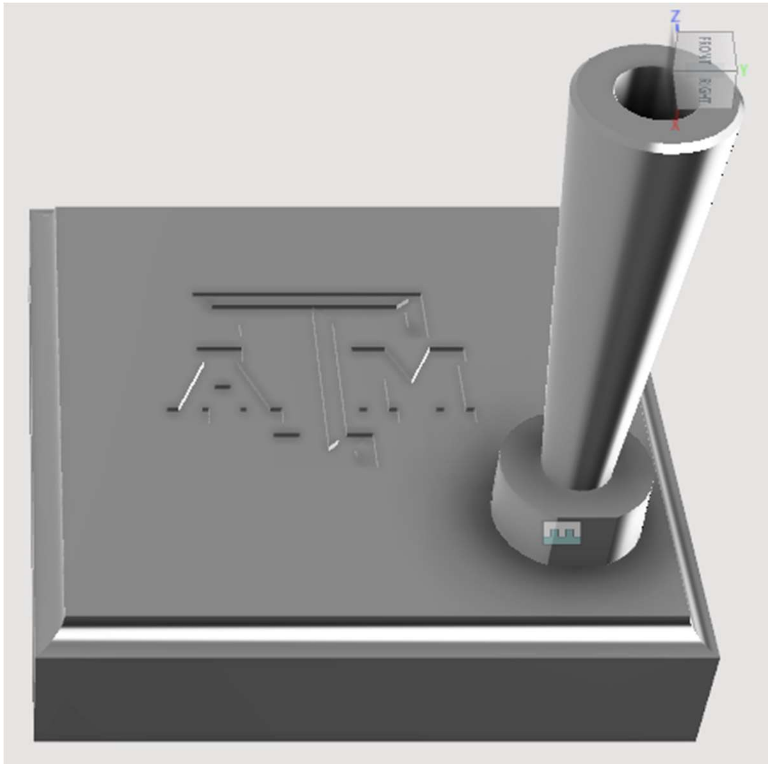
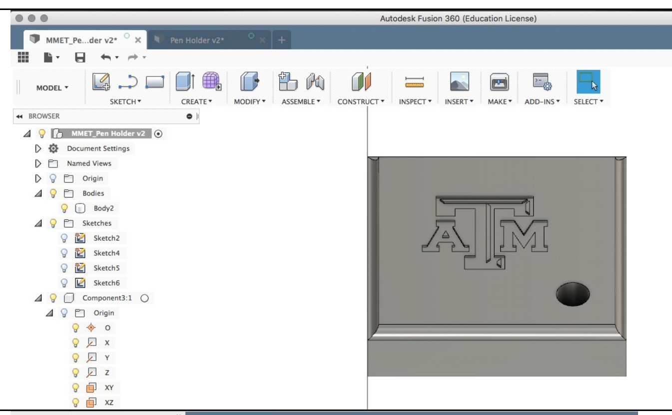
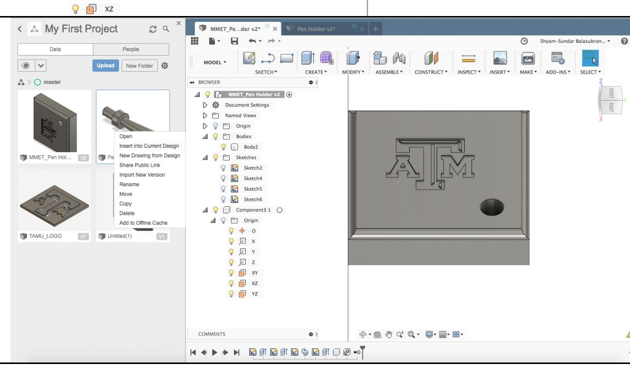
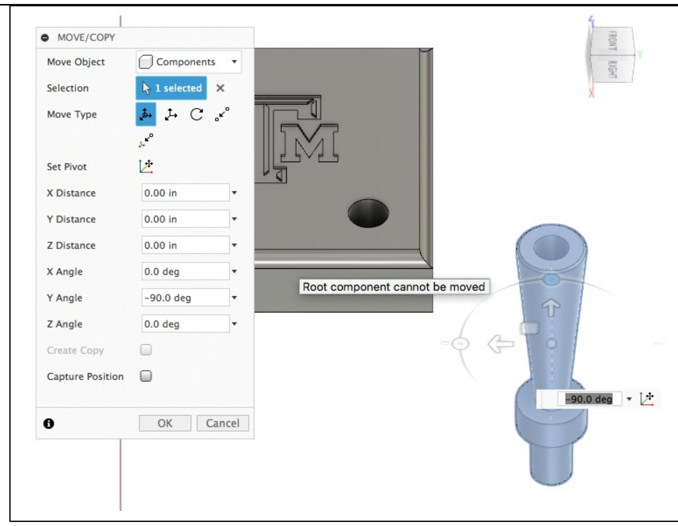
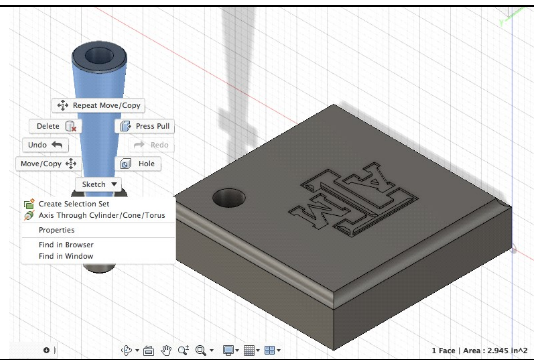
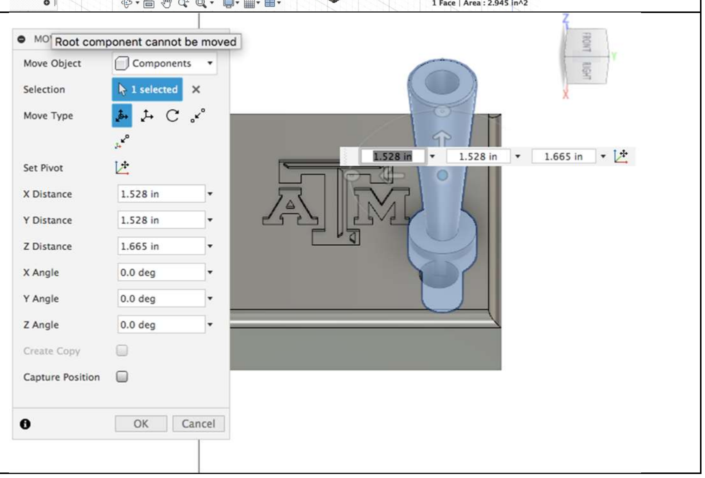
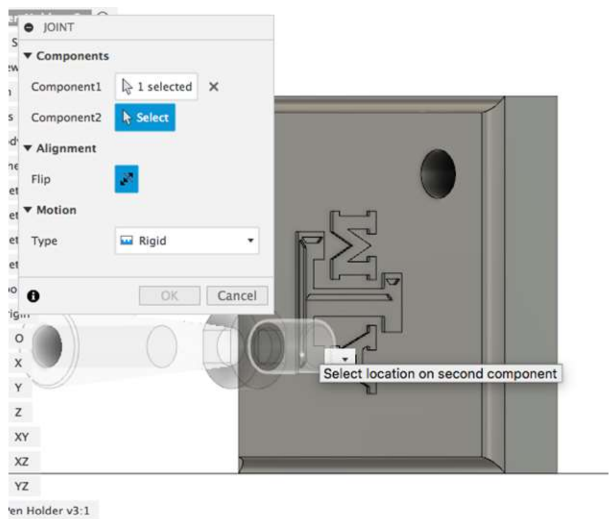
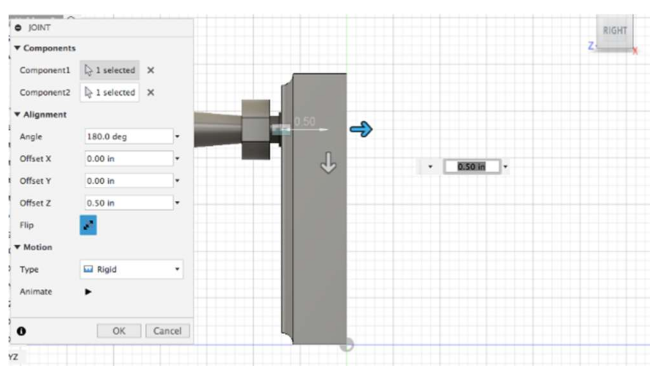


Fig. 4: Completed picture of the pen holder assembly.

Step 1: Open the Base of the Pen holder.	
Step 2: Click on the Grid Icon shown. This prompts the File Explorer within Fusion 360. From the file explorer, right click on the Pen Holder file and select ‘Insert into Current Design’.	

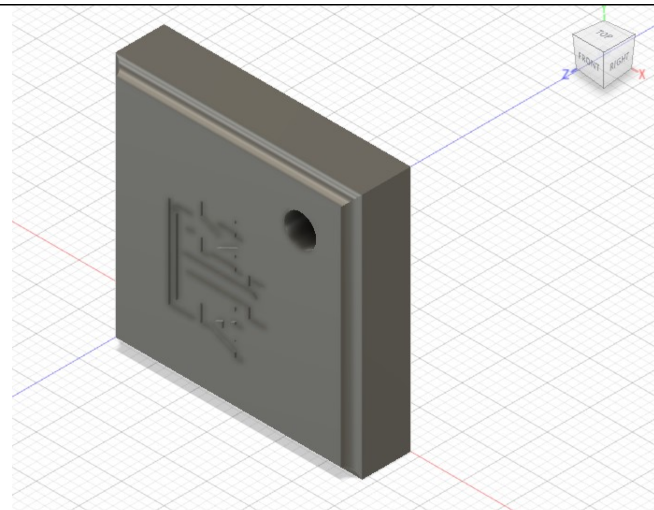
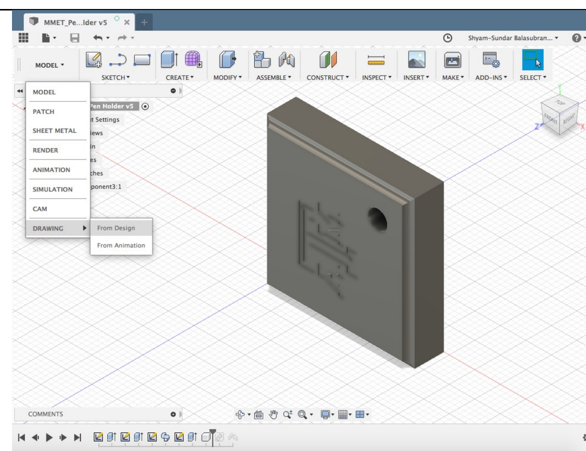
Step 3: Right Click on the pen holder and select move. Using the controls, manipulate the bottom of the pen holder **NEAR** the hole in the base.	
Step 3.A: Right Click on the pen holder to get more move options.	
Step 3.B: You can reorient and view from different views while bringing the pen holder close to the base and the hole.	

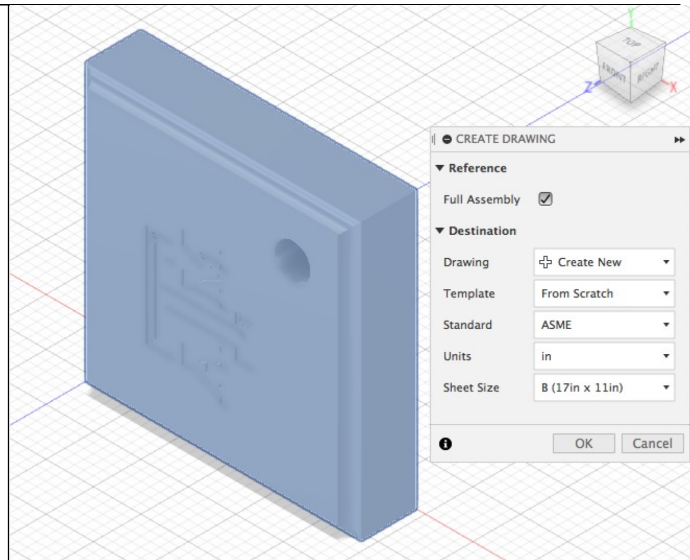
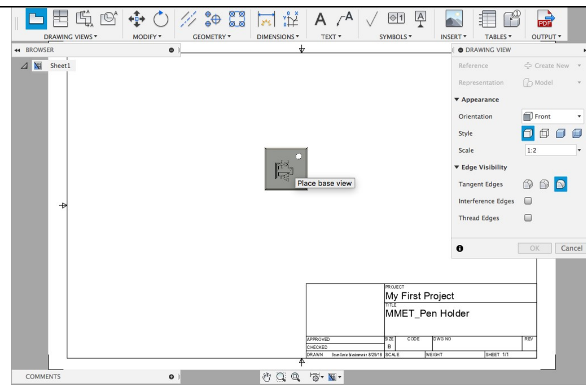
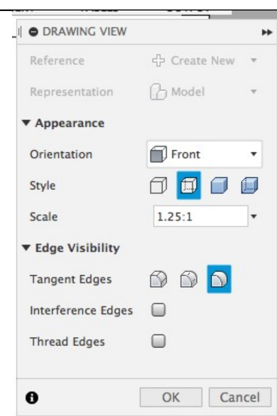
Step 4: In the Assemble menu, select Joint.	
Step 5: Select the stem of the pen holder as the Component 1. For Component 2, select the hole (not the edge of the hole but when the cursor hovers around the hole a cylinder is generated).	
Step 6: The insert depth is 0.5”, which is Offset about the z-axis.	

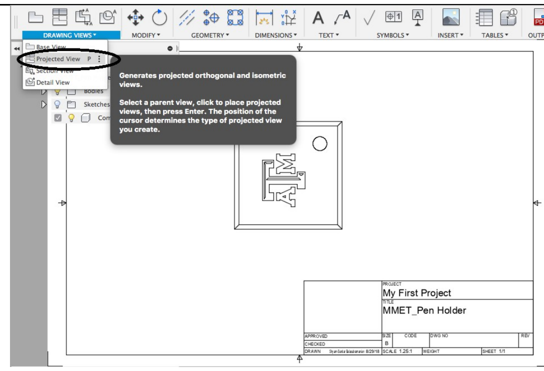
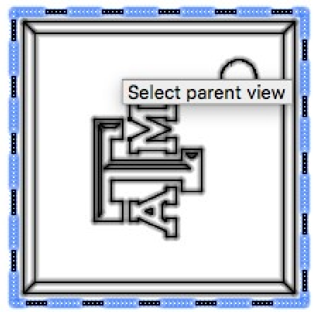
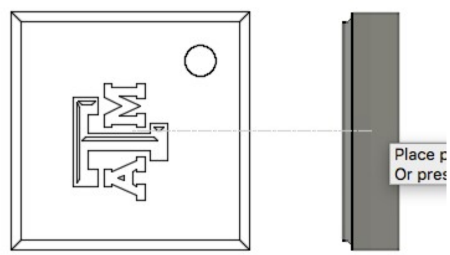
Section 2: Drawings of the parts.

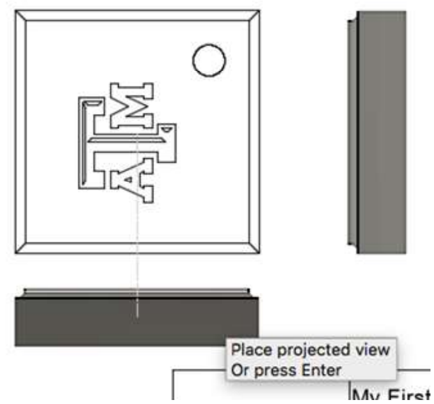
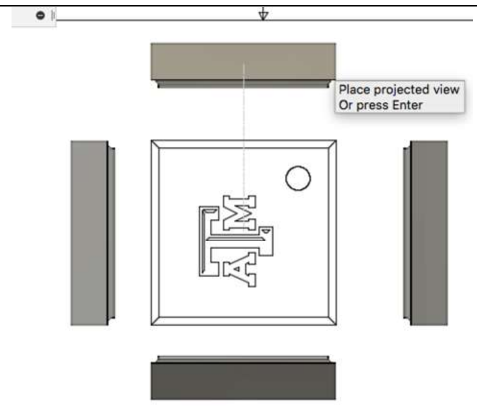
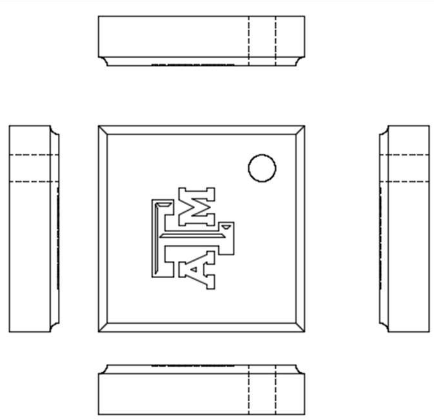
In this section, the steps to create the drawings of the parts are shows. In part 1, the steps to make the front, side and top views, and dimensioning them are explained. In part 2, creating section view of the parts are shown. In part 3, steps to make auxiliary views are explained. Note, the drawings generated are 3rd angle projections, which are default standards of ASME.

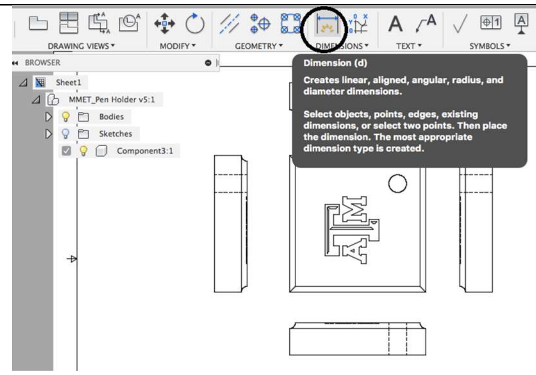
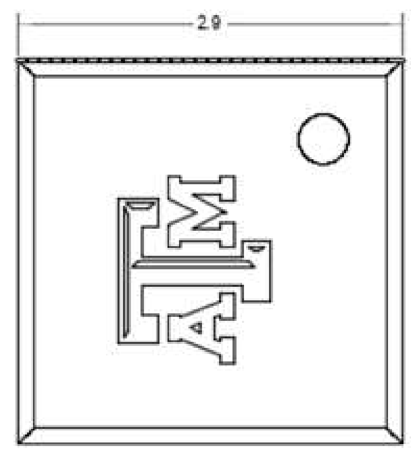
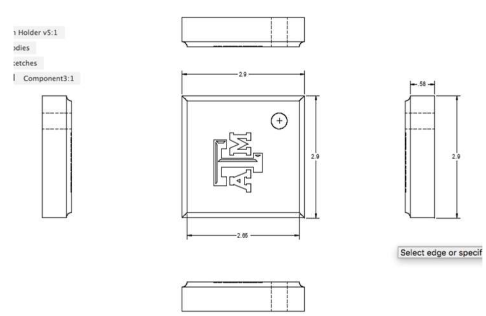
Part 1: Front, top and side views.

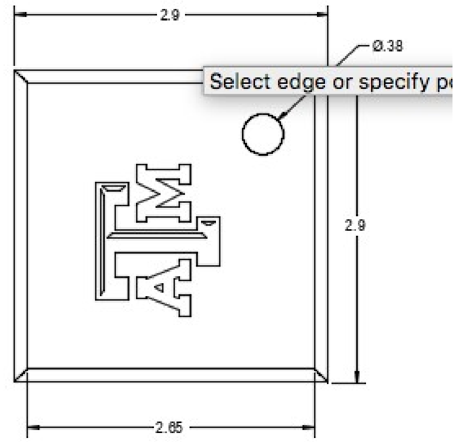
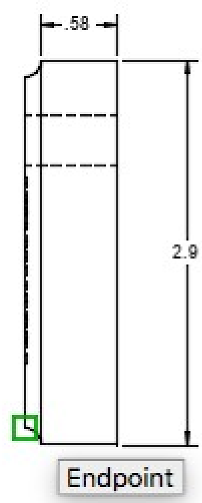
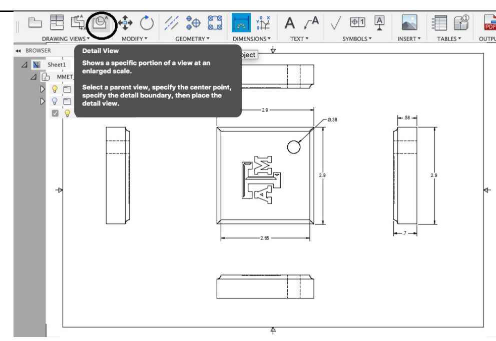
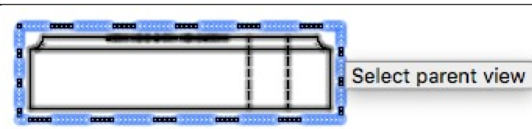
Steps to generate drawings for the base.	
Step 1: Open the base of the pen holder in Autodesk Fusion 360.	
Step 2: On the top left, select the model drop down menu and select 'drawing' and finally select 'From Design'.	

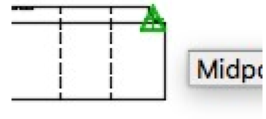
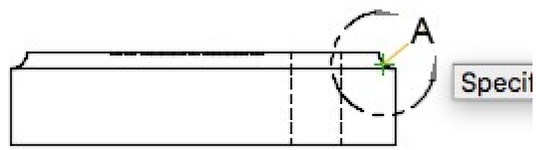
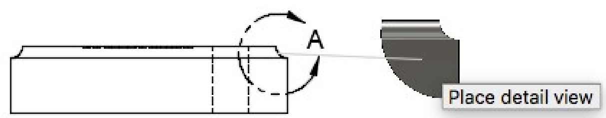
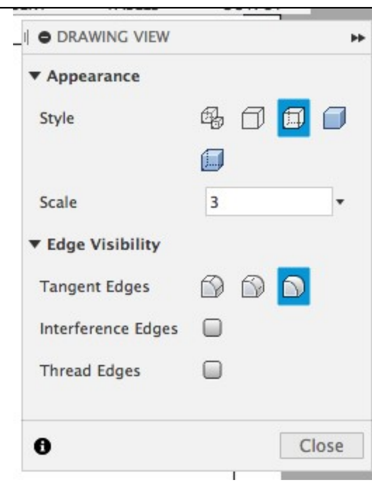
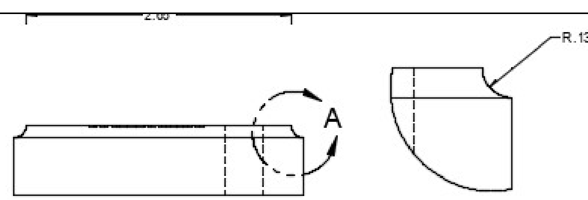
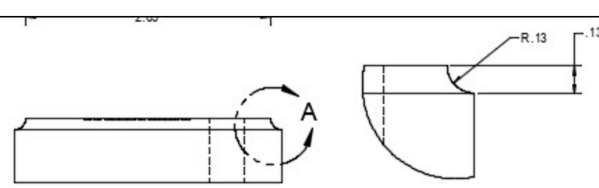
Step 3: In the 'Create Drawing', set the units as inches and click OK.	
Step 4: A new tab will be opened with the drawing template. Place the front view of the block at approximately the middle of the sketch, and make a left click.	
Step 5: In the 'Drawing View' prompt, select the scale as '1.25:1' and the style as 'View Visible Edges'. And press OK.	

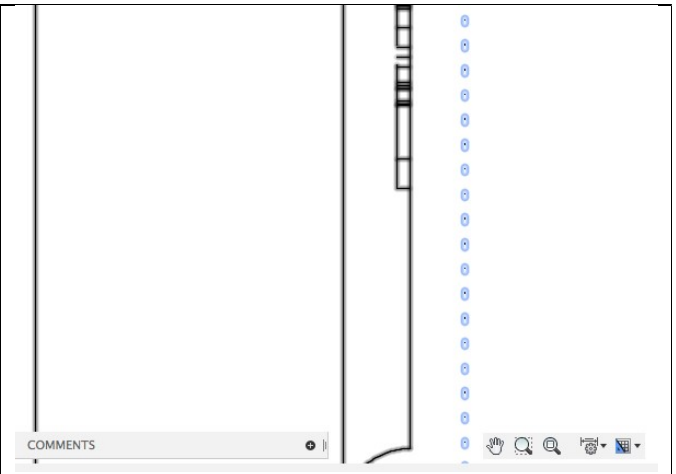
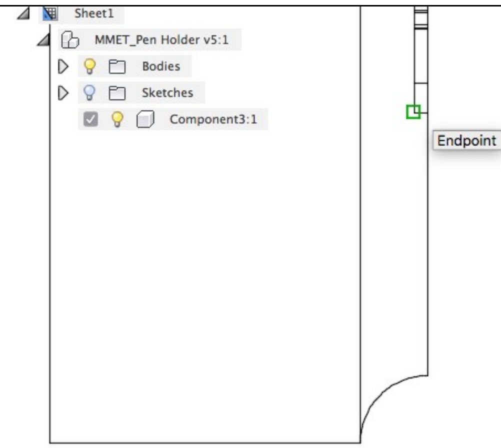
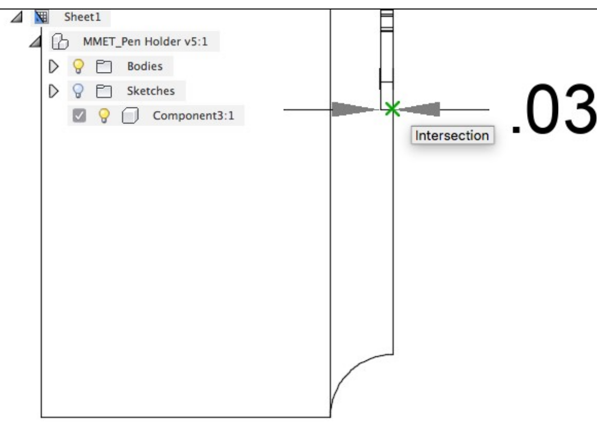
Step 6: From the 'Drawing Views' drop down menu, select projected view.	
Step 7: Bring the cursor to the front view, and it will be highlighted in a blue outline. Click the front view.	
Step 8: Drag the cursor to the right and you will see the side view of the block. Place the side vies at a reasonable distance from the front view and make a left click.	

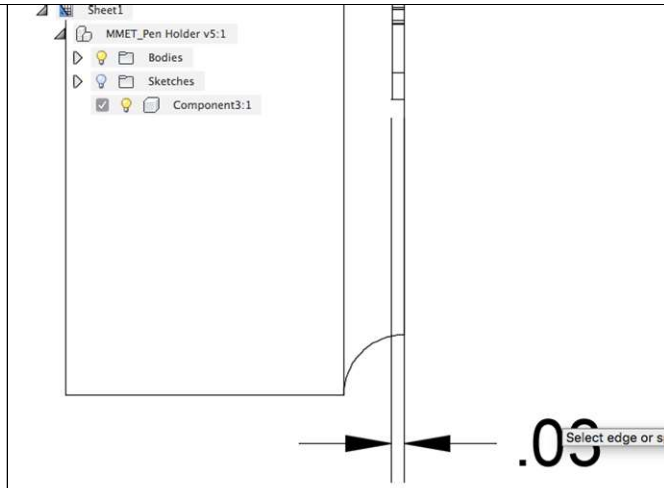
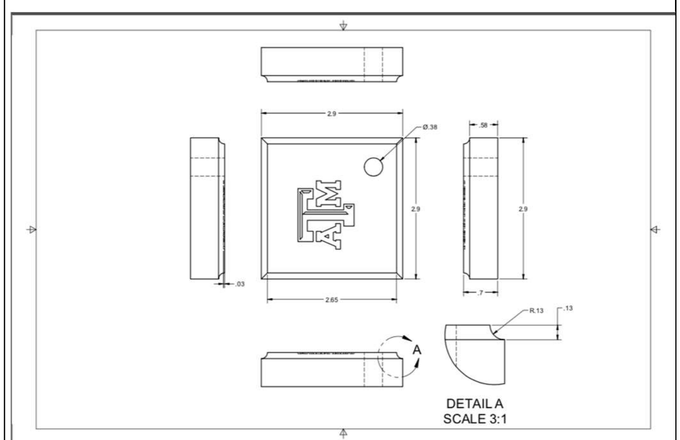
Step 9: When you bring the cursor to the bottom of the front view, you will see the bottom view of the block. Click the left mouse button at the appropriate position.	
Step 10.A.: Repeat step 9 for left and top view. When done, press Escape. Note, for more space, click on the title box and press Delete.	
Step 10.B.: At this point the generated drawings must look similar to this.	

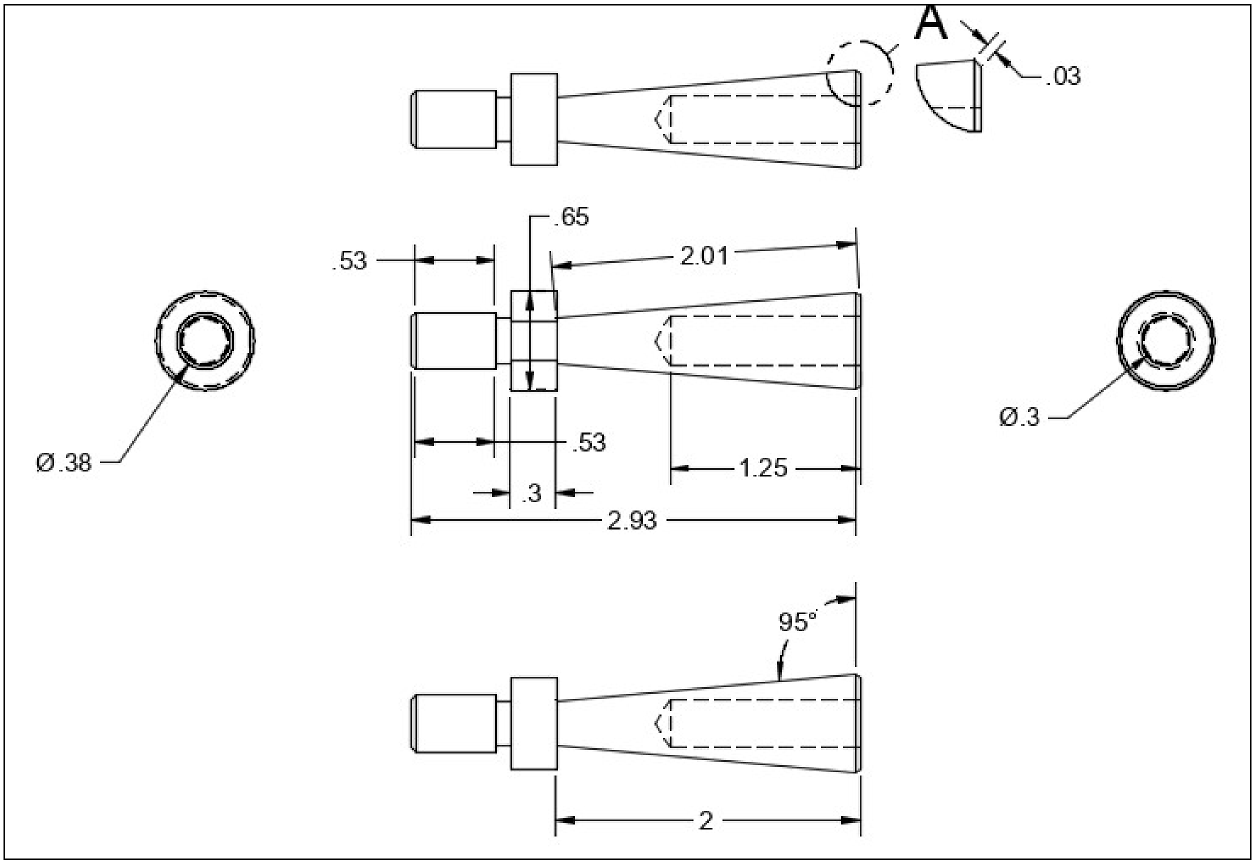
Step 11: Select Dimension button to dimension the parts.	
Step 12: Hover the cursor near the edge of the part, and when you see the program select the correct edge, left click. **Step 12. B:** Drag out the dimension and click on the left button.	
Step 13: Similarly, generate dimensions for the other edges as shown.	

Step 14: To dimension the hole, hover around the circle for the program to detect the feature. Then click the left button, drag out the dimension and the click the left button.	
Step 15: To generate the dimension of the total thickness of the block, hover the mouse as shown in the picture. When the green square is visible, left click. **Step 16:** Bring the cursor to the other edge, and when you see the outer edge in blue, left click. Drag out the dimension generated and left click.	
Step 17: To generate a detailed view of the fillet, click the highlighted icon in the picture.	
Step 18: Select the bottom view as the parent view.	

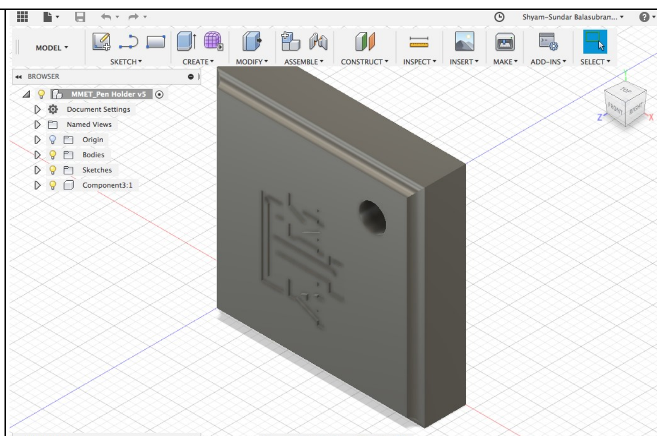
Step 19: Select the fillet as the center point.	
Step 20: Drag out the boundary size and left click.	
Step 21: When the section is generated, drag out the section and left click.	
Step 22: Change the scale to '3:1', 'View Visible and Hidden Edges' and click OK.	
Step 23: dimension the fillet radius.	
Step 25: Dimension the fillet edges as shown (refer to step 15, 16 and 17).	

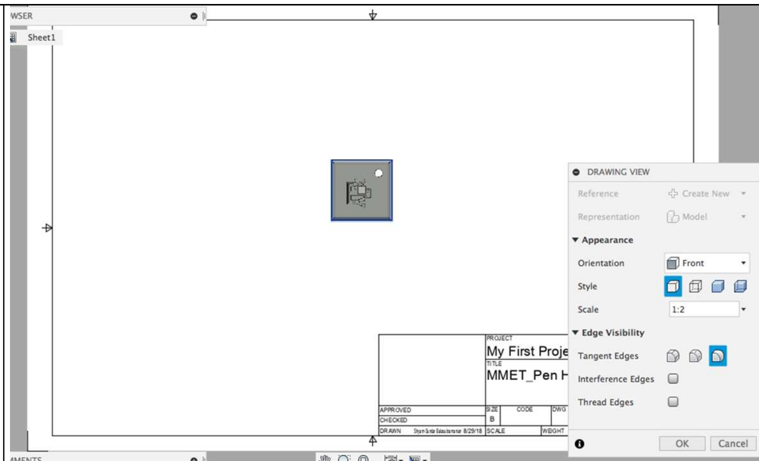
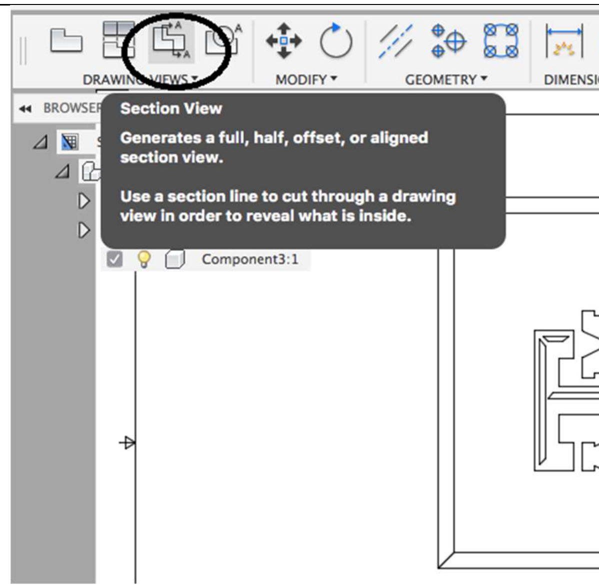
<table>
<tr><td>Step 26: In order to dimension the depth of the engraving, zoom into the left side view as shown.</td><td>
</td></tr>
<tr><td>Step 27: Select the inner edge as shown.</td><td>
</td></tr>
<tr><td>Step 28: Select the outer edge as shown.</td><td>
</td></tr>
</table>

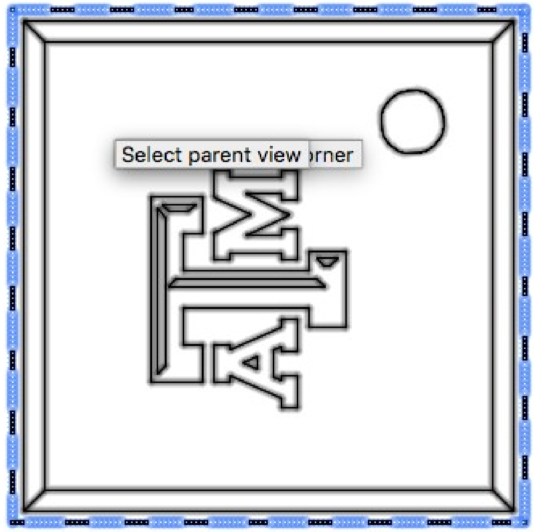
Step 28: When the dimension is generated, drag out the cursor and click.	
The drawings of the base should look similar to this picture.	
Drawing of the pen holder is also generated.	

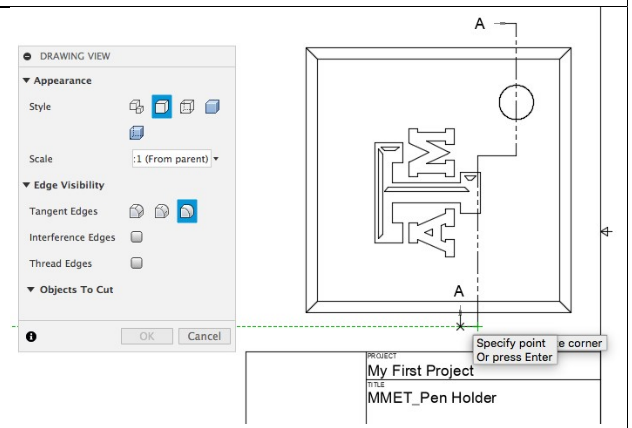
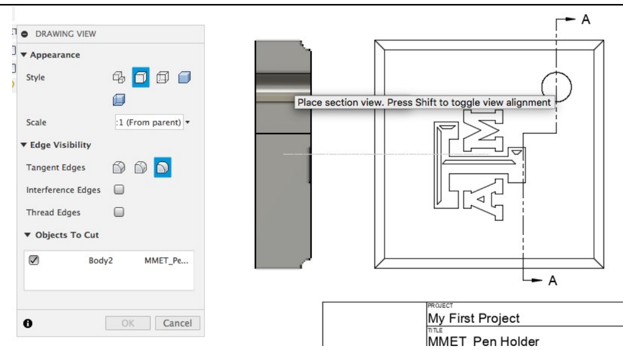


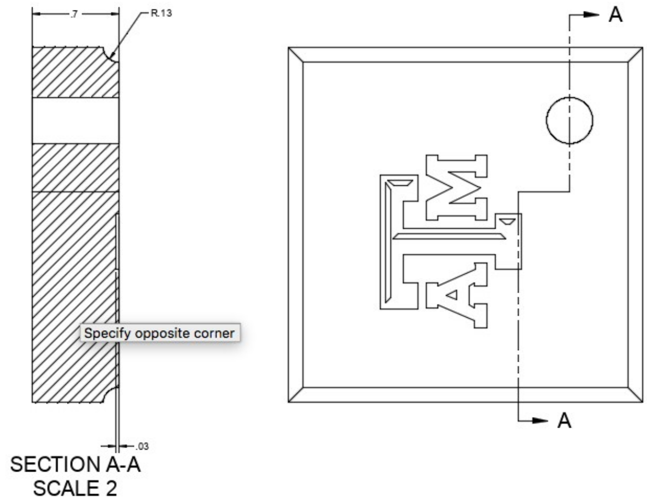
Part 2: Section Views.

Step 1: Open the base of the pen holder. **Step 2:** Select 'Model', Select 'Drawing' and select 'From Design'. Click OK.	

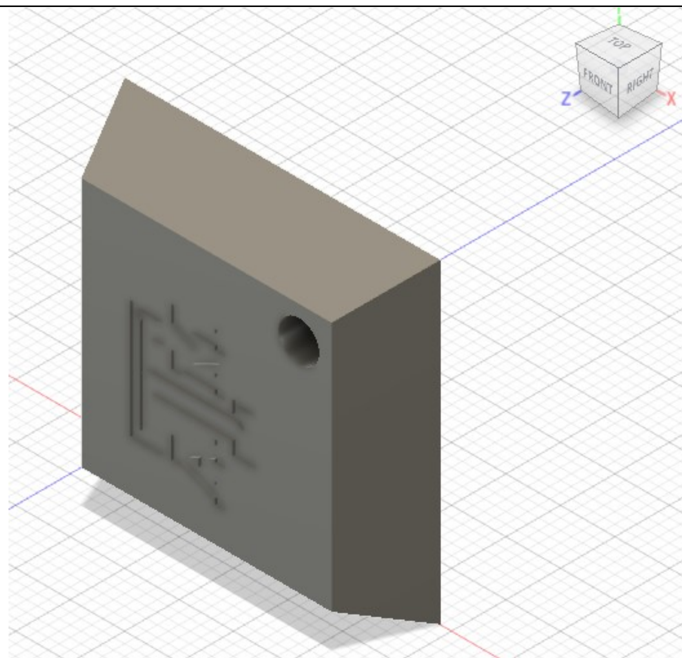
Step 3: Place the front view to the center of the page. **Step 4:** Set the ratio as '2:1' and click OK.	
Step 5: Click on Section View.	

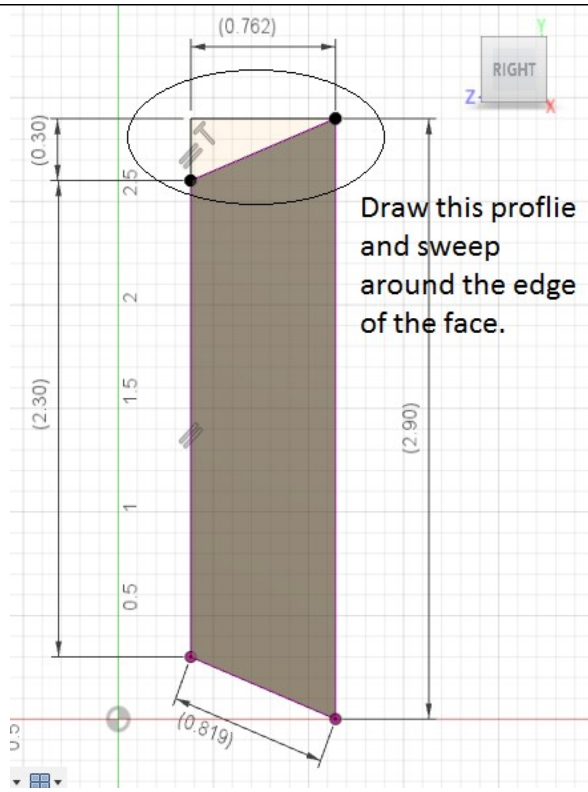
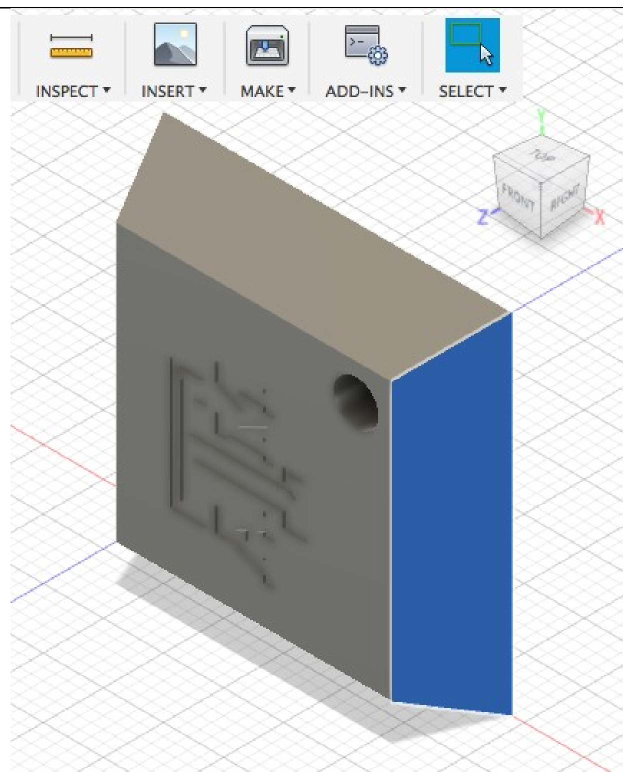
<table>
<tr><td>Step 6: Place the cursor on the front view and when it is highlighted, click it.</td><td>
</td></tr>
<tr><td>Step 7: Section the view as shown in the diagram. Press Enter when sections as shown.

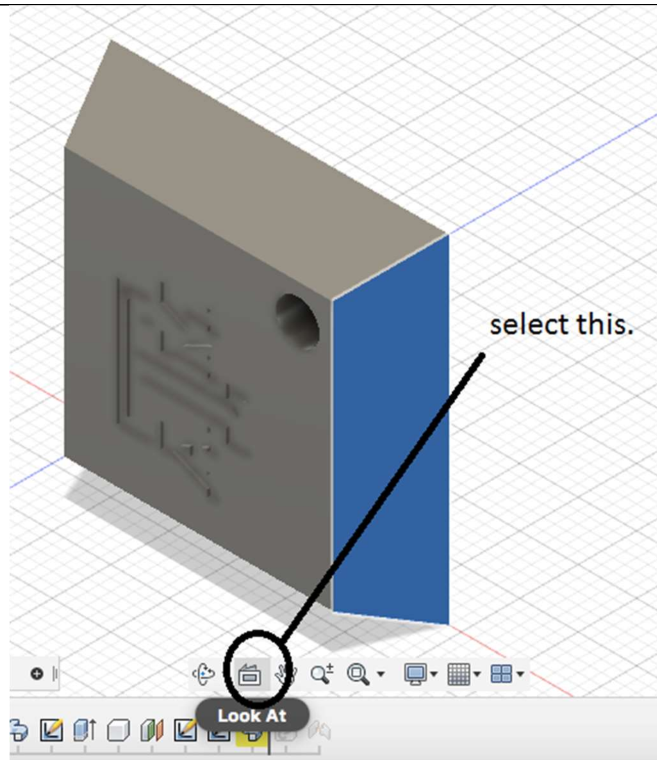
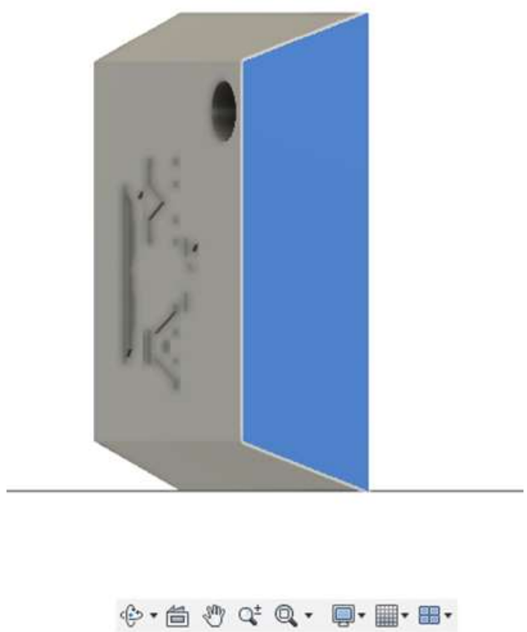
It is sectioned this way as it is not recommended to section/cutting featureless solid features.</td><td>
</td></tr>
<tr><td>Step 8: Drag out the section generated and click OK.</td><td>
</td></tr>
</table>

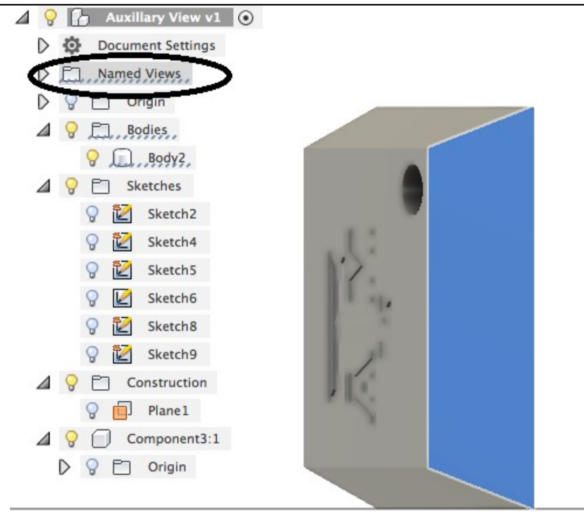
Step 9: Dimension the sectioned diagram as shown.	

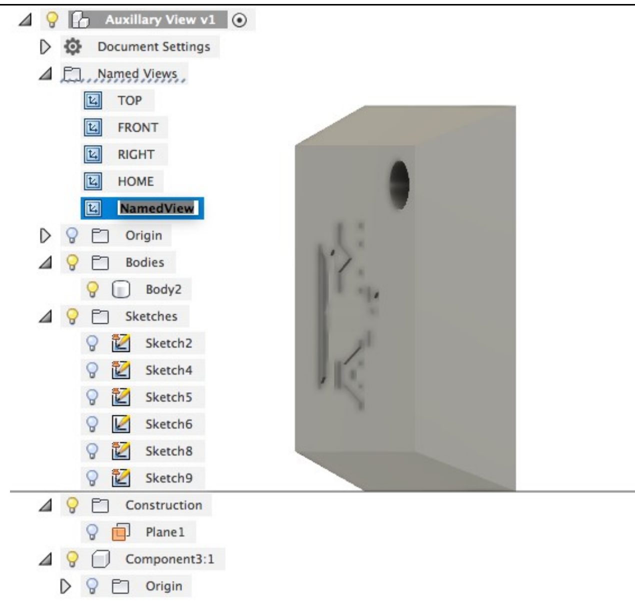
Part 3: Auxiliary View.

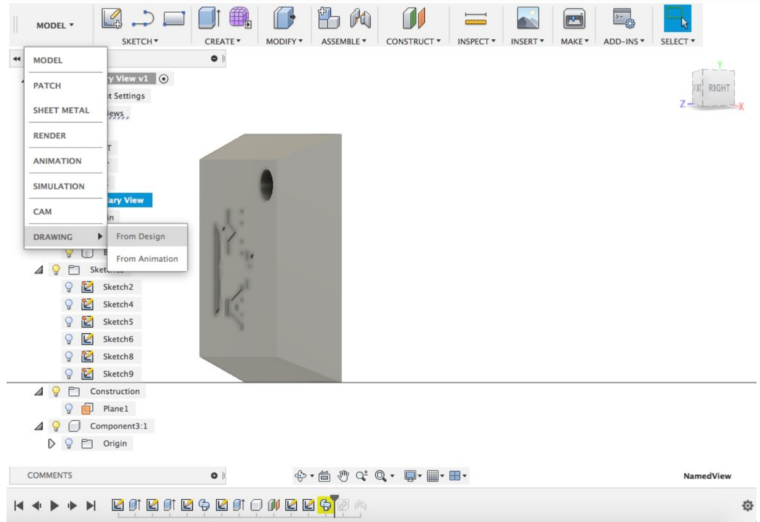
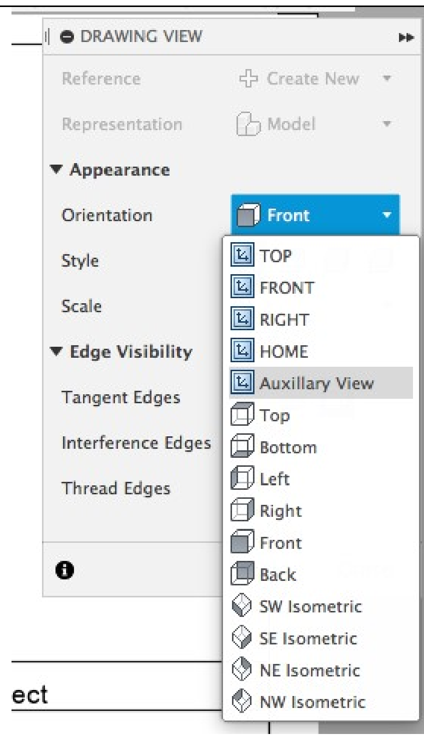
In order to create the Auxiliary view example, a modification of the base of the pen holder is made. Edit the block to the dimensions shown below.	

To create the geometry, instead of creating a fillet, draw a triangle as shown, and create the sweep.	
Step 1: Once sketched, select the surface on the right plane as shown.	

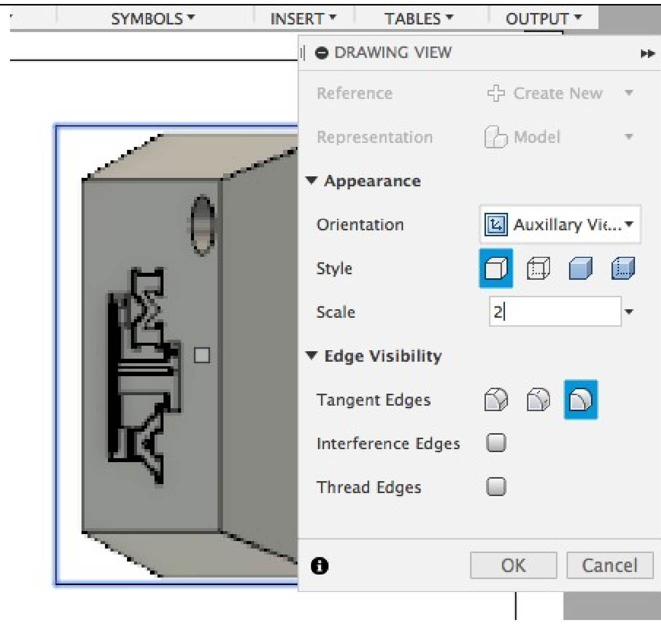
Step 2: Select 'Look At' from the view command as shown.	
Step 3: Once, you select look at, you will see your part as shown.	

<table>
<tr>
<td>Step 4: From the part hierarchy, select ‘Named Views’.</td>
<td>
</td>
</tr>
<tr>
<td>Step 5: Right click on named views and select ‘New Named View’.

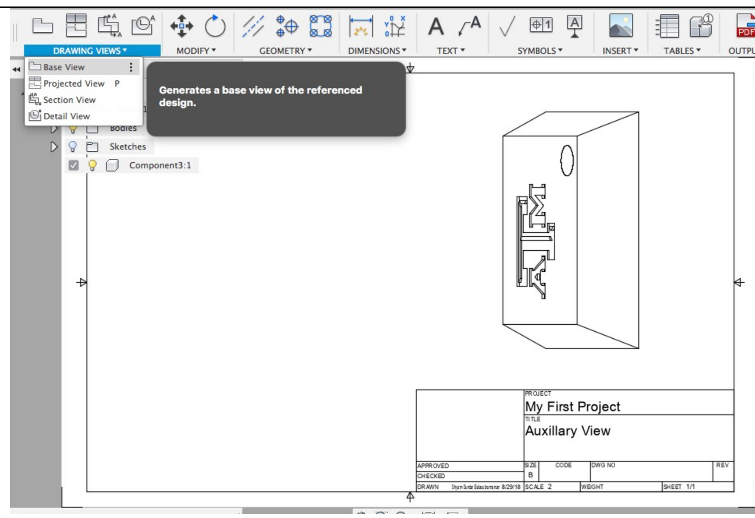
Step 6: On ‘NamedView’; double click and rename as ‘Auxiliary View’.</td>
<td>
</td>
</tr>
</table>

<table>
<tr>
<td>Step 7: Create a new Drawing of this part.</td>
<td>
</td>
</tr>
<tr>
<td>Step 8: When the new Drawing window is prompted, select Auxiliary View as shown.</td>
<td>
</td>
</tr>
</table>

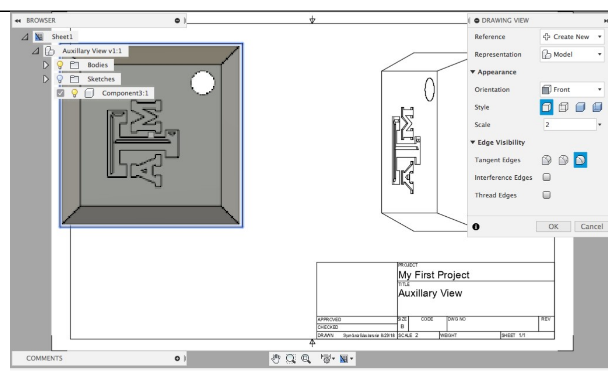
Step 9: Set the scaling ratio as 2 and select OK.

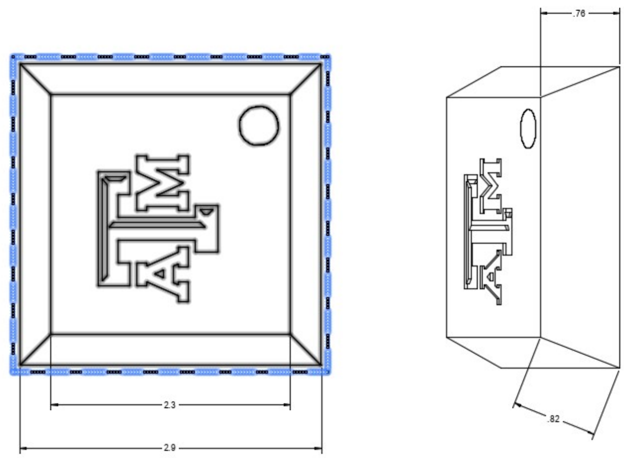
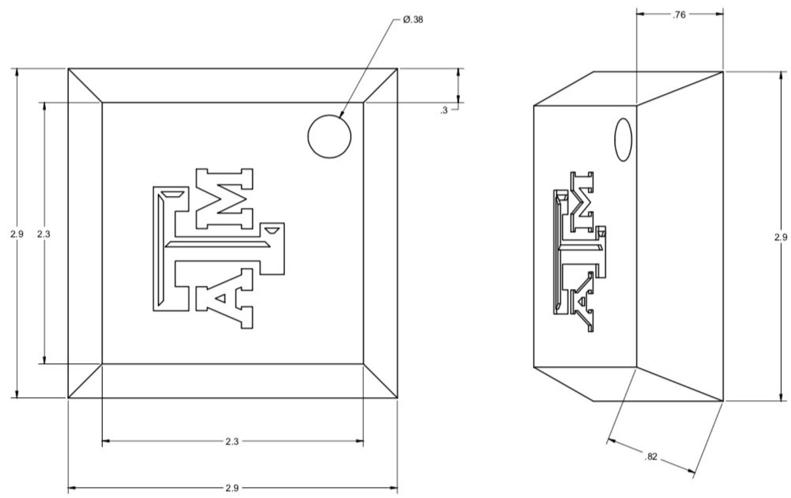


Step 10: To insert the front view of the model, select base view as shown.



Step 10.B.: Position the front view accordingly and select OK.



Step 11: Dimension the parts as necessary.	
Step 12: The drawing must look similar to this picture.	

LAB #2: Metrology-1

I. Objective: To be familiar with basic dimension and form measurement. Part 2 of the exercise will cover data collection in production mode.

II. Tools and Equipment:

– 8 rulers	– 6 inch-micrometers with stands
– 2 Vernier calipers	– 2 metric micrometers with stands
– 6 dial calipers	– 1 set of inch-micrometer with box
– 20 Lego blocks	– 1 stand for 1-2 inch micrometer
– 16 washers	– 2 dial indicators and bases
– 10 plastic tubes	– 2 height gages

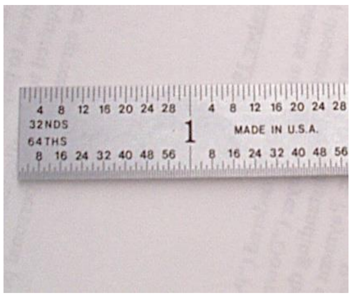


Fig L2.1: Ruler

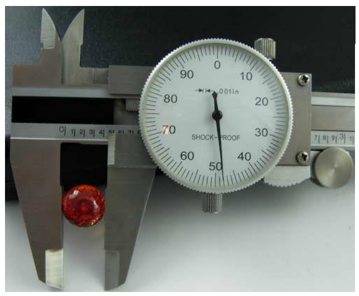


Fig. L2.2: Caliper

Fig. L2.3. Micrometer

Fig L2.4: Dial indicator


Fig. L2.5: Indicator and base


Fig. L2.6: Height gage


Fig L2.7: Lego block


Fig. L2.8: Washers

III. Dimension Measurement

Your TAs will demonstrate how to use each instrument. You will measure and compare dimensions of a Lego block, diameter and thickness of washer.

<u>III.1. Length measurement</u>

Select a Lego block and measure the same length or width using different instruments. Notice possible differences in your measurement.

Table L2.1. Length of a Lego block.

Measurement #	Ruler (inch)	Height Gage (inch)	Dial Caliper (inch)	Micrometer (inch)
1				
2				

<u>III.2. Width measurement</u>

An indicator is used to measure either dimension or relative deviation from a dimension. This is applied to measure dimension or shape changes (form measurement is in next session).

Measure the width of the Lego block at two different locations. Practice with a metric equipment if possible, otherwise you might need to convert the reading from inch to millimeter.

Table L2.2. Width of a Lego block.

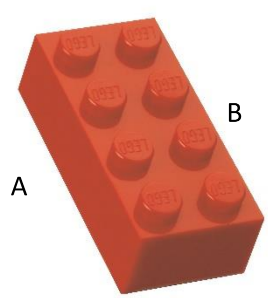
Measurement #	Dial caliper (mm)	Vernier caliper (mm)	Micrometer (inch)	Metric micrometer (mm)
1				
2				

Note: 1 inch = 25.4 mm

IV. Form Measurement

<u>IV.1. Parallelism</u>

Select a Lego block and measure parallelism of two opposite surfaces A and B using a dial indicator. The largest deviation of the two surfaces is the parallelism of those particular surfaces.



Sketch the set up and label the instrument, show direction of motion with an arrow.

Block parallelism: ________________ inch

<u>IV.2. Roundness</u>

Use caliper/micrometer to measure 4 different diameters around the top of a plastic test tube. The largest radial deviation is the roundness of that particular tube.

Notes:

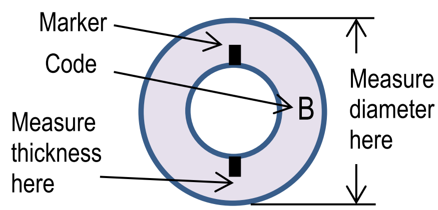
- Measure diameter of the same top circle to avoid error due to the taper angle.
- Apply minimum pressure to avoid deforming the tube.
- Need more measurements to improve the roundness accuracy.

Object	#	Diameter (inch)
	1	
	2	
	3	
	4	

$$\text{Roundness} = \frac{\text{Max diameter - Min diameter}}{2} = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \text{ inch (4 decimal digits)}$$

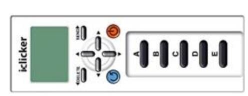
V. Assessment

Measure dimensions of a washer (Fig. L2.8) at marked locations using different instruments.

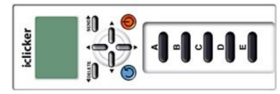


Washer code: ________	Thickness (inch)	Outside diameter (inch)
Caliper (± 0.001 in)		
Micrometer (± 0.000,5 in)		

10pt for each correct answer + 10pt for attendance = 50pt



LAB #3: Metrology-2



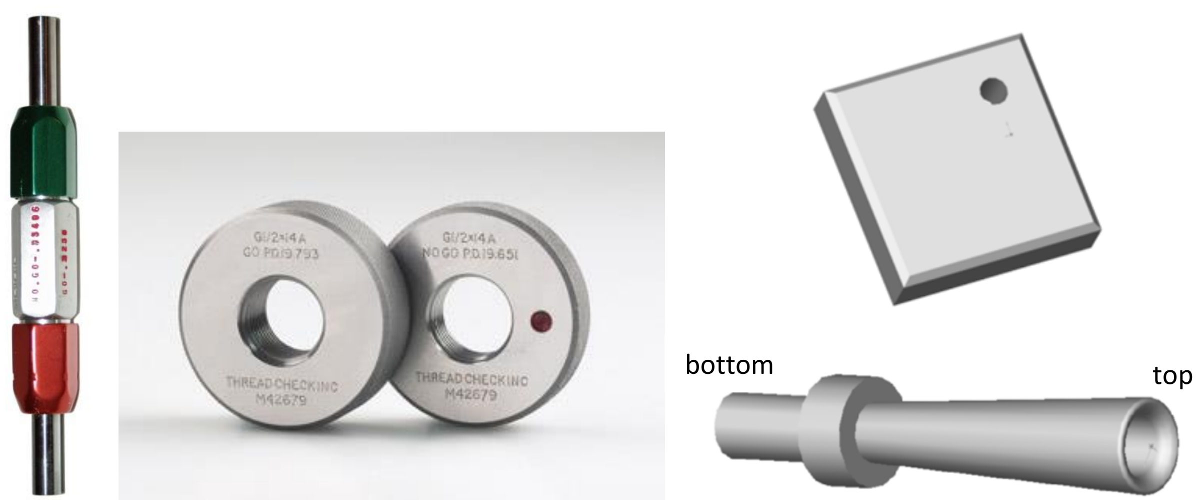
I. Objective: To be familiar with data collection technique for a group of parts in mass production mode.

II. Tools and Equipment:

– 8 dial calipers – 2 indicators and stands – 2 sets of plug gages (0.5 in go/no-go) – 2 sets of ring gages (0.5 in go/no-go) – 2 ten-holder sets – 2 pen-base sets	– Two 0.7-in combination gage blocks – Mitutoyo Strato-Apex 7106 CMM, Profile projector PH-A14, Vision QS-E2010B, Form RA-120 –

(a) (b) (c) (d)

Fig L3.1:
a) Profile projector, b) Coordinate measuring machine, c) Form measuring system, and d) Vision measuring system



(a) (b) (c)

Fig L3.2:
a) Go/No-go plugs (0.500-0.510 in), b) Go/No-go rings (0.487-0.497 in), c) pen-base and pen-holder set

III. Direct Measurement: Caliper

Table L3.1. Caliper measurement of a pen-holder

Part code: _______________	Measurement #1 (inch)	Measurement #2 (inch)
Outside diameter (Top)		
Inside diameter (Top)		
Hole depth		

Table L3.2. Caliper measurement of a pen-base at four corners.

Part code: ______	Measurement #1 (inch)	Measurement #2 (inch)	Measurement #3 (inch)	Measurement #4 (inch)
Thickness				

IV. Direct Measurement: Variation

IV.1. Use of Go/No-go gages

- Use Go/No-go gages to verify the tolerances of provided parts. Do not force parts into the precision gages.
- Use plug gages (ϕ0.500-0.510 in) for holes.
- Use ring gages (ϕ0.487-0.497 in) for cylinders.
- Write a check mark (√) if the part passes the Go/No-go tests, or a cross (X) otherwise.

Table L3.3. Go/No-go test (delete parts that you don't work with)

	A	B	C	D	E	F	G	H	I	J
	K	L	M	N	O	P	Q	R	S	T
Pen-holder (Bottom)										
Pen-base (hole diameter)										

IV.1. Use of Dial Indicator

- The design thickness of the pen-base is 0.700±0.010 inch. Set a standard height of 0.7 inch using precision gage blocks.
- Verify the indicator stem is in vertical position, and then zero the indicator at 0.7 inch height.
- Measure deviation of each pen-base thickness with the dial indicator near the block center. Plot the deviation (from the average of 0.7 inch) of each part in the chart below.

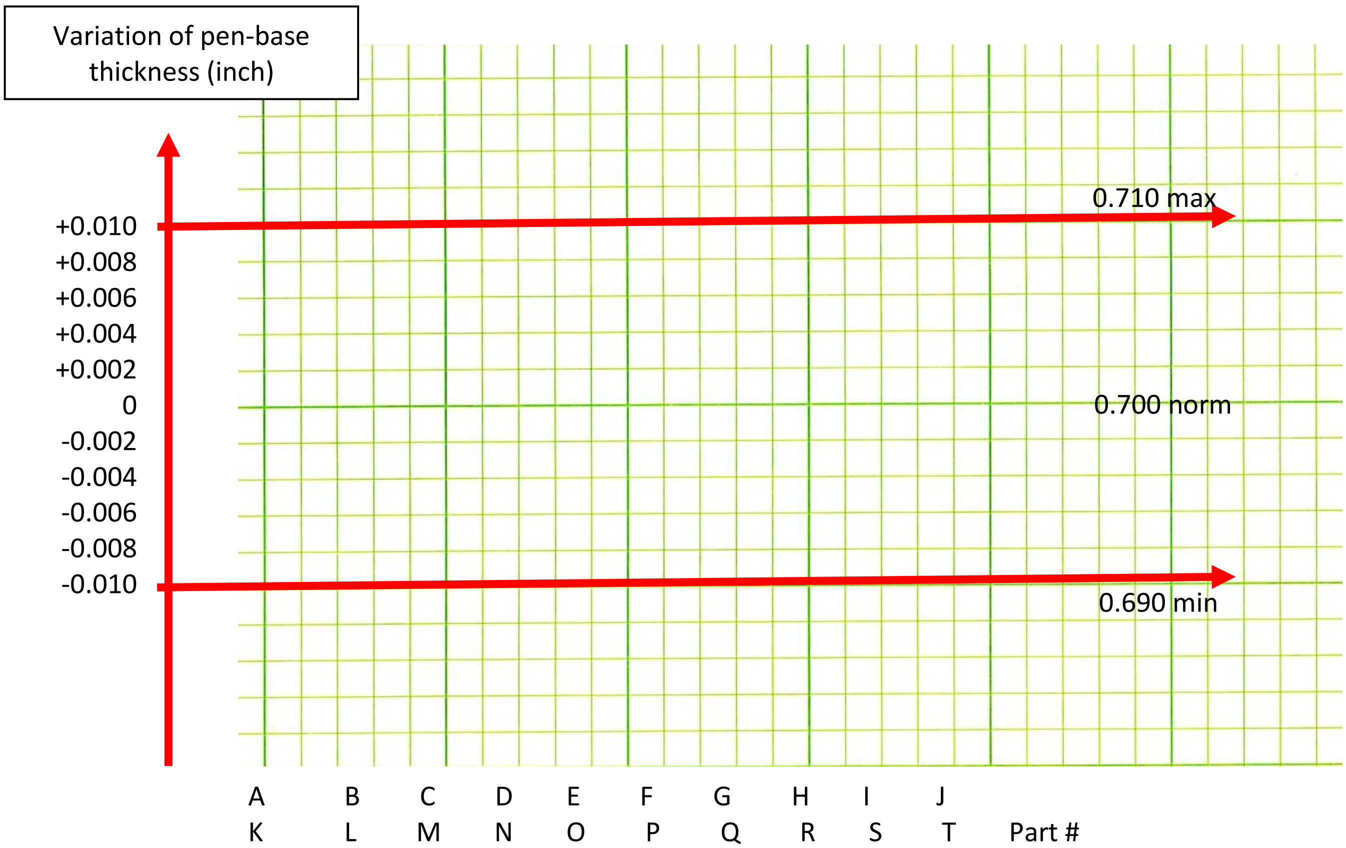
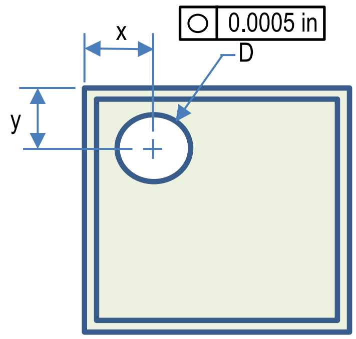


Fig. L3.3. Average and range chart (delete parts that you don't work with)

V. Indirect Measurement: Dimension and Form



- Design dimensions:
  - hole diameter $\phi 0.5$ in
  - hole center X = Y = 0.600 ± 0.010 in
  - hole roundness 0.0005 in allowance
- You will measure and calculate, either manually or using a program: hole diameter, coordinates of hole center, and its roundness on a pen-base.
- Recall that roundness is the radial zone width containing all points on a circle.
- Use the same part with different equipment to understand pro's and con's of each instrument.

Pen-base code: ________________.

Table L3.4. Hole center position and hole roundness

Instrument	X (in)	Y (in)	Diameter (in)	Roundness (in)
Caliper				
Profile Projector				
CMM				
Vision System				

<u>V.1. Use of Profile Projector</u>

Fig. L3.4a. Mitutoyo PH-A14 profile projector and QM Data 200 controller.

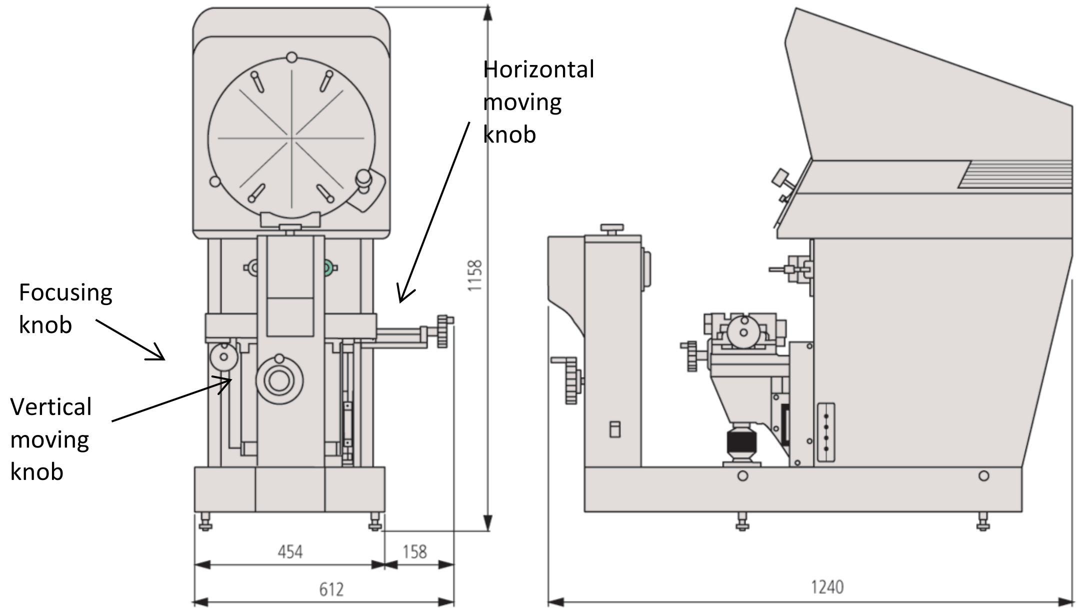
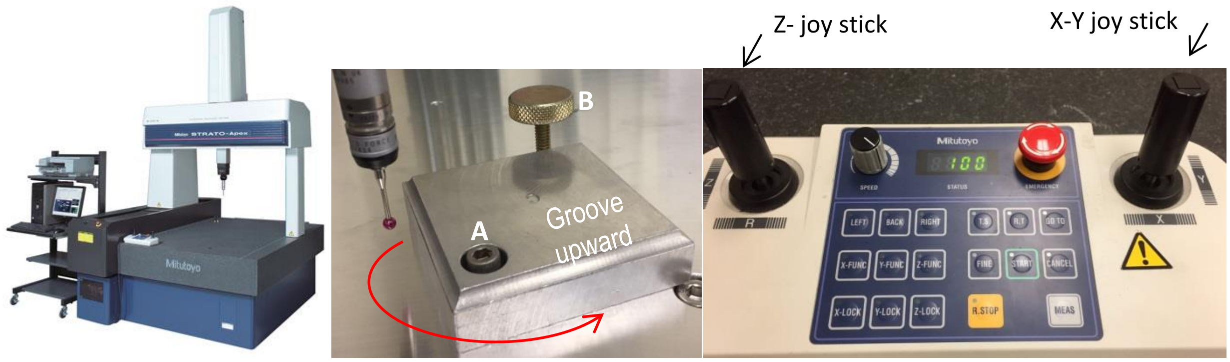


Fig. L3.4b. Mitutoyo PH-A14 profile projector.

Measure hole position, hole size and hole diameter using Mitutoyo profile projector.

1) Turn the system on
2) Set units
   a) Press Menu2 (row 7, column 6). Choose #8.
   b) Use Up or Down cursor (last column) to highlight dimension
   c) Use Left or Right Cursor (last column) to select inch or mm.
   d) Accept new change by pressing F5.
3) Align protractor wheel at some angle for easy of reading of the cross-hair position
4) Position a pen-base with hole position at lower left on vise (upper right on screen).
5) Focus so that machining marks are visible
6) Set new local coordinate system
   a) Press XY coordinate (row 3, column 1), then 5 on numeric pad. Observe the blinking dot on the screen.
   b) Use X or Y wheel, position the cross-hair to upper right corner of the part shadow, press LOAD and then F5 to complete. The current coordinates of the part origin now should be x=0, and y=0 on screen.
7) Measure the circle. You will measure at least 4 points on the circle.
   a) Press Circle (row 2, column 4)
   b) Position the cross-hair to point 1 on the circle, press LOAD
   c) Repeat for point 2, press LOAD
   d) Repeat for point 3, press LOAD
   e) Repeat for point 4, press LOAD
   f) ….
   g) When done, press F5
8) Read and copy the hole center coordinates (X, Y), hole diameter D, and roundness (F2) in Table 3.4.

V.2. Use of CMM



(a) (b) (c)

Fig. L3.5. a) Mitutoyo Strato-Apex CMM, b) setup, and c) CMM control box

Measure hole position, hole size and hole roundness using Mitutoyo CMM.
Your TA have loaded the program, set unit, probe, and prepared the fixture for a pen-base.

Procedure:

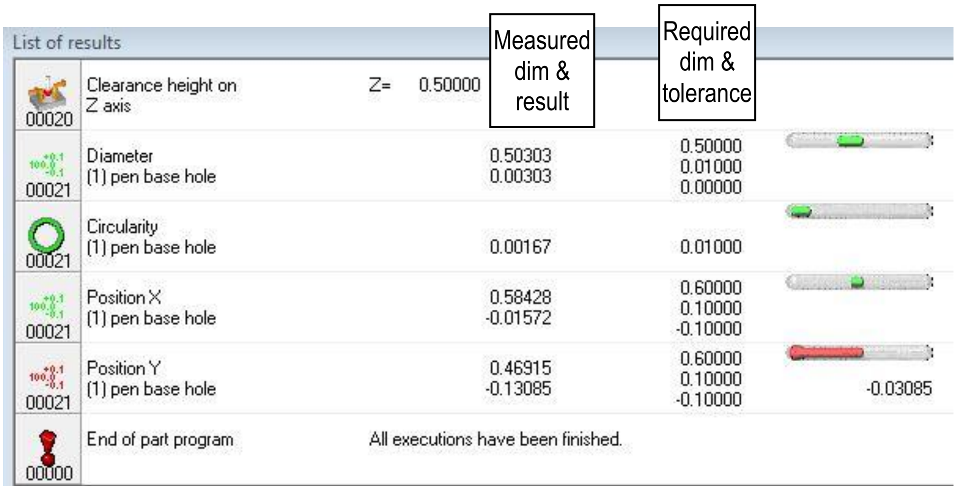
If the computer is already on, then proceeds to step #7

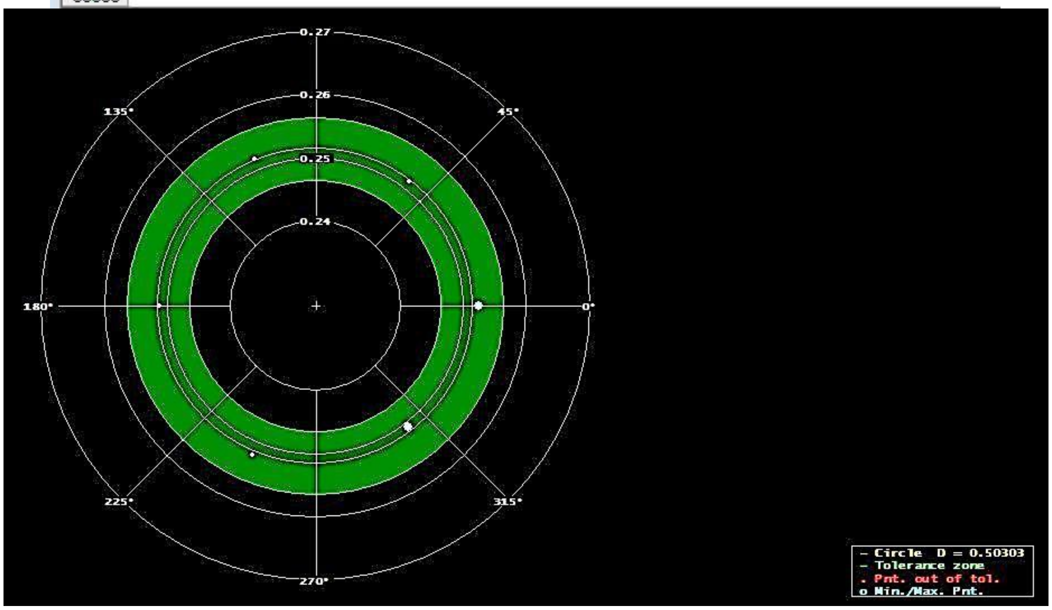
1) Verify that compress air is on, maximum pressure of 55 psi.
2) Log in to the computer system using your TAMU Net ID.
3) Turn the power on. The switch is at the lower left corner of the granite base.
4) Confirm on control box (Fig. L3.5c): The LED window reads "Abs 0" (absolute zero), and the green light on Start button is on.
5) Press the Start button. The probe will move to the home position (upper left corner)
6) Use the X-Y joystick on the control box, move the probe away from its home position and toward you.

---------- Start here if the computer and system are on and ready ----------------

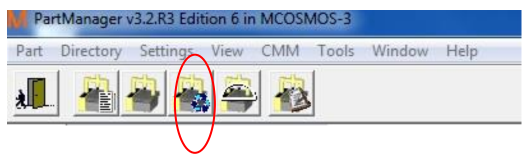
7) From the computer monitor, click on the icon M to open the Cosmo program.
8) Click OK
9) Highlight the program 181 pen base
10) From the top row, click the icon CMM/Repeat mode.

11) Secure a pen-base (Fig. L3.5b)
    - Insert the hole of a pen-base into the pin A, the grooves should face downward
    - Rotate the part counter clockwise until it stops by the screw B
    - Finger tighten the screw B clockwise onto the part. Click OK.
12) From a new window "GEOPAK: 181 pen-base", verify inch mode, click OK.
13) The probe will move to 4 points on one edge to set the y-axis and another 4 points on the other edge to set the x-axis; it then moves to 6 points inside the hole to measure its relevant dimensions. The probe will move away for the next part.
14) Record the coordinate of hole center, hole diameter, and hole roundness.
15) Unclamp the part, make sure you do not crash the probe.
16) Done!





17) To measure subsequent part:
   - Repeat step #10
   - From top row, click icon Execute Again

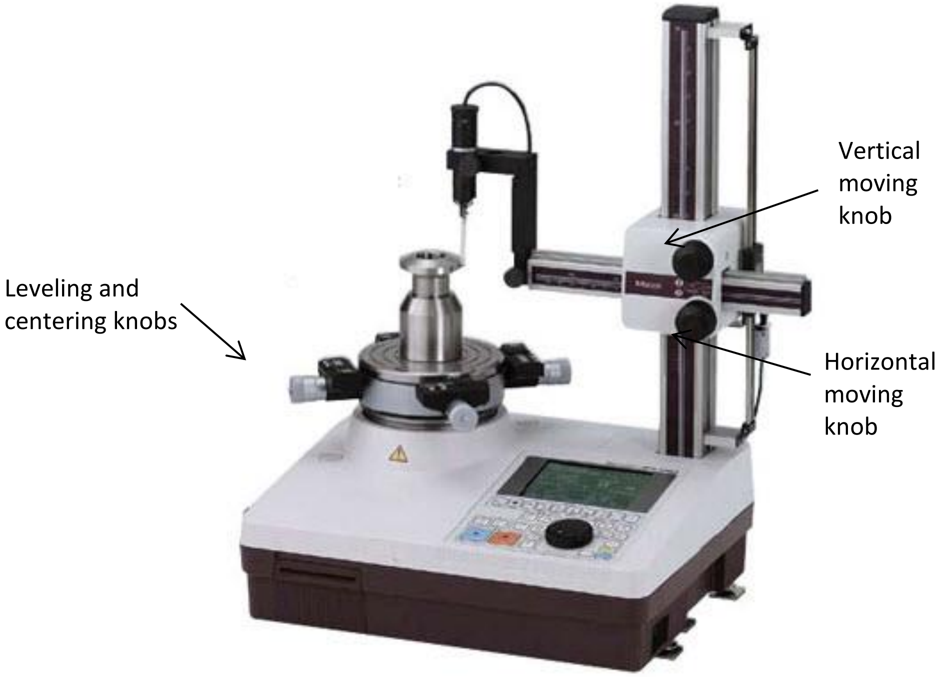


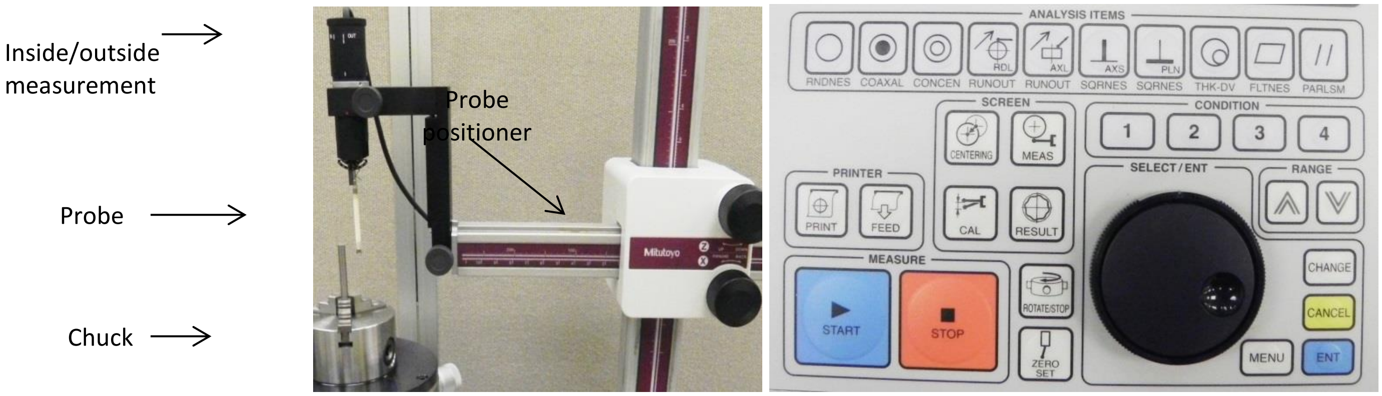
18) Click File/Exit to log out or ready for the next measurement.

NOTES: If your part is positioned wrongly, let the system detect error and it will stop itself.

a) An error message shows on monitor, click OK to acknowledge it.
b) From the list of next action items, choose Abort part program, then OK, then OK.
c) Use the joy sticks on control box (Fig. L3.5.c)
   - Push forward the left Z joy stick to bring the probe up (go slow at the beginning)
   - Tilt the X-Y joy stick to move the probe away from the part
d) Reposition the part as shown in Fig L3.5.b
e) From top row, click icon Execute Again

V.3. Use of Form Measuring System (Demonstration)





(a) (b)

Fig. L3.6. a) Mitutoyo RA-120 system, and b) Control panel.

Roundness demonstration (Fig. L3.6)

1) Secure a plug gage (or equivalence) on the chuck by slightly tightening the 3 jaws. Do not adjust 4 leveling/centering screws below the chuck.
2) Verify outside diameter set up.
3) Position the probe using Z and X knobs. Slowly move the probe in X direction to touch the part surface.
4) Press the RNDNES roundness button (Row 1) on control panel.
5) Slowly increase the probe contact pressure by moving the probe positioner and then fine tune using the SELECT/ENT wheel until the pressure bar is at center of the pressure gage window.
6) Press START button. The chuck will rotate while data is collected.
7) View the graphic display of roundness and read the roundness value.
8) Disengage the probe away from the part using the X-knob.

V.4. Use of Vision System

We will measure hole position and roundness of a pen-base.

INITIAL SETUP

1) Turn computer on, wait till it finishes booting.
2) Switch the Quick Scope controller on. This must be done after computer is on.
3) Click QSPAK MSEV3.0 icon on Desktop.
4) Zero the stage by clicking OK.
5) Turn the X/Y stage dials to move the stage to left, right, font and back as shown on the monitor. Click OK in between.
6) See Program Run page on monitor. If not, repeat the zeroing steps.
7) Select File, choose 181 Pen Base.pp file, click Run, initialize OK.

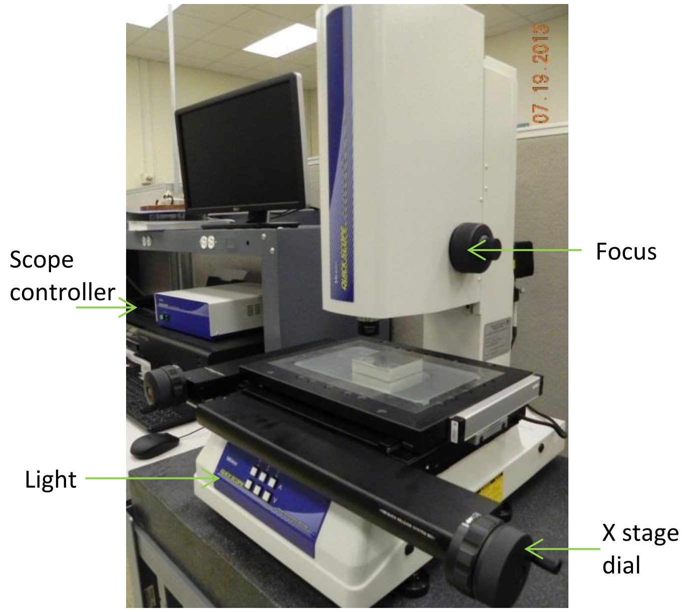
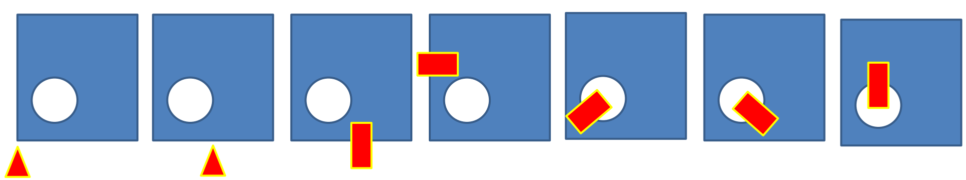


Fig. L3.7 Mitutoyo vision system

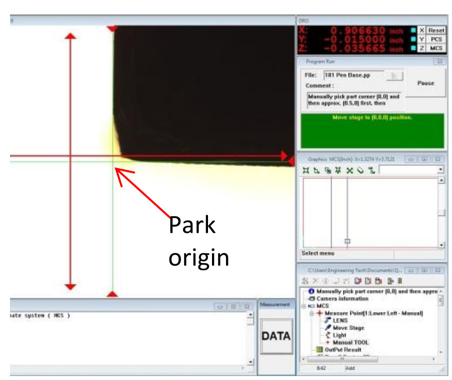
MEASURING PROCEDURE



(a) (b) (c) (d) (e) (f) (g)

a) Define origin (1st point on x, y axes)
b) Define x-axis (2nd point on x axis)
c) Define y-axis
d) Collect points on circle, group 1
e) Collect points on circle, group 2
f) Collect points on circle, group 3

Program outputs: Center position relative to part origin, hole size, and hole roundness.

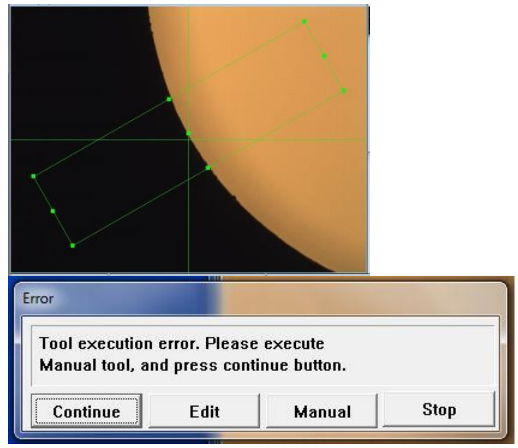


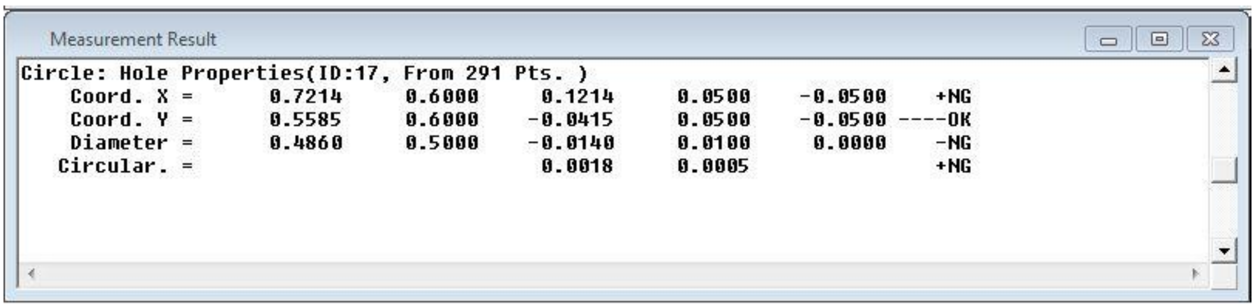
1) Position a pen-base on stage: bottom up, with hole at lower left, aligning the edges to marked lines on the stage. Be careful and do not scratch the glass stage or hit the lens.
2) Focus and set light (below the stage) for best contrast
3) Using the stage dials, align the shadow with green cross-lines, use mouse to click and define the part origin. Program will start running.
4) Use the X-dial, move to ~x=0.5, click on the part edge.
5) Follow the screen instruction according to steps c-f above. Use X/Y dials and move the stages until the red

cross-lines turn green, then press foot pad or click DATA.

6) If the system fails to detect points on an edge, choose Manual from the Error window, use mouse to click and define ~5 points on the edge, then click Continue.

7) Copy results (hole center , hole diameter, and hole roundness) into Table 3.4. Note: "NG" is "no good."





<u>V.5. Group discussion</u>

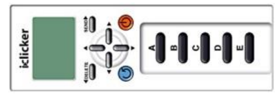
a) Highlight advantages of each instrument for dimensional /form measurement.
b) Repeat for disadvantages.
c) Discuss about instrument selection and effective usage of these instruments.

<u>VI. Assessment</u>

- Clicker quiz
- Filled tables

LAB #4: Machining

I. Objectives
II. Tools and consumables
III. Saw operation: tooling and task
IV. Drill operation: tooling and task
V. Lathe operation: tooling and task
VI. Mill operation: tooling and task
VII. Grind operation: tooling and task



I. Objective: To be familiar with basic machining operations. You will learn basic machine operation in this lab and will fabricate sets of parts in the next lab exercise.

II. Tools, equipment and consumables

Sawing	– 1 Al rod (20” long, ϕ0.75”) – 8 Al bar (3.0” x 0.75”) – Horizontal and vertical saw	– 1 marker – 2 dial calipers – 2 files
Drilling/tapping Die threading, deburring	– 2 center drills – 2 twist drills #Q (ø0.332") for ø3/8-24 threads – 2 deburring tools (counter sinker) – 3 Al blocks (3 x 3 x 0.75”)	– 1 marker – 2 dial calipers – 2 files – Drill and drill/mill machines – 2 die sets for ø3/8-24 threads
Lathe	– 2 Al rod (10” long, ϕ0.75”) – 2 center drills – 2 twist drills (ϕ0.5”) – 2 deburring tools (counter sinker) – 3 Al blocks (3 x 3 x 0.75”)	– 1 marker – 2 dial calipers – 2 files – 2 lathes with collets – Preset tools (turn, face, knurl, groove)
Milling	– 4 Al blocks (3 x 3 x 0.75”) – Horizontal and vertical mill – 4” face milling cutter – 4” peripheral milling cutter – 2 sets of parallel bars	– 1 marker – 2 dial calipers – 2 files – 2 rubber mallets – 1 combination square
Grinding	– Steel rod for cylindrical grinder – Steel block for surface grinder	– Surface grinder – Cylindrical grinder

Deburring tools and tool holder (for edge and hole)

Deburring tool (for hole)

Counter sinking and hole deburring tool

Deburring files

III. Sawing operation:

Fig. L4.1. Jet vertical band saw VBS1408 Jet horizontal band saw J3410

Start with an aluminum rod Ø3/4 inch, mark and saw to 4.0 inch long.

Table L4.1. Process plan for sawing round rods. Save the cut rods for next week.

Step	Machine	Process
1	Horizontal saw	Mark the cutting line (4.000-4.125 inch) Claim rod
2	Horizontal saw	Saw rod to length
3	Horizontal saw	Advance rod and repeat
4		Deburr Verify the part dimension (ø0.75 x 4.0 in minimum)

Start with an aluminum bar mark and saw to 3.0 x 6.0 x 0.75 inch.

Table L4.2. Process plan for sawing rectangular bars. Save the cut parts for next week.

Step	Machine	Process
1	Horizontal /vertical saw	Mark 6 inch cut Claim bar
2	Horizontal /vertical saw	Saw bar to length
3	Horizontal /vertical saw	Advance bar and repeat
4		Deburr Verify the part dimensions (3.0 wide, 6.0 long, 0.750 in thick)

III. Drilling, tapping, die threading operations:

Fig. L4.2. Center drills

Drills

Countersink tools

Fig. L4.3 Tapping tools for internal threads

Die threading tools for external threads

Fig. L4.4. Jet Drill/Mill JMD 18

Jet 15 inch drill press

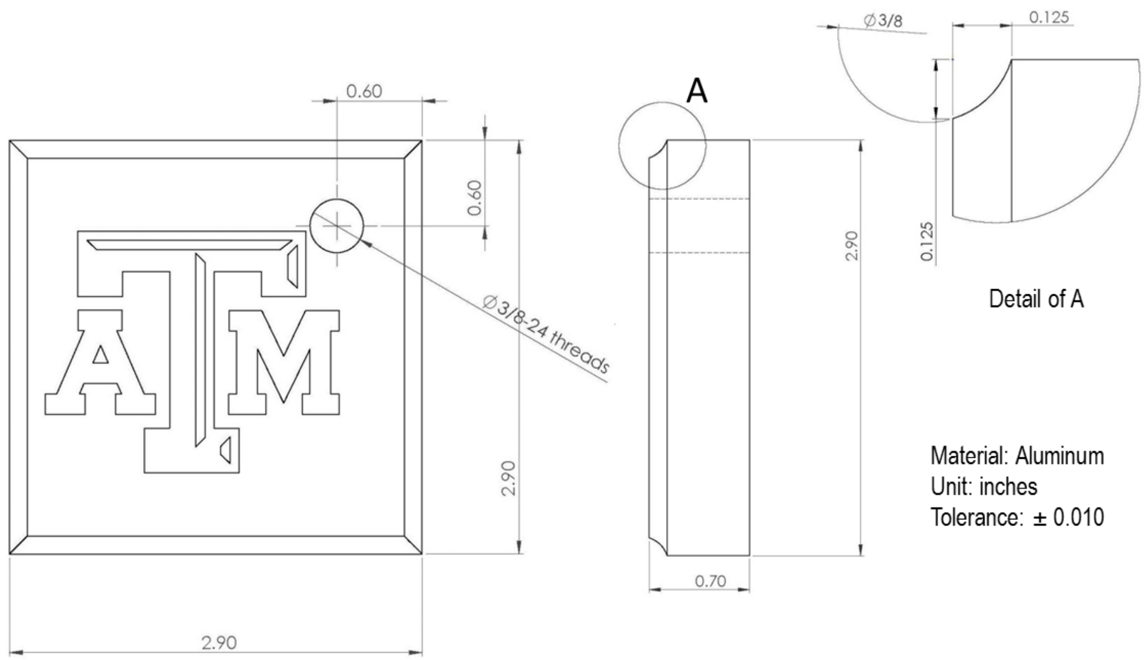


Fig. L4.5: Details of the pen-base.

Table L6.3. Process plan for drilling and tapping. Use practice workpieces.

Step	Machine	Process
1		Mark hole location Adjust drill fixture. Clamp part.
2	Drill	Mount a center drill. Drill center hole. Repeat for others
3	Drill	Mount the drill Q (ϕ0.332” drill). Drill through hole. Repeat for others
4	Drill	Mount a countersink tool. Deburr hole both sides. Repeat for others
5	Tap	Clamp the part on a vise, cut the internal threads with a tapping tool for ϕ 3/8-24 threads

Notes:

- Use a smaller drill of ø0.322 inch for the ϕ3/8 (0.372 inch) internal threads.
- Hole deburring can be done manually with a countersink tool.

IV. Lathe operation:

Fig. L4.5. Knurling tool

Fig. L4.6. Turning/facing tool.

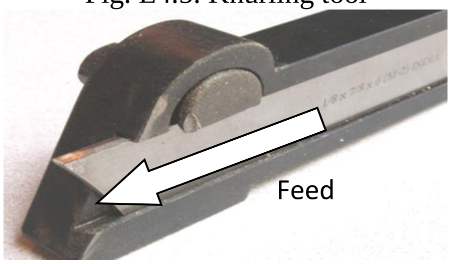


Fig. L4.7. Part off/grooving tool

Fig. L4.8. Fixed center-drill and chuck (at tailstock)

Fig. L4.9. A live (rotate-able) center at tailstock

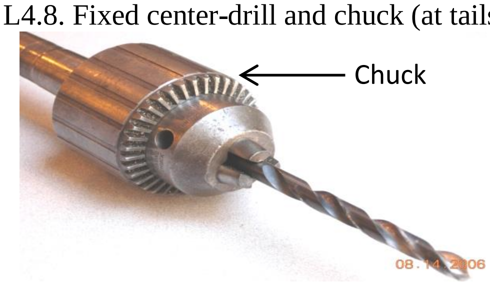


Fig. L4.10. Fixed drill and chuck (at tailstock)

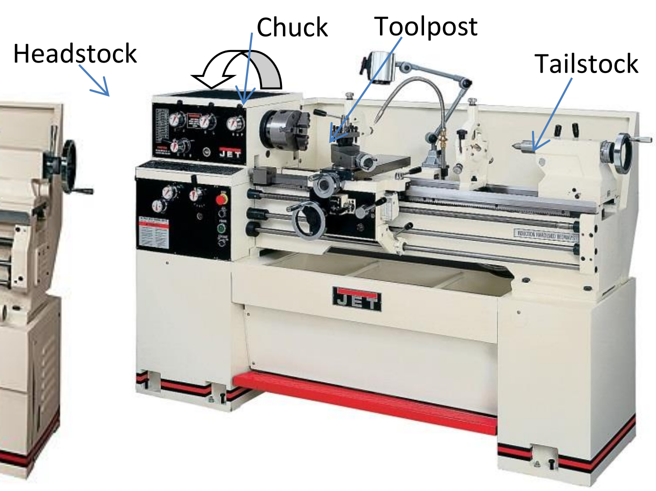


Fig. L4.11. Jet GH1440 lathe Jet GH1340 lathe.

You will partially fabricate set of pen holder in this lab exercise. The details are shown below

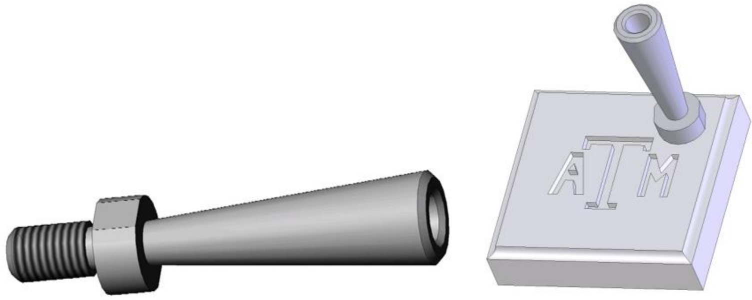


Fig L4.12. The pen-holder (left) and final assembly (right).

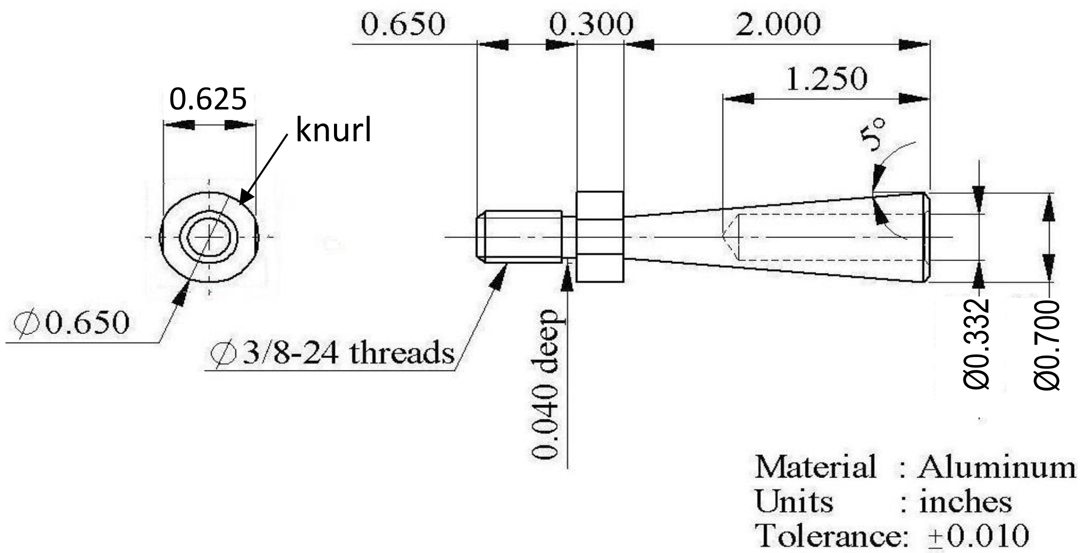


Fig. L4.13. Details of pen-holder.

Start with an aluminum rod Ø3/4 in x 4 in long, face and drill operations.

Table L4.4. Partial process plan for a pen-holder.

Step	Machine	Process
1	Lathe	Claim rod, ~1 inch protrusion
2	Lathe	Facing right end
3	Lathe	Center drill right end
4	Lathe	Drill right end to ϕ0.332 x 1.25" deep
5		Hand deburr with a countersink tool

V. Mill operation

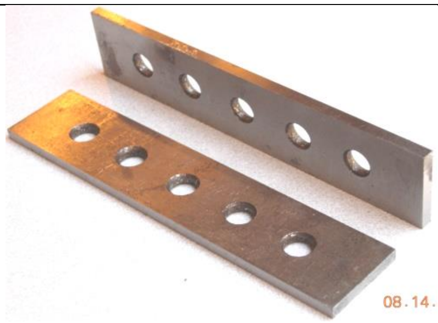


Fig. L4.14. Parallel bars (to raise a workpiece)

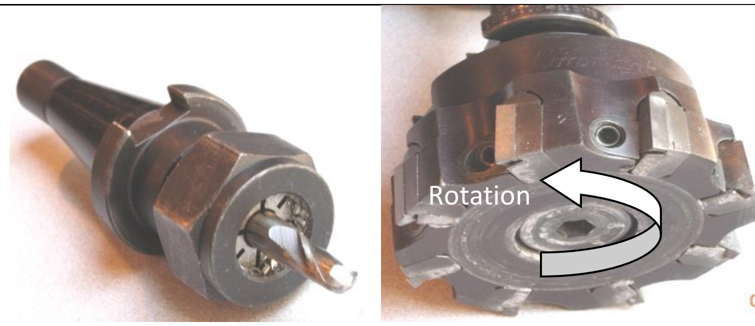


Fig. L4.15. Cutters for vertical milling machine.

Fig. L4.16. Cutters for horizontal milling machine.

Fig. L4.17. Sharp VH25 horizontal milling machine

Jet JTM 9x42 inch vertical milling machine

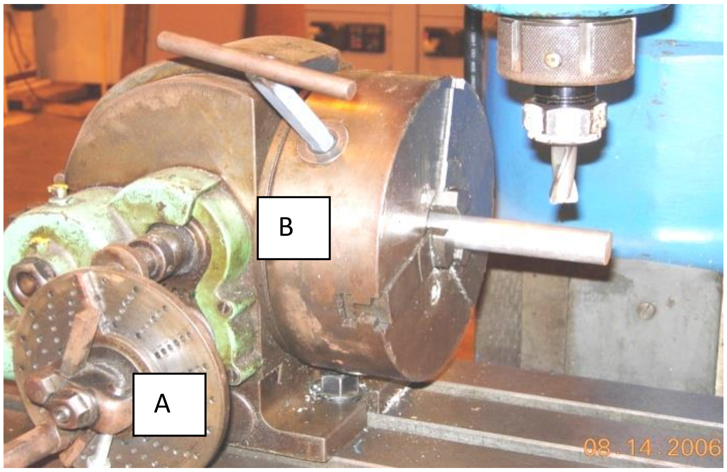


Fig. L4.18. An indexing head. Twenty revolutions of the dial A will rotate the chuck B by 180°.

You will partially fabricate set of pen-bases in this lab exercise. The details are shown below.

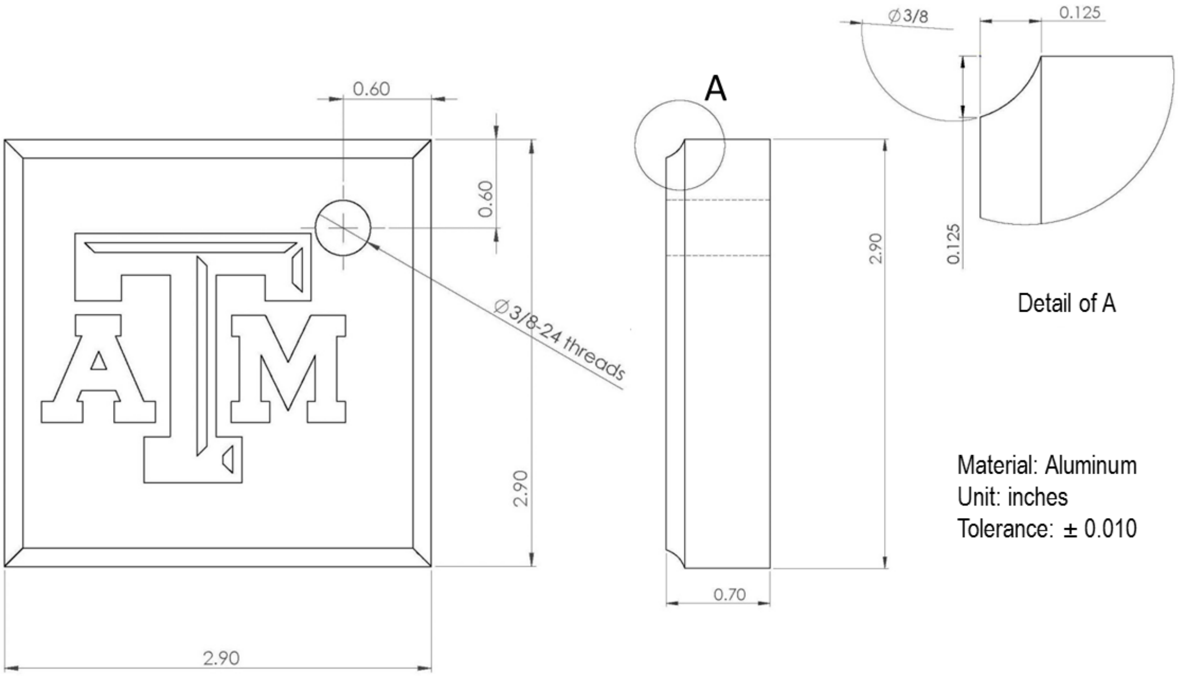


Fig. L4.19. Details of pen-base.

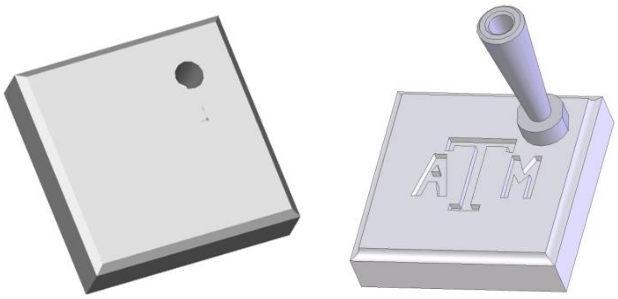


Fig L4.20. The pen-base (left) and final assembly (right).

Start with sawed aluminum block 3.0 x 6.0 x 0.75 inch, mill both sides to 2.9 x 6.0 x 0.75 inch

Table L4.5. Partial process plan for a pen-base.

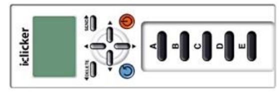
Step	Machine	Process
1	Mill	Claim a block on 3x6 in^2 area Mill the 1st side
2	Mill	Unclamp, clean chips, rotate block 180°, re-clamp Mill the 2nd side in several passes.
3	Mill	When the milled width is 2.900 ±0.010, unclamp and remove part.
4		Deburr with a file

VI. Grind operation:

Fig L4.21. Clausing CGS 818H surface grinder SukperTec G20P cylindrical grinder

Your TA will demonstrate the grinding processes.

LAB #8: Stamping



I. Objectives: To be familiar with basic sheet metal operations; to integrate sheet metal process with welding process to fabricate a simple product.

II. Tools and Equipment:

– 1 Jet shear/brake/role machine – 1 National shear and brake machines – 1 Piranha P50 IonWorker – 1 Miller SSW-2020ATT resistance spot welder – 16 steel sheets per section (10 x 2.75 x 0.019” , 26-gage)	– 8 rulers – 8 protractors – 2 pliers – Markers, different color spray paints – 1 quick dry while caulk – Safety gadgets: safety goggles, leather shoes (to work in welding lab), ear plugs

Fig. L8.1a: Jet shear/brake/roll combination

Fig. L8.1a: Piranha P50 IronWorker system

Fig. L8.1c: Resistance spot welder Miller SSW-2020ATT

Fig. L8.1d: National shearing machine

Fig. L8.1e: National brake for bending

III. Task:

We will fabricate a star using steel sheets (Fig. L8.2).

Fig. L8.2. A sheet-metal 3D star

NOTES:

- Familiar with basic sheet metal processes: marking, shearing, folding/bending, hemming, and spot welding.
- Test on a dummy blank to verify the optimal set up before welding your workpiece.
- Beware of sheet spring back after bending (sheet returns partially toward original position). A slightly overbending and accurate positioning would help.

Note: The finishing base of the star should lie completely on a flat surface

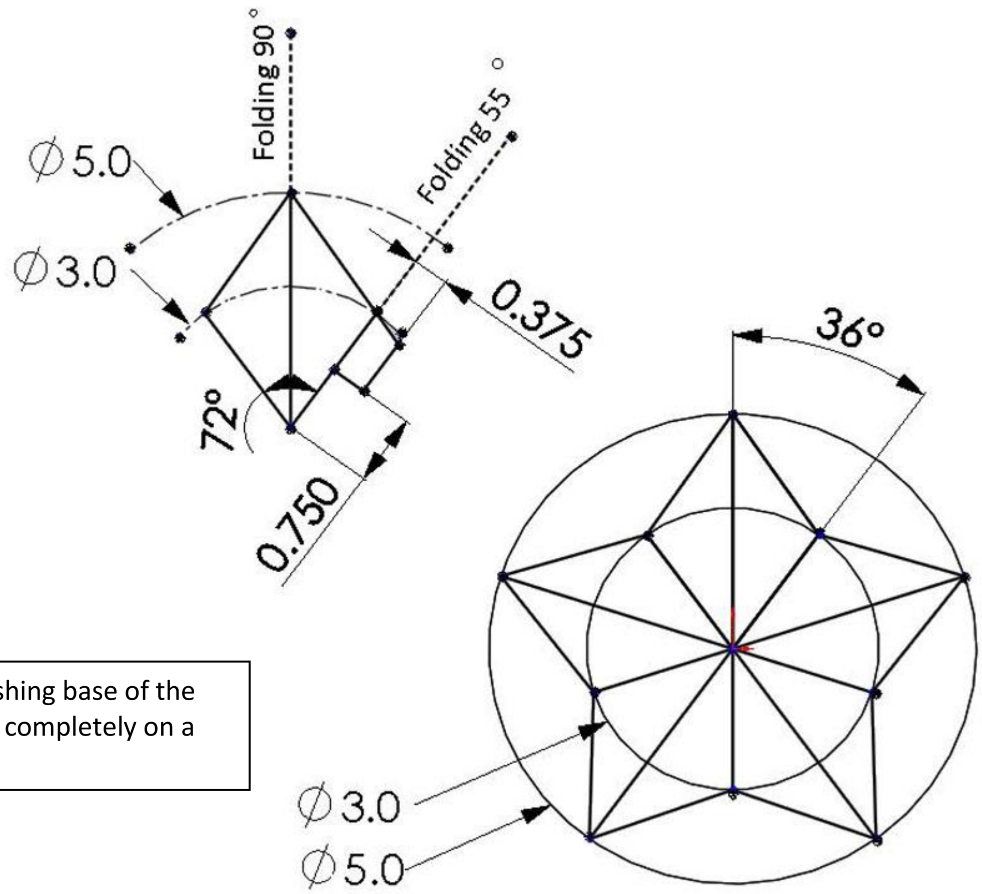


Fig. L8.3: Layout for the star. All dimensions are in inches.

Procedure to fabricate the 3D star:

1. Shear a steel sheet to approximately 10 x 2.75 in^2.
2. Draw the layout of a branch using compass, protractor, and ruler (Fig. L8.3). Repeat for 4 other branches.
3. Shear all 5 branches along their perimeters.
4. Slightly round the outer tips of the branches on a grinder to avoid sharp points.
5. For each branch, V-bend 90° along the main diagonal, and 55° along the shorter edge (Fig. L8.4). Notice the spring back after bending.
6. Align the branches and resistance spot weld them at the overlapping portions.
7. Deburr and clean the workpiece.
8. Seal the gap with paintable caulk. Write your name inside and hand your workpiece to a TA for grading.
9. Dry the caulk and paint the star. You will collect your workpiece in the next lab session.

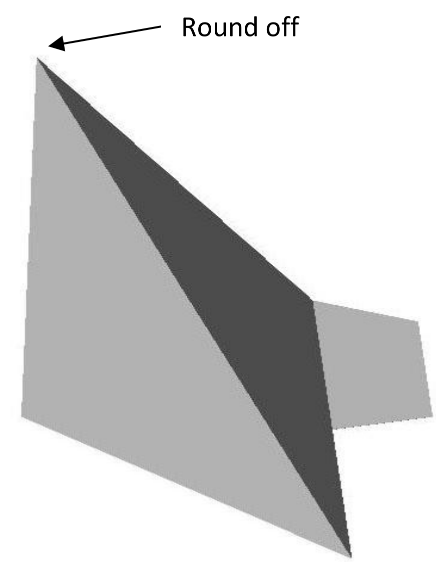


Fig. L8.4: A V-bent branch (1 of 5).

Due to some difficulties when aligning components of the stars during welding, you can have an option to notch a square at the tip of each of the star element. The complete project is a 3D star with a hollow star at the tip (Fig. L8.5)

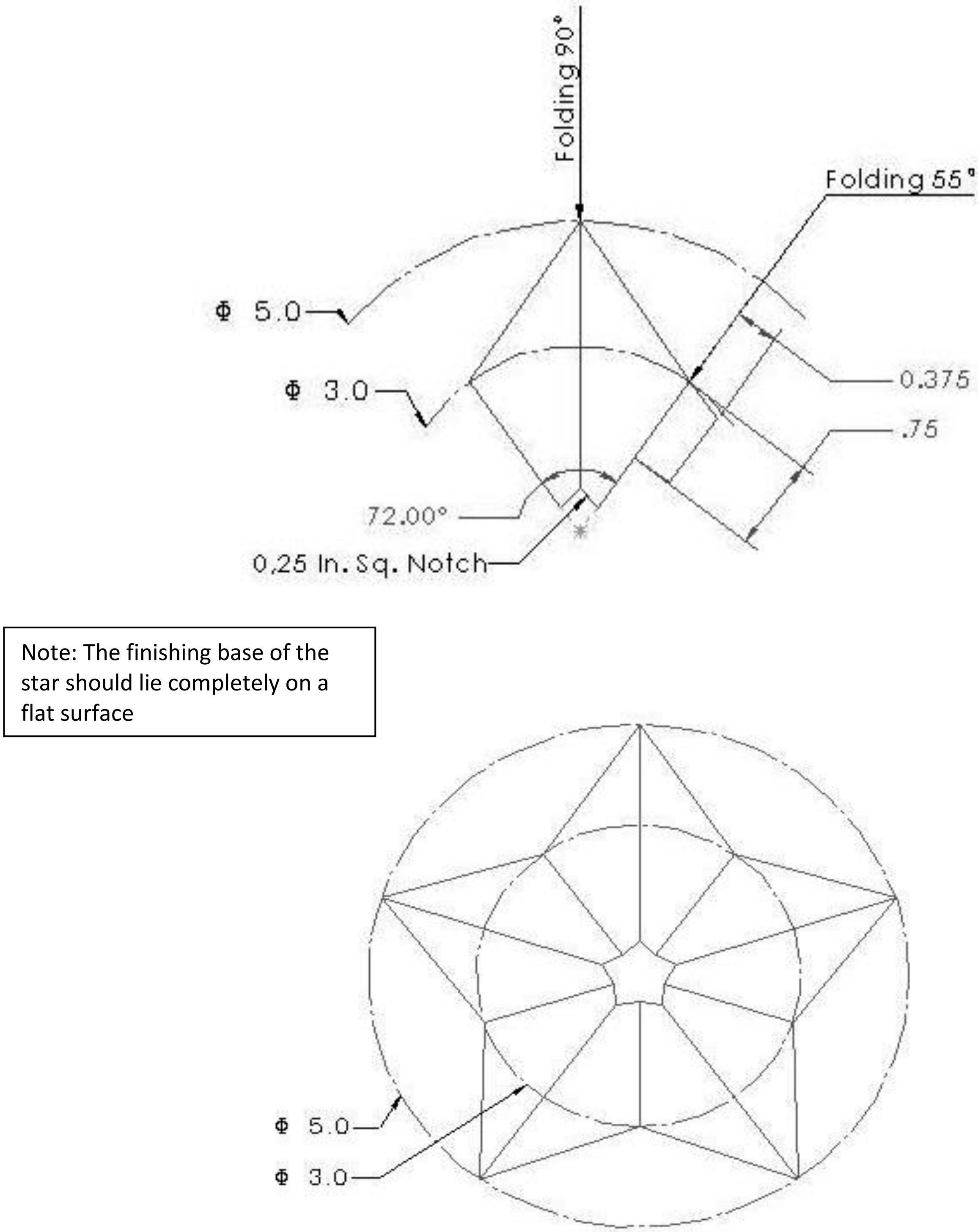


Fig. L8.5: Layout for the star (option cut out at center). All dimensions are in inches.