

**PRAIRIE VIEW A&M UNIVERSITY
ROY G. PERRY COLLEGE OF ENGINEERING
DEPARTMENT OF MECHANICAL ENGINEERING
MCEG 3103 – P02 Manufacturing Processes Lab
FALL 2021**

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 - Average (Graded original work)**
 - Below Average (Graded original work)**
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 - Original Quiz Questions & Master Solution/grading scheme used**
 - Above Average (Graded original work)**
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 - Summary of Topics Covered by Project**
 - Project Problem Statement and Grading Scheme**
 - Above Average (Graded original work)**
 - Average (Graded original work)**
 - Below Average (Graded original work)**

[Include any other evaluation used and omit any method above method (Test, Quizzes, Homework, Laboratory and Project reports) that was not used]

Course Description in ABET Format

1. Course number and name:	MCEG 3103 MANUFACTURING PROCESSES LAB
2. Credits and contact hours:	1 credit hours; 3 contact hours * Subject Area: Engineering Topics
3. Instructor's or course coordinator's name:	Dr. Lai Jiang
4. Text book:	
Title:	Fundamentals of Modern Manufacturing: Materials, Processes, and Systems
Author:	Groover, Mikell P.
Publisher, Year & Edition:	John Wiley & Sons Inc., New York, NY. 2016, 6 th Edition
a. Other Supplemental material	N/A
5. Specific course information	
a. Brief description of the content of the course (catalog description)	This lab includes experiments for metal identification, machinability of materials, effects of factors on surface roughness measurement, material removal rates, and cutting tool force analysis. It also includes illustrations of casting, forging, rolling, and powder metallurgy. Student will be required to design a structure part and perform manufacturing operations.
b. Prerequisites or Co-requisites	MCEG 3303, Manufacturing Processes
c. ** Indicate whether a required, elective, or selected elective (as per definition provided) course in the program	Required
6. a. Specific goals for the course specific outcomes of instruction (e.g., The student will be able to explain the significance of current research about a particular topic.) <i>Students will be able to:</i>	b. Explicitly indicate which of the student outcomes listed in Criterion 3 or any other outcomes are addressed by the course. <i>The specific goals for the course specific outcomes listed on the left column will address the following student learning outcomes:</i>
1. Apply knowledge of different skills and techniques in the manufacturing of engineering products.	Outcome 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factor (including use of the techniques, skills, and modern engineering tools necessary for engineering practice).
2. Manage the knowledge to pursue the literature and to consult databases.	

3. Analyze operational procedure required to manufacture an engineering part.

Outcome 4

An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

7 Brief list of topics to be covered

Introduction, Safety training	(3 hours)
Hammer manufacturing project	(18 hours)
CNC milling project	(18 hours)
Additive manufacturing project	(3 hours)

* For all Engineering programs, indicate subject area from the following: **Math, Basic science, Engineering topic or Other**

** **Required** courses are required of all students in the program, **elective** courses (often referred to as open or free electives) are optional for students, and **selected elective** courses are those for which students must take one or more courses from a specified group

II ASSESSMENT RESULTS FOR CURRENT AND PAST THREE PERIODS

Program Outcomes Assessed in this course

Outcome 2:

An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global cultural, social, environmental, and economic factor.

Outcome 4:

An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.

Assessment Summary of Class Semester Averages for Outcomes (Should be provided for Fall 2020 through Fall 2021 Assessment Period)

Outcomes	2	4
Semester	Semester Class Average (%)	Semester Class Average (%)
Fall 2021		78.9
Spring 2021	68.0	
Fall 2020		53.1
Comments on Trend of Data (Improving or deteriorating)	The average for this outcome has been above 70% from the only semester in the evaluation period.	The low average of this outcome may mainly due to the COVID-19 pandemic and the online education mode. The instructor emphasized the importance of technical writing skills and also how the project reports' grades can improve their overall grades. The problem was fixed, with the performance significantly improved in Fall 2021.

*Expected Semester Class Average = 70% (or as defined by the program)

Ideal Semester Class Average = 75% (or as defined by the program)

End of Semester Course Assessment Reports Fall 2021 and Last Three Assessment Periods.

Each summary contains the following Information

1. Performance Statistics

- Total number of students in class
- The class average performance (**stated as %**) in each course outcome assessed in this class and the **two previous times course was assessed**.
- The acceptable class average for the class in each outcome area as set by your department.
- Percentage of students who scored below the expected average in each outcome.

2. Implementation Summary

- Brief summary of plans implemented during the semester based on last assessment report

3. Perceived Problems

- Instructor's **critical evaluation** of perceived problems that affected students' performance. **Realistic problems should be identified throughout the semester and summarized in this section of the report.**

4. New Plans for Addressing Problems

- Instructor's plans for addressing the perceived problems the next time the class is taught. **These should be specific enough for another instructor to implement. Most of these should be things that, you, the instructor can implement to help students to improve. Be creative.**

5. Overall Trend over last three assessment periods

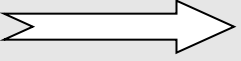
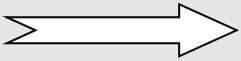
- Instructors summary of overall performance trend for each outcome measured over the last three periods.

6. Were Expectations Met?

- Answer **YES** if the **class average was above the expected average** and the **stated percentage of students** scored at or above the expected average, else answer NO.

Table 2.1 END OF SEMESTER COURSE OUTCOME ASSESSMENT REPORT
MCEG 3103-P02 MANUFACTURING PROCESSES LABORATORY
FALL 2021 SEMESTER

Report Prepared by: Dr. Lai Jiang
Report Date: Dec. 12, 2021

Semester	Analysis Type	Number of Students	Outcome 2 An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global cultural, social, environmental, and economic factor.			Outcome 4 An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgements, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts.		
			Expected Average	Class Average	% Students Above Expected Average	Expected Average	Class Average	% Students Above Expected Average
Fall 2021	Direct	14				70	78.9	78.6
Spring 2021	Direct	13	70	68	46.2			
Fall 2020	Direct	7				70	53.1	45.5
Implementation Summary			1. Instructions and expectations are given for the report assignment. 2. Examples of good reports are shown in class.			1. Related project materials were posted on eCourses. 2. Detailed project requirements were covered in class.		
Perceived Problems			1. The students' ability in understanding and utilizing the knowledge learned in class needs to be improved. 2. Some students can come up with a good design idea or topic, but cannot program those in a clear and logical manner.			1. Students had problems with the typical essay formats. 2. Students had problems with citation formats.		
Plans for Addressing Problems			1. Further enforce class attendances and make sure more students can practice with example problems. 2. Give students more design examples so they could refer to a good one and then proceed with their own design.			Getting the students started early and provide feedback along the way.		
Overall Trend over Periods			Class average is below the expected average. Overall expectation was not met in outcome - 2.			There was a huge improvmenet in the students' performance comparing to the evaluation results from Fall 2020.		
Were Expectations Met?	Average $\geq 70\%$? and $\geq 70\%$ students above avg.?		NO			YES		

MANUFACTURING PROCESSES LAB
Fall 2021

Title of Assignment: Midterm Exam

TOPICS COVERED IN MIDTERM EXAM

The Midterm Exam covered the following topics:

1. Use of a micrometer
2. Use of a Vernier caliper
3. Safety rules of operating machines
4. Understanding threads specifications
5. Knowledge of lathe structure and operations

Avg. = 74.3

≥ 90 0
 80-89 2
 70-79 10
 60-69 3
 < 60 0

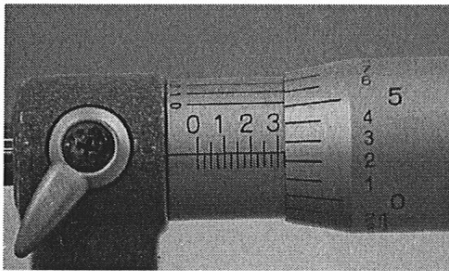
MCEG 3103 Midterm Exam (Fall 2021)

Print Name: Solu.

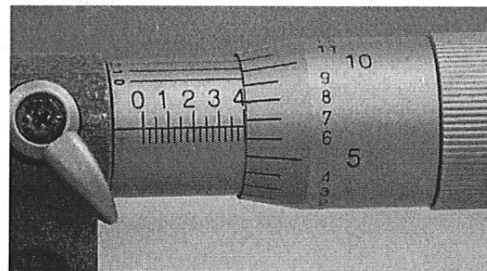
Section: P02

1. Write the readings of the following two micrometers (ignore the Vernier reading). (10%)

(1) 0.327 or 0.328

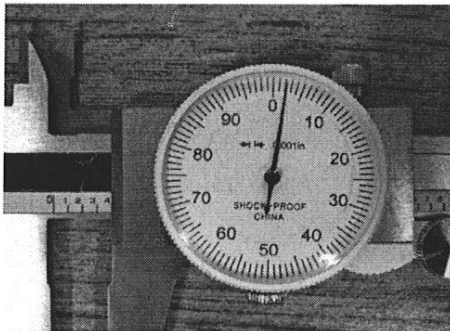


(2) 0.407

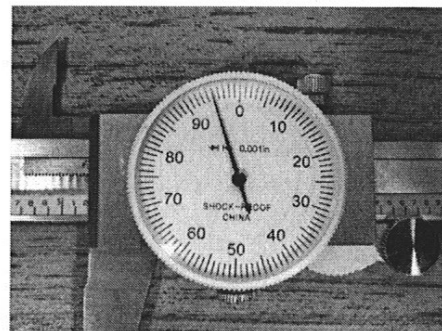


2. Write the readings of the following two dial calipers. (10%)

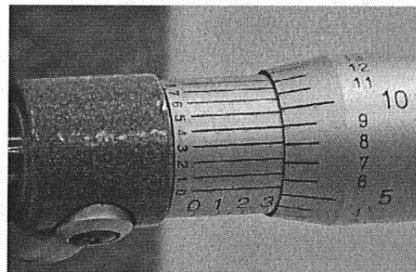
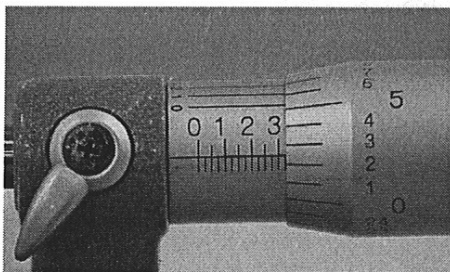
(1) 0.402



(2) 1.195



3. Write the reading of the following Vernier micrometer. (10%) 0.3274



4. (a) When should you change the spindle speed or feed speed? (b) What must be done about wrenches and other hand tools before you turn off the power of any machine? (10%)

(a) when the machine is off

(b) They must be put away or secured.

5. Write the minor diameters and thread sizes of the following bolts: (16%)

Item	Major OD (in)	Minor OD (in)	Measured length of Bolt (in)	No. of threads within measured bolt length	Thread Size of the Bolt
1	0.1380	0.1073	0.50	20	6-40-UNC-2A
2	0.7500	0.6733	1.50	24	3/4-16-UNC-2A

6. List two methods for fixing the work part on a lathe. Also, specify how to hold work part in each method. (12%)

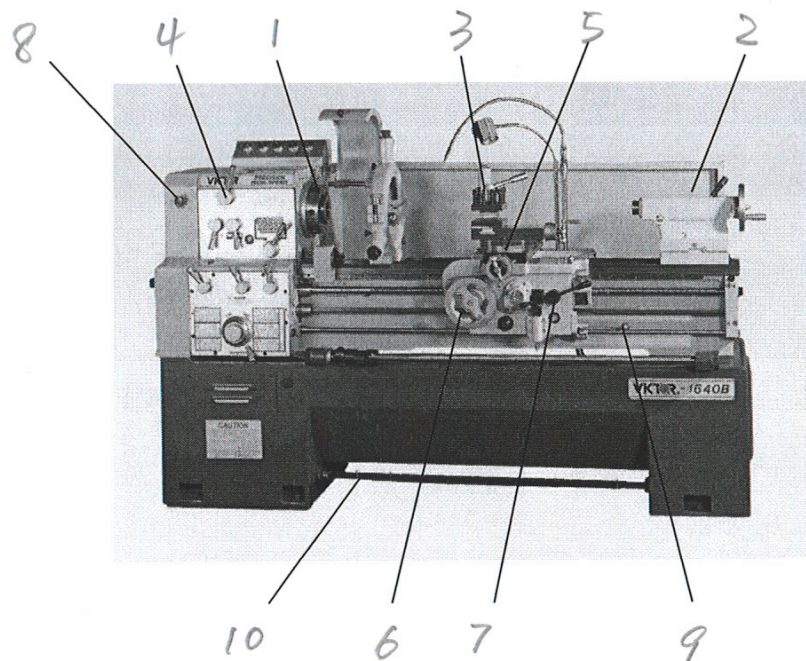
- ① Use two centers to support both sides and rotate with a dog.
- ② Use a chuck and close the jaws until the part is fixed.
- ③ Use a collet to hold the cylindrical part
- ④ Use a face plate to clamp customized part shape.

7. Write the procedures of using a lathe to reduce the diameter of a shaft from 0.75 inch to 0.5 inch. (12%)

- ① Load work part on the lathe and set up the cutting tool to zero
- ② Do two passes of roughing cuts, with cutting depths of 0.05 in.
- ③ Do one final finishing cut with a cutting depth of 0.025 in.
- ④ Move away the cutting tool, unload the shaft.

8. Label the following parts using the assigned numbers on the picture of a lathe below. (20 %)

- (1) Spindle (collet chuck); (2) Tailstock; (3) Tool holder; (4) Spindle speed change handle;
 (5) Cross feed handle; (6) Longitudinal feed handle; (7) Automatic feed handle;
 (8) Emergency-stop; (9) Start switch; (10) Foot break;



ABOVE AVERAGE

81 → 86

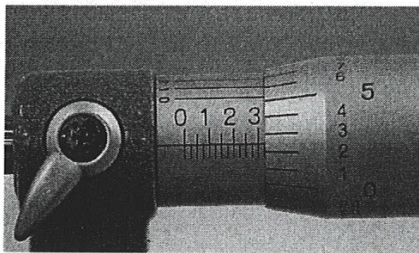
MCEG 3103 Midterm Exam (Fall 2021)

Print Name: Courtenay Moore

Section: P02

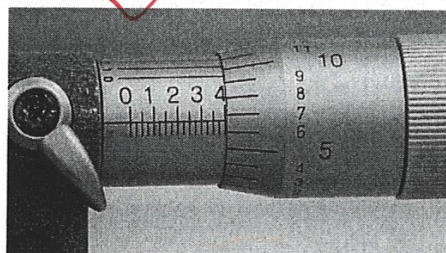
1. Write the readings of the following two micrometers (ignore the Vernier reading). (10%)

(1) 0.328 in



.3
+ .025
+ .003
= .328

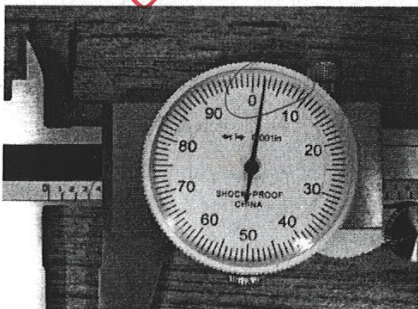
(2) 0.407 in



.4
+ .007
= .407

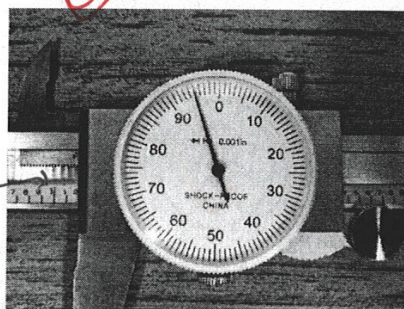
2. Write the readings of the following two dial calipers. (10%)

(1) 0.402 in



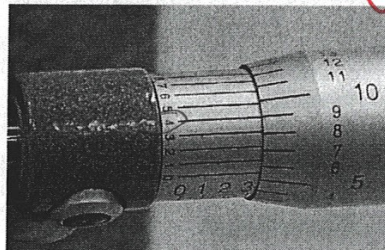
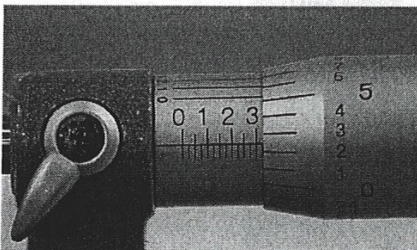
0.4
+ 0.002

(2) 3.095 in



+ 9.
3.00
+ 0.095
= 3.095
Not yet at .2 in

3. Write the reading of the following Vernier micrometer. (10%) 0.3274 in



0.3
+ 0.025
+ 0.002
+ 0.0004
= 0.3274

4. (a) When should you change the spindle speed or feed speed? (b) What must be done about wrenches and other hand tools before you turn on the power of any machine? (10%)

a) You should change the spindle or feed speed once the machine is turned off and has stopped spinning.

b) wrenches and other hand tools must be collected and placed away from the machine before you turn it on to prevent damage or injury.

5. Write the minor diameters and thread sizes of the following bolts: (16%)

Item	Major OD (in)	Minor OD (in)	Measured length of Bolt (in)	No. of threads within measured bolt length	Thread Size of the Bolt
1	0.1380	0.1075 in	0.50	20 $\frac{40}{inch}$	0.1200 in
2	0.7500	0.6733 in	1.50	24 $\frac{16}{inch}$	0.7031 in

6. List two methods for fixing the work part on a lathe. Also, specify how to hold work part in each method. (12%)

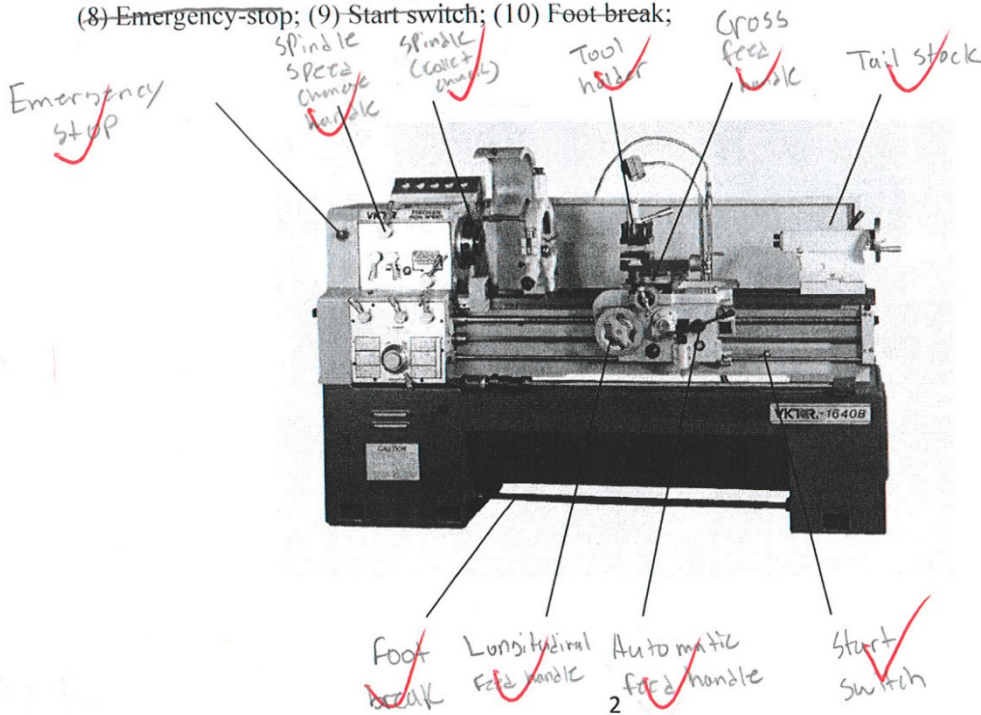
The first method is by using the Chuck which is connected to the spindle. It holds the work by clamping down on one end and locking in place.

7. Write the procedures of using a lathe to reduce the diameter of a shaft from 0.75 inch to 0.5 - .25 inch. (12%)

Clear area of all tools and debris. Secure work piece in the chuck. Bring your cutting tool to the work piece to zero it out. turn on the machine and let it get up to spinning speed. Make your first pass only removing .1 inch of material. Make your second pass removing only .1 inch of material. Then make your final pass removing .03 inches of material. turn off the machine and wait till it stops spinning. inspect your work piece.

8. Label the following parts using the assigned numbers on the picture of a lathe below. (20 %)

- (1) Spindle (collet chuck); (2) Tailstock; (3) Tool holder; (4) Spindle speed change handle;
(5) Cross feed handle; (6) Longitudinal feed handle; (7) Automatic feed handle;
(8) Emergency-stop; (9) Start switch; (10) Foot break;



AVERAGE

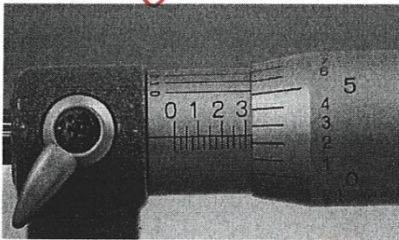
MCEG 3103 Midterm Exam (Fall 2021)

Print Name: Chinonso Okezie

Section: P02

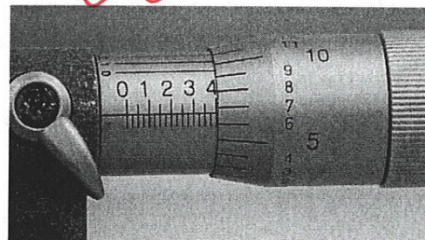
1. Write the readings of the following two micrometers (ignore the Vernier reading). (10%)

(1) 0.327



$$\begin{array}{r} 0.300 \\ 0.025 \\ 0.002 \\ \hline 0.327 \end{array}$$

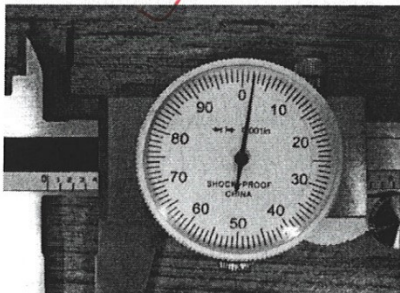
(2) 0.406



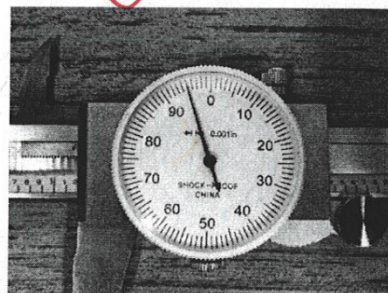
$$\begin{array}{r} 0.400 \\ 0.000 \\ 0.006 \\ \hline 0.406 \end{array}$$

2. Write the readings of the following two dial calipers. (10%)

(1) 0.402

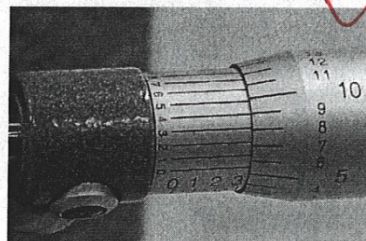
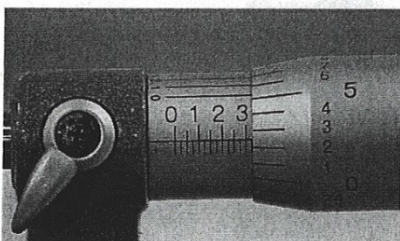


(2) 0.195



+10

3. Write the reading of the following Vernier micrometer. (10%) 0.3274



$$\begin{array}{r} 0.300 \\ 0.025 \\ 0.002 \\ 0.0004 \\ \hline 0.3274 \end{array}$$

+10

4. (a) When should you change the spindle speed or feed speed? (b) What must be done about wrenches and other hand tools before you turn on the power of any machine? (10%)

a) Before or after machining. b) Keep clear of machine.

+10

5. Write the minor diameters and thread sizes of the following bolts: (16%)

Item	Major OD (in)	Minor OD (in)	Measured length of Bolt (in)	No. of threads within measured bolt length	Thread Size of the Bolt
1	0.1380	.1015	0.50	20	.1250
2	0.7500	.6731	1.50	24	.7731

+4

6. List two methods for fixing the work part on a lathe. Also, specify how to hold work part in each method. (12%)

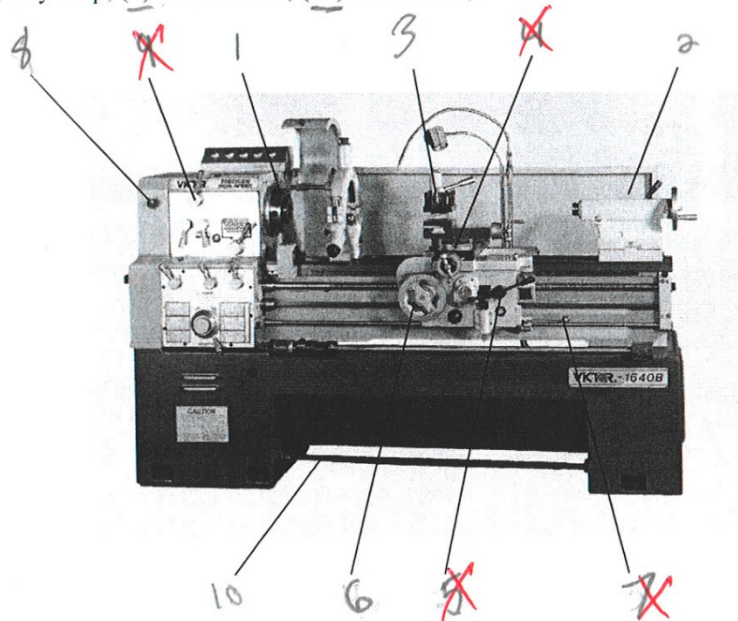
7. Write the procedures of using a lathe to reduce the diameter of a shaft from 0.75 inch to 0.5 inch. (12%)

Place shaft in spindle. Set spindle speed before machine is turned on. Use handle to set machine to exact speed and degree. Press start switch to turn on machine.

+5

8. Label the following parts using the assigned numbers on the picture of a lathe below. (20 %)

- (1) Spindle (collet chuck); (2) Tailstock; (3) Tool holder; (4) Spindle speed change handle;
 (5) Cross feed handle; (6) Longitudinal feed handle; (7) Automatic feed handle;
 (8) Emergency-stop; (9) Start switch; (10) Foot break;



+12

BELOW AVERAGE

42 → 62

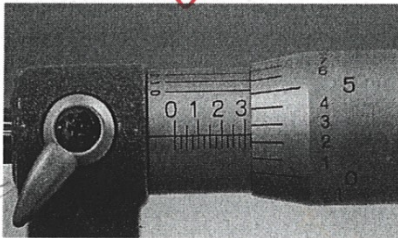
MCEG 3103 Midterm Exam (Fall 2021)

Print Name: Christopher Nwuke

Section: P&V

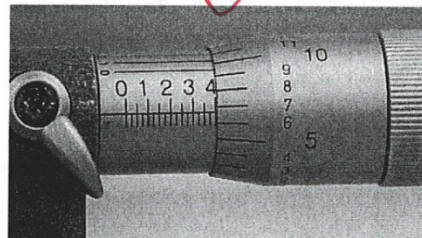
1. Write the readings of the following two micrometers (ignore the Vernier reading). (10%)

(1) 0.327



0.3
0.025
0.002

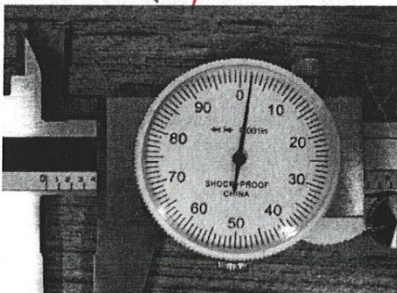
(2) 0.407



0.40
0.000
0.007
0.407

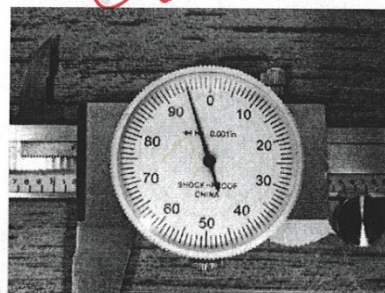
2. Write the readings of the following two dial calipers. (10%)

(1) 4.002



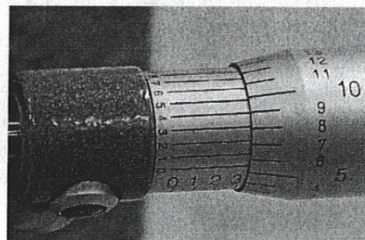
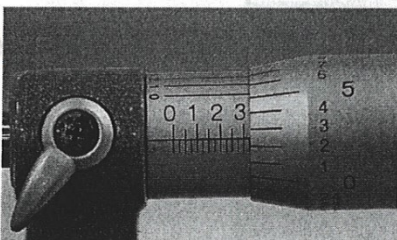
4.00
0.003
0.002

(2) 3.195



3.00
0.100
0.095
+4

3. Write the reading of the following Vernier micrometer. (10%)



0.3
0.025
0.002
0.3274

4. (a) When should you change the spindle speed or feed speed? (b) What must be done about wrenches and other hand tools before you turn on the power of any machine? (10%)

Wrenches should be placed in area that is safe away from any machine construction due to safety change spindle speed based on piece that is cut in machine

+5

5. Write the minor diameters and thread sizes of the following bolts: (16%)

Item	Major OD (in)	Minor OD (in)	Measured length of Bolt (in)	No. of threads within measured bolt length	Thread Size of the Bolt
1	0.1380	0.1075	0.50	20	4-20
2	0.7500	0.6175	1.50	24	3/8-24

6. List two methods for fixing the work part on a lathe. Also, specify how to hold work part in each method. (12%)

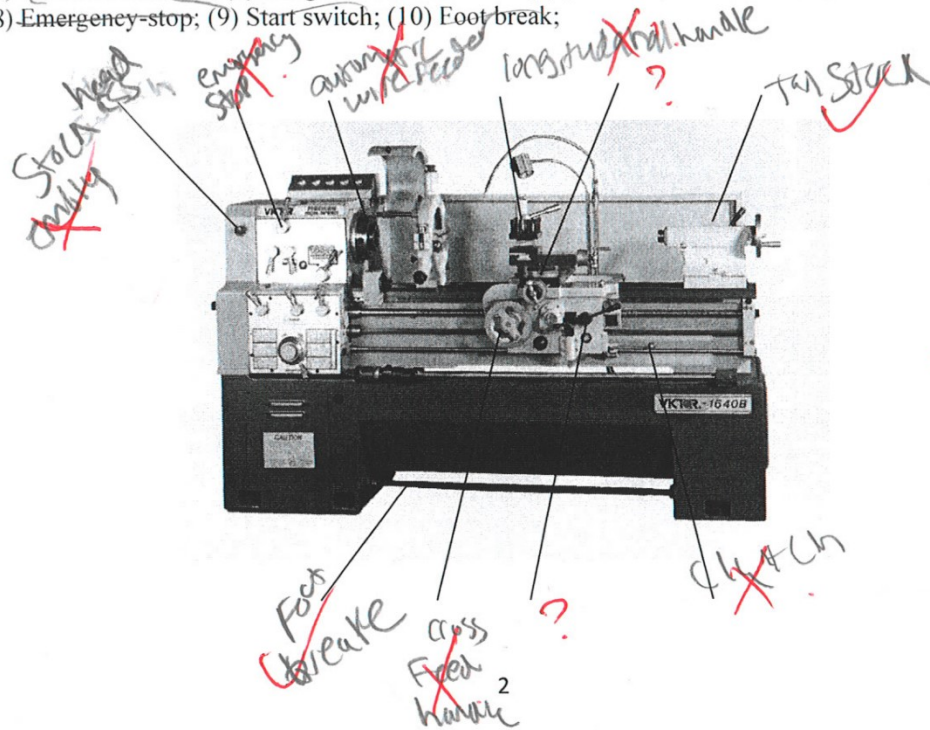
Work part can be placed near the piece of lathe with clamps
ans. cutting edge of carbide tool

7. Write the procedures for using a lathe to reduce the diameter of a shaft from 0.75 inch to 0.5 inch. (12%)

load bar stock into lathe, get carbide tool ready to align carbide tool below center stock align cutting edge of carbide tool with jaws measure diameters

8. Label the following parts using the assigned numbers on the picture of a lathe below. (20 %)

- (1) Spindle (collet chuck); (2) Tailstock; (3) Tool holder; (4) Spindle speed change handle; (5) Cross-feed handle; (6) Longitudinal feed handle; (7) Automatic feed handle; (8) Emergency-stop; (9) Start switch; (10) Foot break;



**MANUFACTURING PROCESSES LABORATORY
FALL 2021**

Title of Assignment: Lab Safety Quiz

TOPICS COVERED

General lab safety

General Shop Safety Solution

MCEG 3103 Manufacturing Processes Lab

This is a **mandatory** safety examination taken after the required Safety Lecture provided with general safety shop demonstration. All students are required to pass this examination 100% before the student is allowed to attend the subject class. Students who fail the examination have the chance to re-take the test after one week with the additional study of the safety literature.

1. Why is it important to keep machine tool that you are using clean?
For safety considerations.
2. Why is it important to know where the fire extinguishers are kept and how to use them?
Use it in case of a fire.
3. Where should you place the oily rags?
To the designated place (Oily Waste Can).
4. Why should you avoid throwing things in the shop?
People may get hurt and the equipment may be damaged.
5. When should you wear safety glasses?
All the time in the shop.
6. To whom should you report an accident in the shop?
lab technician/instructor.
7. Where should you place tools when you are done using them?
Back to the proper place.
8. Why must you always use a hand file with a handle?
To protect your hands.
9. When should you clean a machine that you need to or have used?
Before and after using it.
10. When operating a machine, what should you do with sleeves, neckties, jewelry, or loose clothing?
Put away or secure them.
11. How must chips and shavings be removed from all metal working machines?
Use a brush.
12. Can chips be removed when the machine is running?
Never.
13. Who should inspect all special machine setups?
lab technician/instructor.
14. What should you do if you think your machine is not operating properly?

Stop the machine immediately and report to lab technician/instructor.

15. Why it is important to keep the floor around a machine clear of scraps, chips, etc.?

So that people will not get hurt.

16. Are you permitted to operate a machine if the lab technician or instructor is not present?

No.

17. When is the best time to take measurements on the part that you are machining?

Before and after machining (when the machine tool is off).

18. Is there any reason to ever turn on a machine in the shop just to see what it will do?

No.

19. What must be done about wrenches and other hand tools before you turn on the power of any machine?

Put away those tools in a proper place.

20. In machining operations, what is the sequence of events that one must always follow?

Safety training, demonstration, self-practice.

I have read and understood all the safety rules concerning general shop safety. I also understand the consequences of not following the safety rules.

Print Name _____ **Solu.** _____ **Lab Section No.** _____

Signature _____ **Date** _____

ABOVE AVERAGE

19.5/20

General Machine Shop Safety

MCEG 3103 Manufacturing Processes Lab

This is a **mandatory** safety examination to be taken after the required Safety Lecture provided with a general safety shop demonstration. All students are required to know the correct answers to the quiz before the student is allowed to continue with the class.

1. Why is it important to keep the machine tool that you are using clean?
so it does not cause a safety hazard
2. Why is it important to know where the fire extinguishers are kept and how to use them?
In case there is a fire, you may be able to put it out
3. Where should you place the oily rags?
dispose of them as instructed by instructor
4. Why should you avoid throwing things in the shop?
Safety hazard, and you could break the tool
5. When should you wear safety glasses?
every time you enter the lab
6. To whom should you report an accident in the shop?
lab instructor
7. Where should you place tools when you are done using them?
back where they came from
8. Why must you always use a hand file with a handle?
Safety hazard. file could slip
9. When should you clean a machine that you need to or have used?
so its clear of chips to prevent safety hazard
10. When operating a machine, what should you do with sleeves, neckties, jewelry, or loose clothing?
~~Secure them~~
Secure them
11. How must chips and shavings be removed from all metal working machines?
using a broom and dust Pan
12. Can chips be removed when the machine is running?
no

13. Who should inspect all special machine setups?

The lab instructor

14. What should you do if you think your machine is not operating properly?

Shut it off and tell the instructor or technician

15. Why it is important to keep the floor around a machine clear of scraps, chips, etc.?

Safety, chips and scraps may cut skin

16. Are you permitted to operate a machine if the lab technician or instructor is not present?

Yes, as long as ~~the~~ you are approved to do so, and the Tech checks in everyday. Also you need a buddy

17. When is the best time to take measurements on the part that you are machining?

Before ~~and~~ machining has started, and after machining has ended

18. Is there any reason to ever turn on a machine in the shop just to see what it will do?

NO

19. What must be done about wrenches and other hand tools before you turn on the power of any machine?

They must be clear of the machine

20. For machining operations, what is the sequence of events that one must always follow?

The sequence marked on the machine or given by instructor

I have read and understood all the safety rules concerning general shop safety. I also understand the consequences of not following the safety rules.

Print Name Ty Duple Lab Section No. PO2

Signature Ty Duple Date 8-26-21

AVERAGE

17/20

General Machine Shop Safety

MCEG 3103 Manufacturing Processes Lab

This is a **mandatory** safety examination to be taken after the required Safety Lecture provided with a general safety shop demonstration. All students are required to know the correct answers to the quiz before the student is allowed to continue with the class.

1. Why is it important to keep the machine tool that you are using clean?
To keep the machine tool from malfunctioning and causing injury
2. Why is it important to know where the fire extinguishers are kept and how to use them?
In case of a fire emergency occurs in lab
3. Where should you place the oily rags?
Disposed of in designated disposal bin
4. Why should you avoid throwing things in the shop?
To avoid injury and machine tool breakage.
5. When should you wear safety glasses?
Everytime when in the machine shop.
6. To whom should you report an accident in the shop?
To the lab supervisor/technician.
7. Where should you place tools when you are done using them?
Away from current work area
8. Why must you always use a hand file with a handle?
To protect hand from injury
9. When should you clean a machine that you need to or have used?
When the lab supervisor/technician instructs to do so.
10. When operating a machine, what should you do with sleeves, neckties, jewelry, or loose clothing?
Tuck them away from the operating machine.
11. How must chips and shavings be removed from all metal working machines?
Must be removed with caution and when machine is off.
12. Can chips be removed when the machine is running?
No, must be turned off.

13. Who should inspect all special machine setups?

Lab Supervisor / Technician

14. What should you do if you think your machine is not operating properly?

Notify Lab Supervisor / Technician

15. Why it is important to keep the floor around a machine clear of scraps, chips, etc.?

To avoid injury and accidents

16. Are you permitted to operate a machine if the lab technician or instructor is not present?

NO, Lab Supervisor / Technician must be present

17. When is the best time to take measurements on the part that you are machining?

When the machine is turned off.

18. Is there any reason to ever turn on a machine in the shop just to see what it will do?

No, it is dangerous

19. What must be done about wrenches and other hand tools before you turn on the power of any machine?

Must be put away before operating machine

20. For machining operations, what is the sequence of events that one must always follow?

Operate on Lab Supervisor / Technician's command, make sure all safety procedures are met, operate machine, turn off machine when done, clean up work station

I have read and understood all the safety rules concerning general shop safety. I also understand the consequences of not following the safety rules.

Print Name Oscar Perez Lab Section No. P02

Signature Oscar Perez Date 08-26-2021

BELOW AVERAGE

15/20

General Machine Shop Safety

MCEG 3103 Manufacturing Processes Lab

This is a **mandatory** safety examination to be taken after the required Safety Lecture provided with a general safety shop demonstration. All students are required to know the correct answers to the quiz before the student is allowed to continue with the class.

1. Why is it important to keep the machine tool that you are using clean?
For safety, mess and items can cause cluttering
2. Why is it important to know where the fire extinguishers are kept and how to use them?
In case of a fire, and to prevent fire from spreading, must act quickly
3. Where should you place the oily rags?
Follow prescribed instructions
4. Why should you avoid throwing things in the shop?
It is not safe, could cause damage to something or someone
5. When should you wear safety glasses?
At all times in the lab
6. To whom should you report an accident in the shop?
Lab Technician/Instructor
7. Where should you place tools when you are done using them?
Must be properly cleaned and stored
8. Why must you always use a hand file with a handle?
It is the safest way to use the hand file
9. When should you clean a machine that you need to or have used?
Before and after you use it or according to prescribed instructions
10. When operating a machine, what should you do with sleeves, neckties, jewelry, or loose clothing?
Must be secured
11. How must chips and shavings be removed from all metal working machines?
according to prescribed instructions
12. Can chips be removed when the machine is running?
No

13. Who should inspect all special machine setups?

Lab Technician

14. What should you do if you think your machine is not operating properly?

Stop and wait for assistance

15. Why it is important to keep the floor around a machine clear of scraps, chips, etc.?

For safety purposes, they can interfere with machinery and other lab supplies

16. Are you permitted to operate a machine if the lab technician or instructor is not present?

No

17. When is the best time to take measurements on the part that you are machining?

Before you begin to use it

18. Is there any reason to ever turn on a machine in the shop just to see what it will do?

No

19. What must be done about wrenches and other hand tools before you turn on the power of any machine?

They must be properly secured

20. For machining operations, what is the sequence of events that one must always follow?

Laboratory Use Policy

I have read and understood all the safety rules concerning general shop safety. I also understand the consequences of not following the safety rules.

Print Name Tyler Valentine Lab Section No. P02

Signature [Signature] Date 8/26/2021

MANUFACTURING PROCESSES LAB
Fall 2021

Title of Assignment: Quiz 1

TOPICS COVERED

- 1. Caliper reading**
- 2. Micrometer reading**

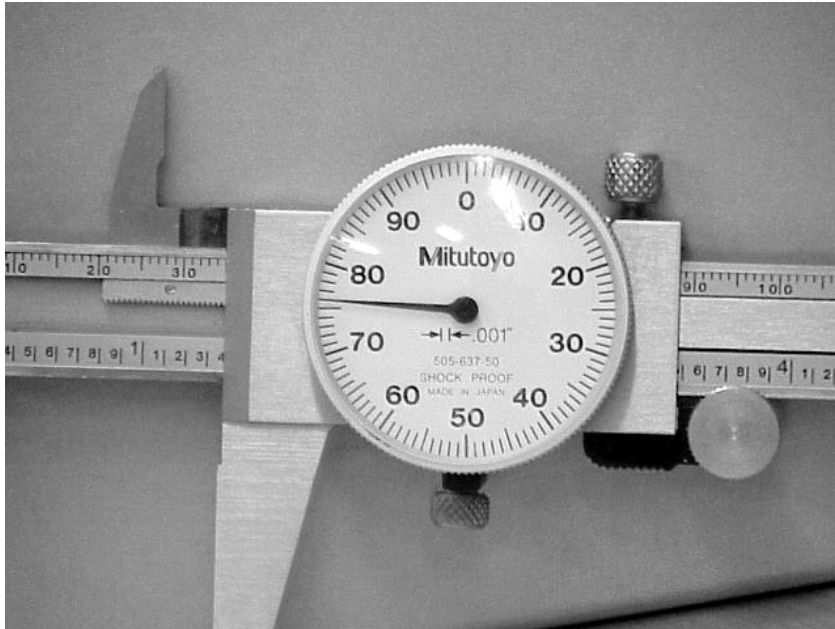
Quiz 1: Reading Measuring Tools

Student Name: _____ Solu. _____ Section Number: _____ P02 _____

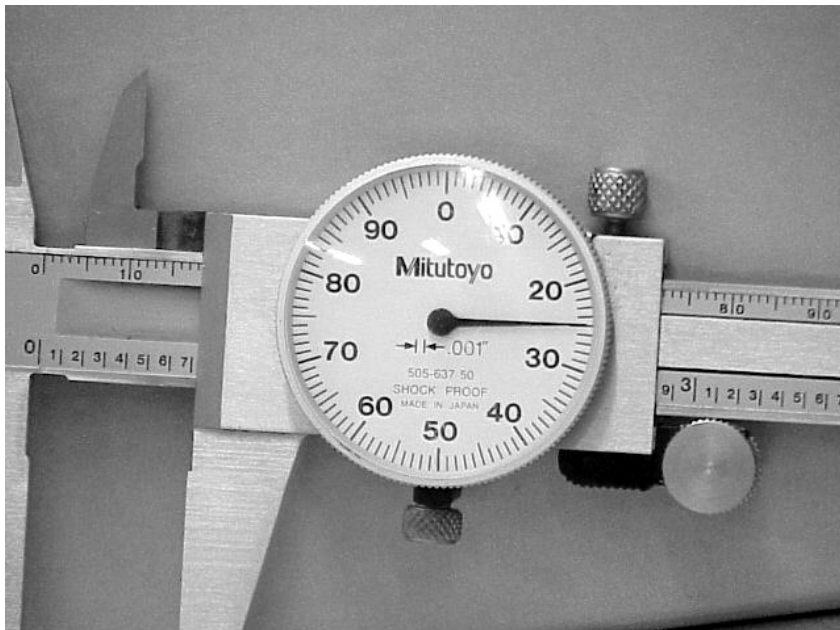
Read each of the following measurements to the closest discrimination possible (22 pts)

Dial Caliper:

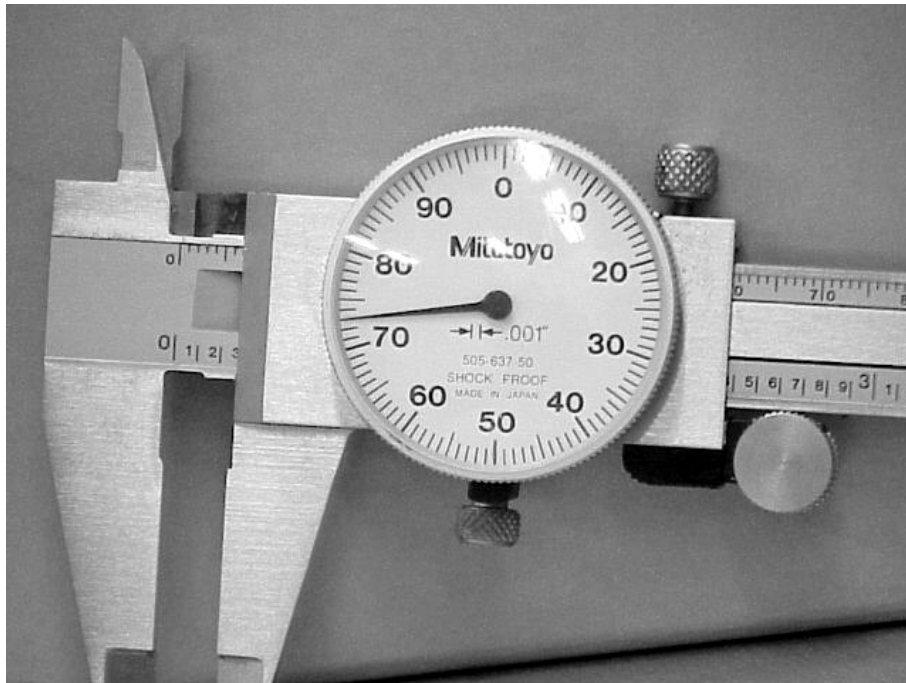
1. _____ 1.376 _____



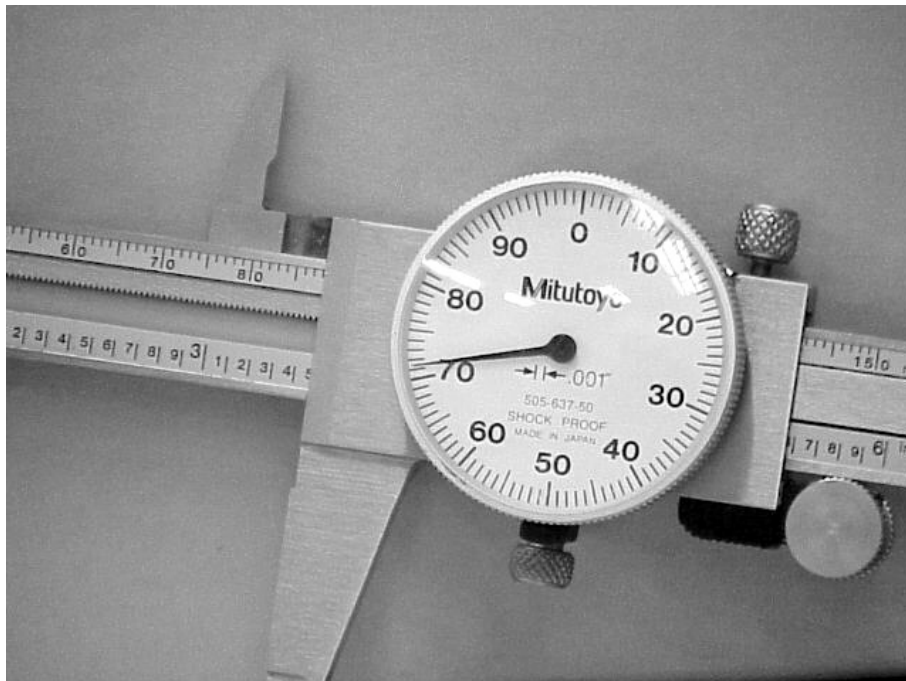
2. _____ 0.725 _____



3. _____ 0.273 _____



4. _____ 3.471 or 3.472 _____



Micrometer:

1. _____ 0.201 _____



2. _____ 0.255 _____



3. 0.357

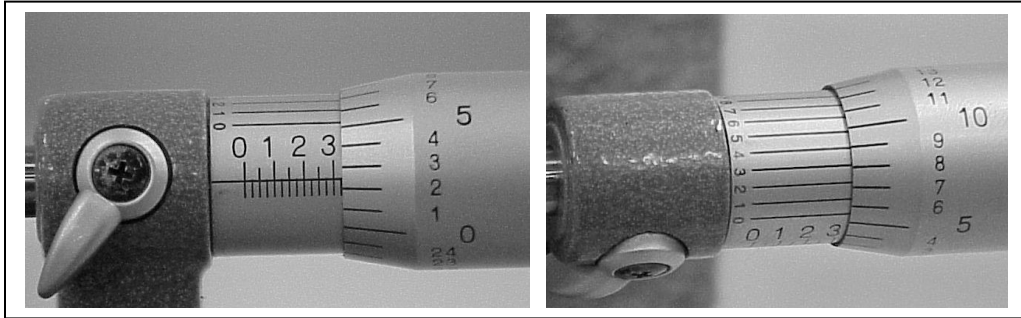


4. 0.512

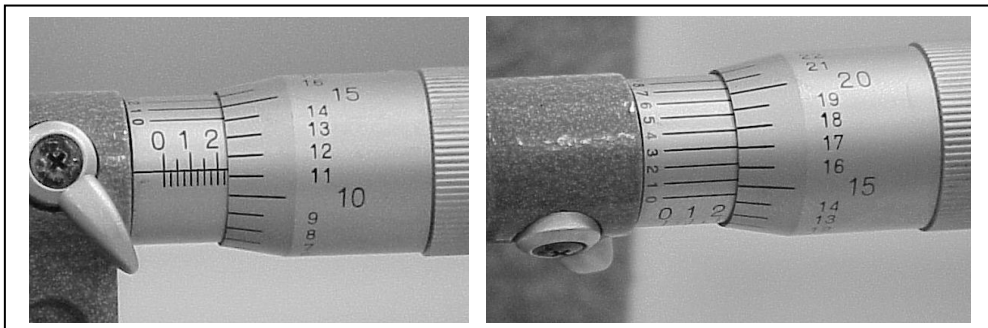


Vernier Micrometer:

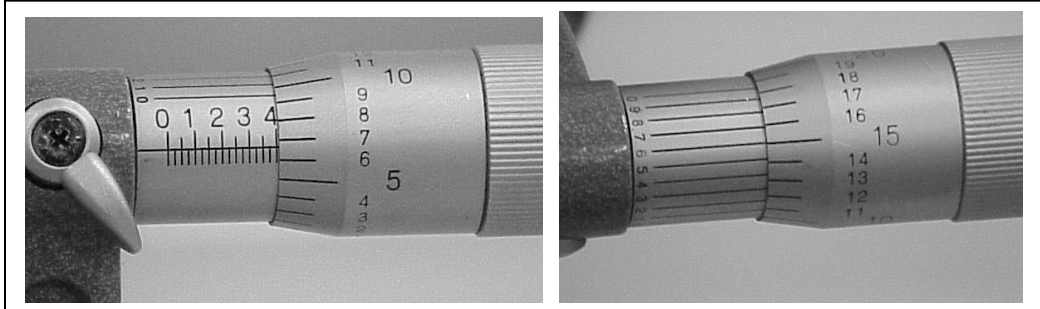
1. 0.3274



2. 0.2363



3. 0.4066



ABOVE AVERAGE

22/22

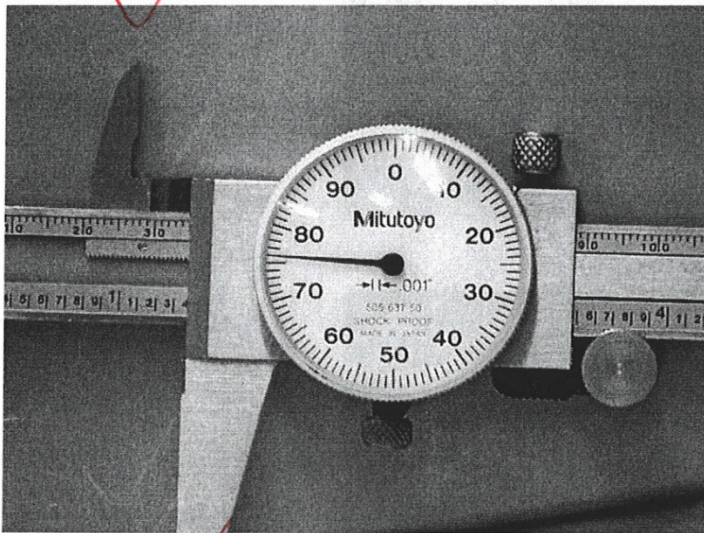
Quiz 1: Reading Measuring Tools

Student Name: Jade A. Coleman Section Number: P02

Read each of the following measurements to the closest discrimination possible (22 pts)

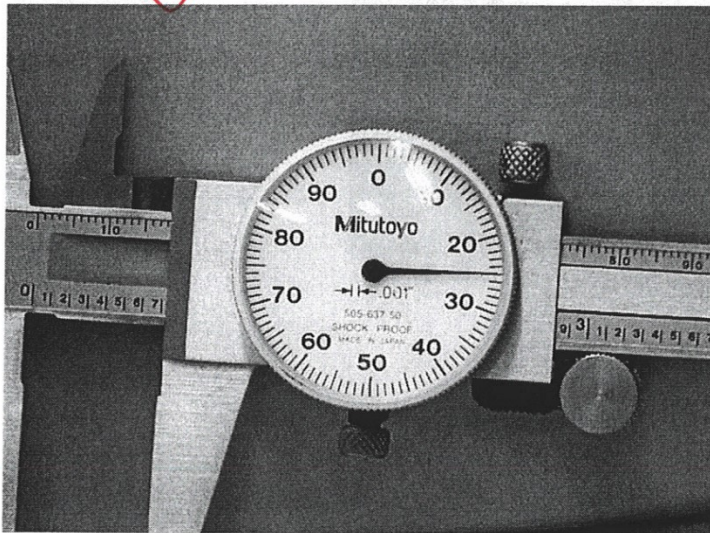
Dial Caliper:

1. 1.376"



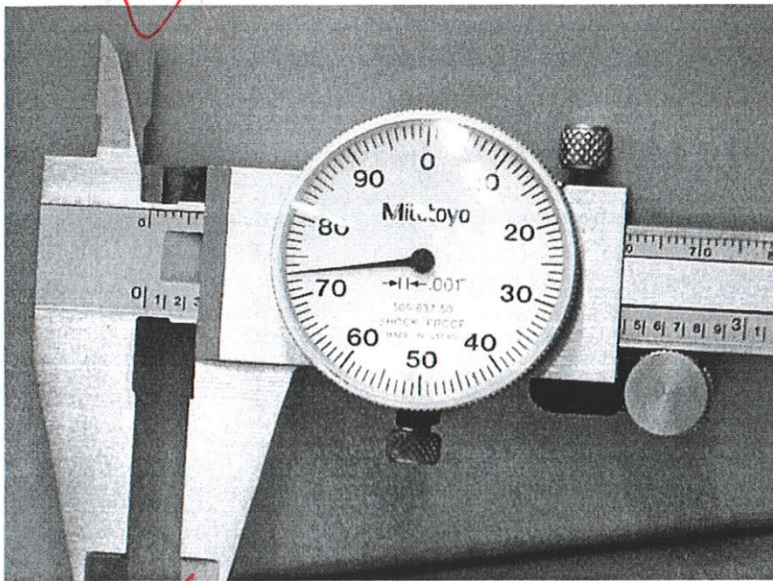
$$\begin{array}{r} 1.000'' \\ 0.300'' \\ + 0.076'' \\ \hline 1.376'' \end{array}$$

2. 0.725"



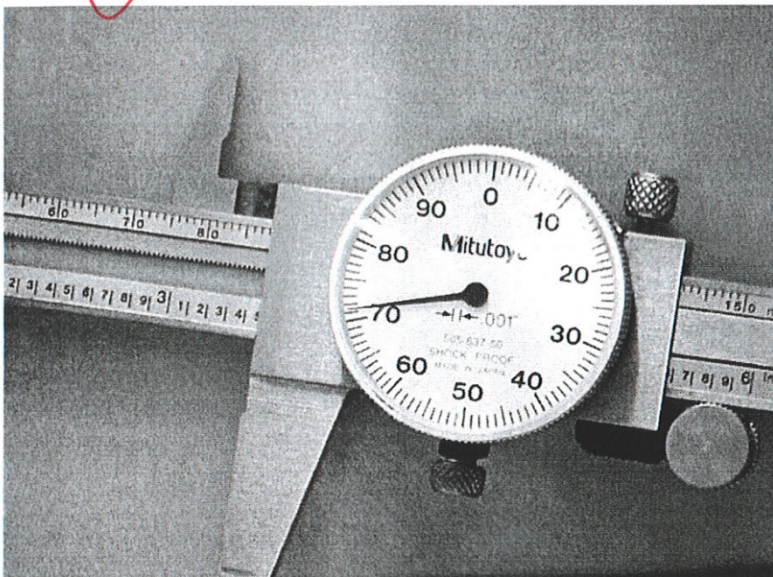
$$\begin{array}{r} 0.000'' \\ 0.700'' \\ + 0.025'' \\ \hline 0.725'' \end{array}$$

3. 0.273"



$$\begin{array}{r} 0.000'' \\ 0.200'' \\ + 0.073'' \\ \hline 0.273'' \end{array}$$

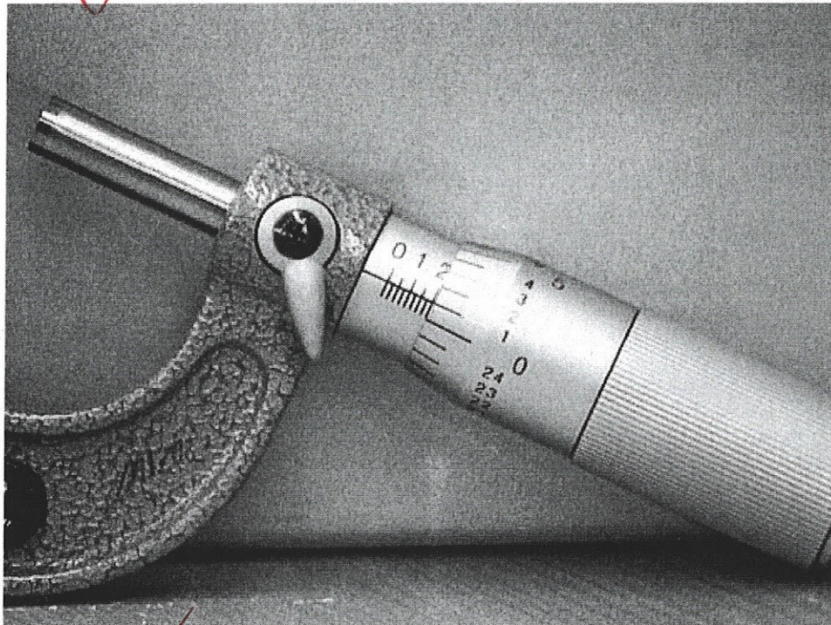
4. 3.471"



$$\begin{array}{r} 3.000'' \\ 0.400'' \\ + 0.071'' \\ \hline 3.471'' \end{array}$$

Micrometer:

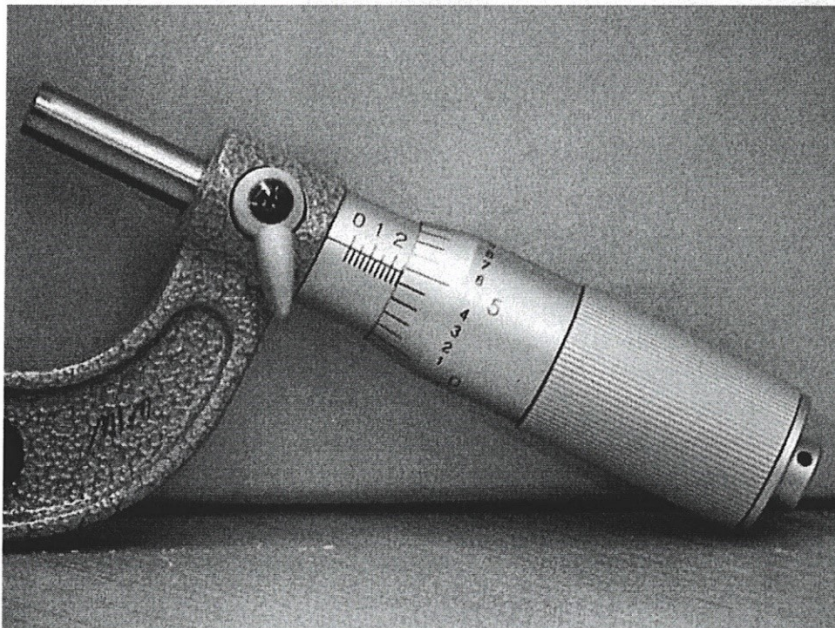
1. 0.201"



$$\begin{array}{r} 0.200 \\ 0.025 \times 0 \\ + 0.001 \\ \hline \end{array}$$

$$\begin{array}{r} 0.200 \\ + 0.001 \\ \hline 0.201" \end{array}$$

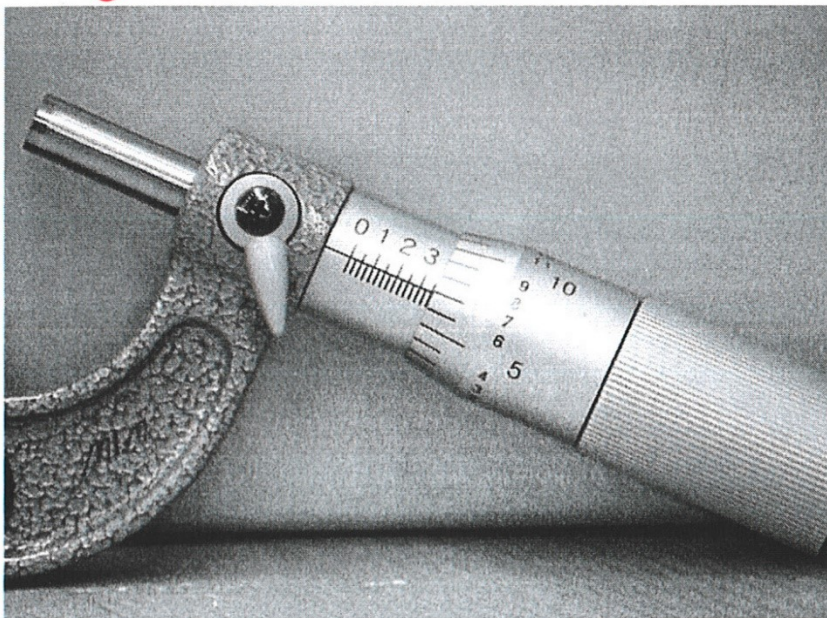
2. 0.255"



$$\begin{array}{r} 0.200 \\ 0.025 \times 2 \\ 0.005 \end{array}$$

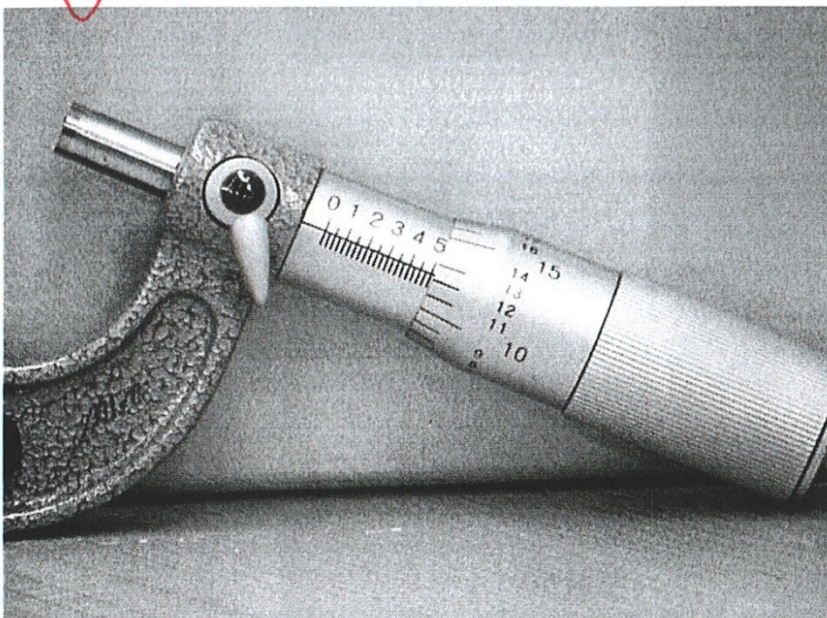
$$\begin{array}{r} = 0.200 \\ 0.050 \\ + 0.005 \\ \hline 0.255 \end{array}$$

3. 0.357"



$$\begin{array}{r} 0.300 \\ 0.025 \times 2 \\ 0.007 \\ \hline = 0.300 \\ 0.050 \\ + 0.007 \\ \hline 0.357 \end{array}$$

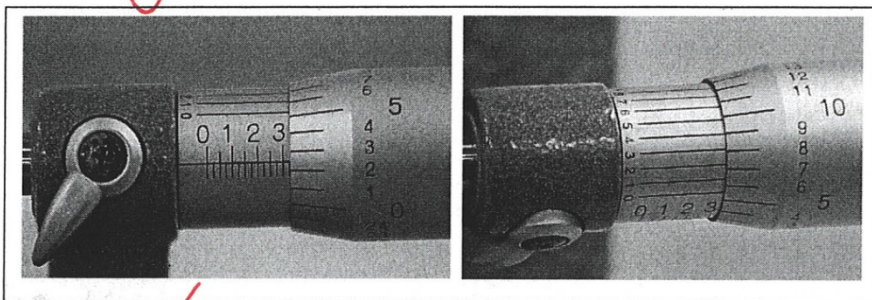
4. 0.512"



$$\begin{array}{r} 0.500 \\ 0.025 \times 3 \\ 0.012 \\ \hline 0.512 \end{array}$$

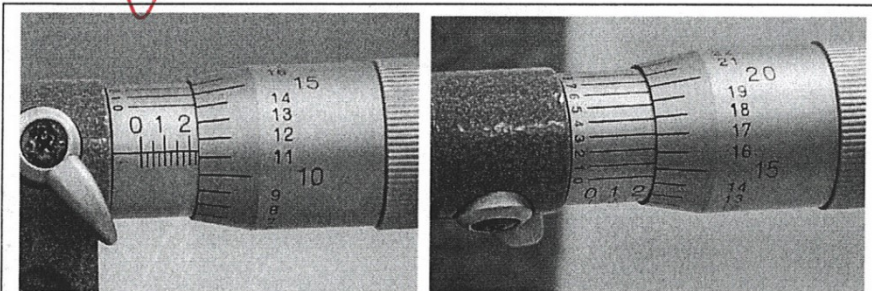
Vernier Micrometer:

1. 0.3274"



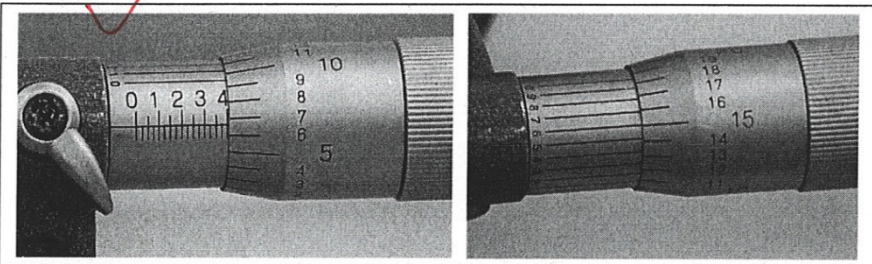
$$\begin{array}{r}
 0.3 \\
 0.025 \times 1 \\
 0.002 \\
 + 0.0004 \\
 \hline
 = 0.3000 \\
 0.0250 \\
 0.0020 \\
 + 0.0004 \\
 \hline
 = 0.3274
 \end{array}$$

2. 0.2363"



$$\begin{array}{r}
 0.2 \\
 0.025 \times 1 \\
 0.011 \\
 0.0003 \\
 \hline
 0.2000 \\
 0.0250 \\
 0.0110 \\
 + 0.0003 \\
 \hline
 0.2363
 \end{array}$$

3. 0.4066"



$$\begin{array}{r}
 0.4 \\
 0.025 \times 0 \\
 0.006 \\
 0.0006 \\
 \hline
 = 0.4000 \\
 0.0060 \\
 + 0.0006 \\
 \hline
 = 0.4066
 \end{array}$$

AVERAGE

18/22

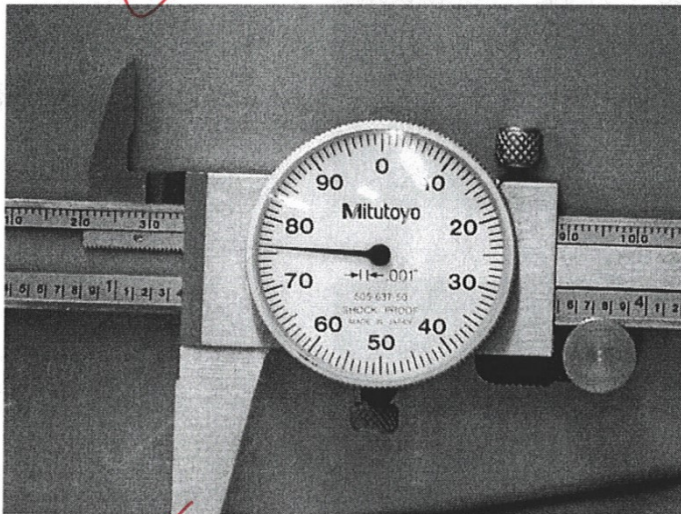
Quiz 1: Reading Measuring Tools

Student Name: Chinonso Okezie Section Number: P02

Read each of the following measurements to the closest discrimination possible (22 pts)

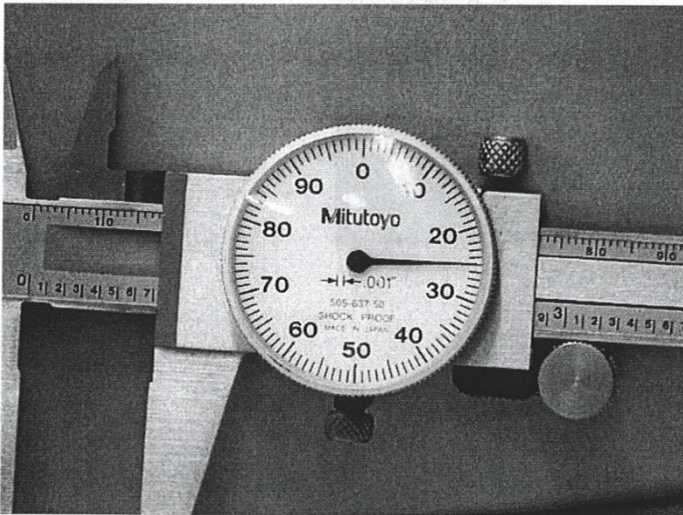
Dial Caliper:

1. 1.376"



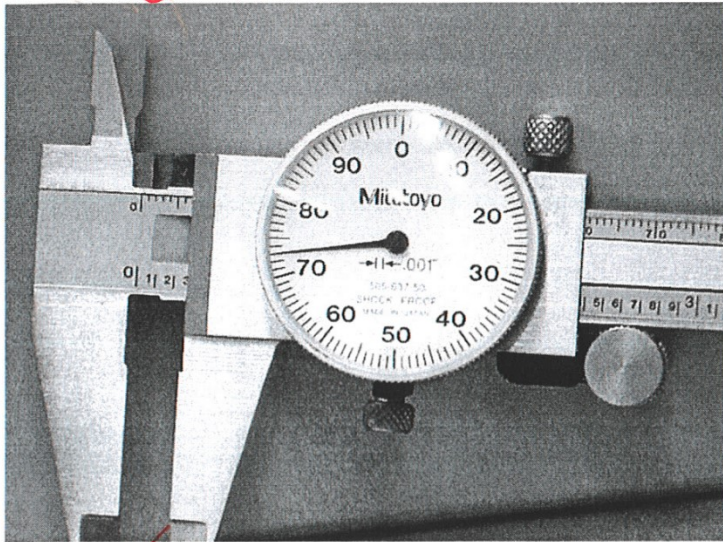
$$\begin{array}{r} 1.000 \\ 0.300 \\ + 0.076 \\ \hline 1.376 \end{array}$$

2. 0.725"



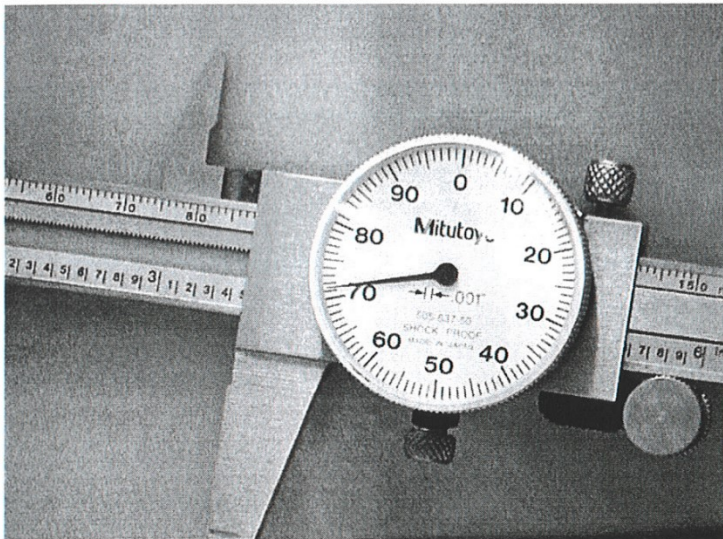
$$\begin{array}{r} 0.000 \\ 0.700 \\ + 0.025 \\ \hline 0.725 \end{array}$$

3. 0.273"



$$\begin{array}{r} 0.000 \\ 0.200 \\ + 0.073 \\ \hline 0.273 \end{array}$$

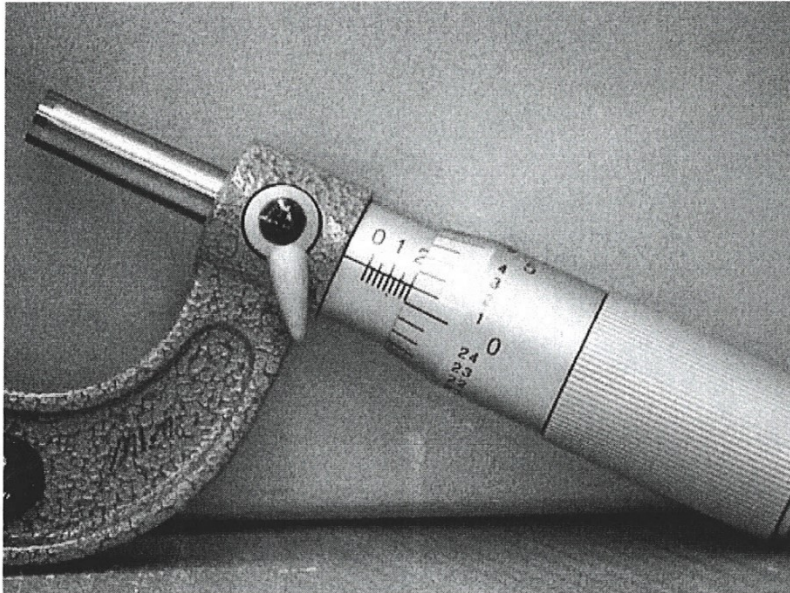
4. 3.471"



$$\begin{array}{r} 3.000 \\ 0.400 \\ + 0.071 \\ \hline 3.471 \end{array}$$

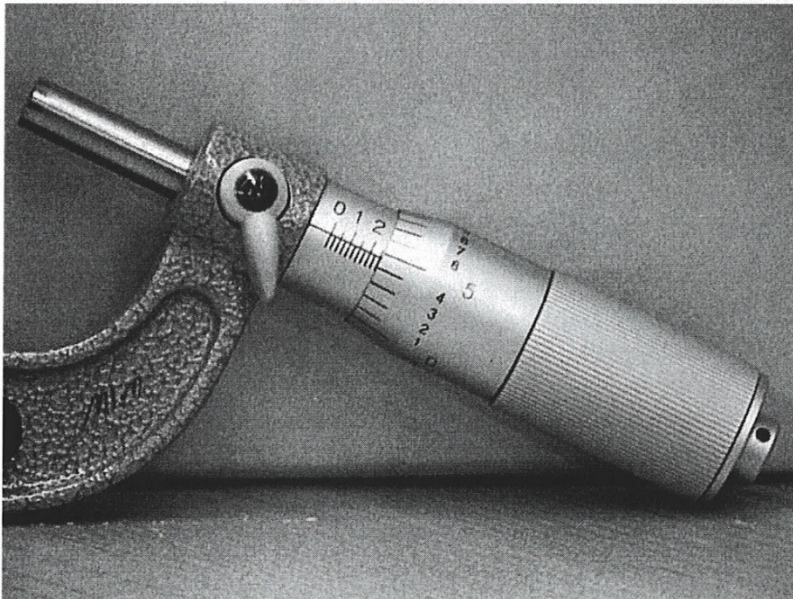
Micrometer:

1. 0.201"



$$0.200 + 0.000 + 0.001$$

2. 0.255"



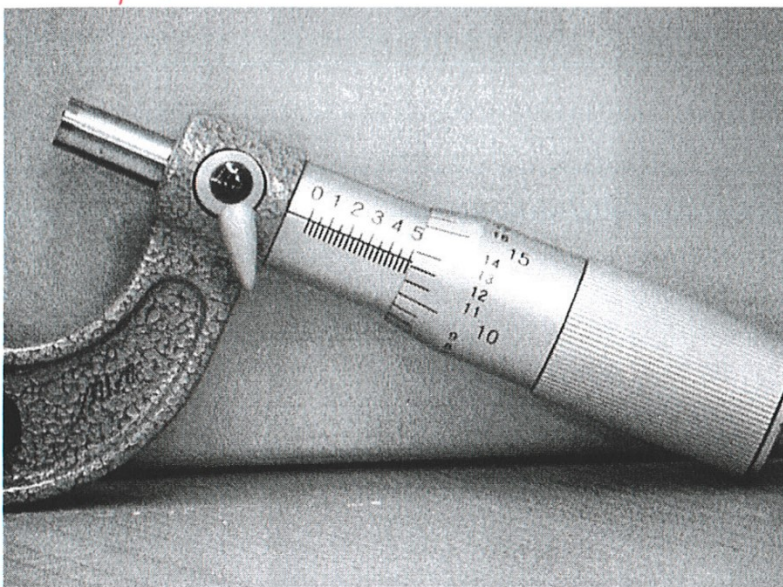
$$0.200 + 0.050 + 0.005$$

3. 0.357 ✓



$$0.300 + 0.050 + 0.007$$

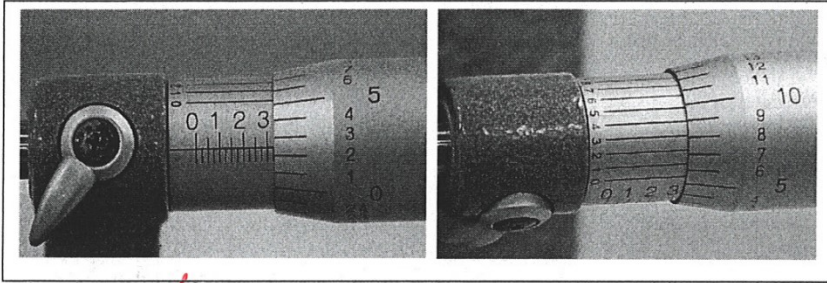
4. 0.502 ✓



$$0.500 + 0.000 + 0.002$$

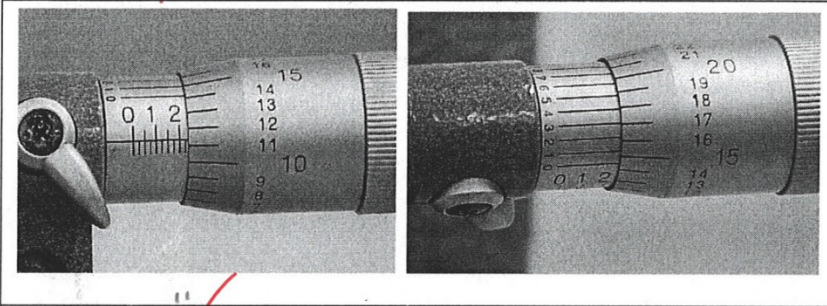
Vernier Micrometer:

1. 0.3274" ✓



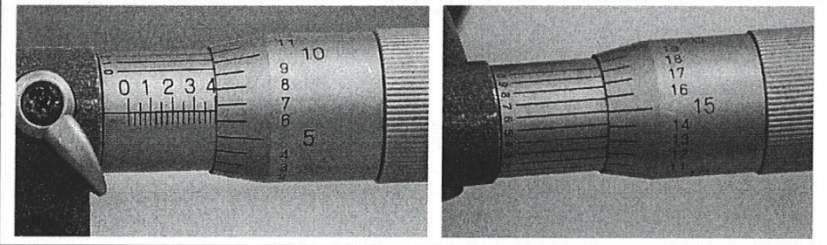
$$0.300 + 0.025 + 0.002 + 0.0004$$

2. 0.2263" ✗



$$0.200 + 0.025 + 0.001 + 0.0003$$

3. 0.4006" ✓



$$0.400 + 0.000 + 0.0006 + 0.0006$$

BELOW AVERAGE

12/22

Quiz 1: Reading Measuring Tools

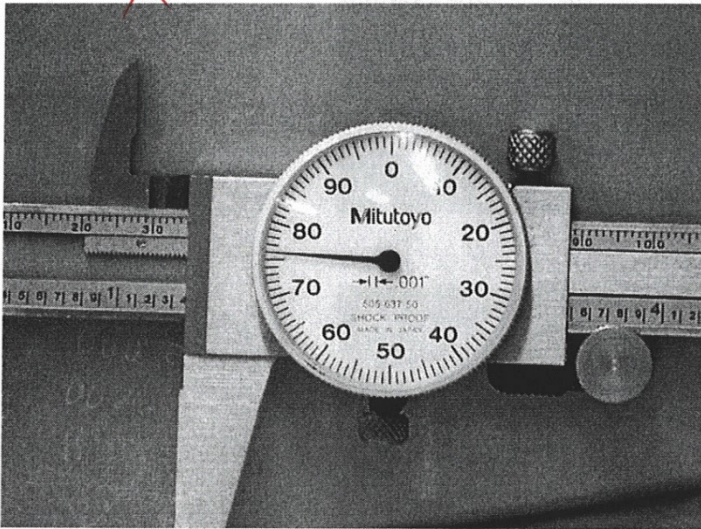
Student Name: Margie Lee

Section Number: 002

Read each of the following measurements to the closest discrimination possible (22 pts)

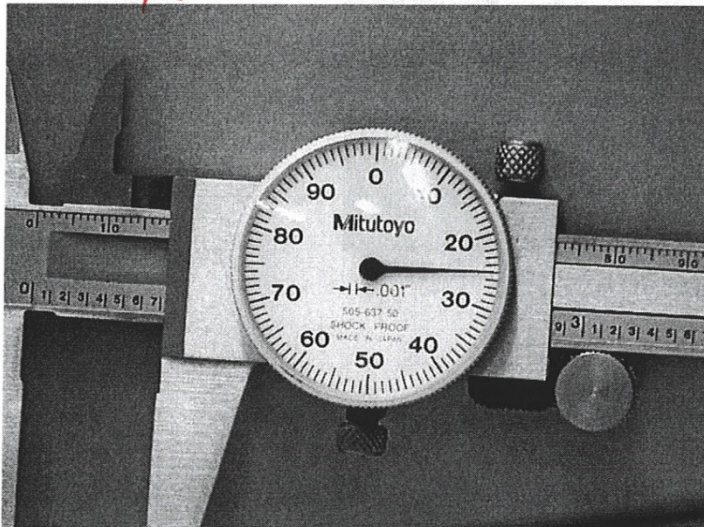
Dial Caliper:

1. 1.476



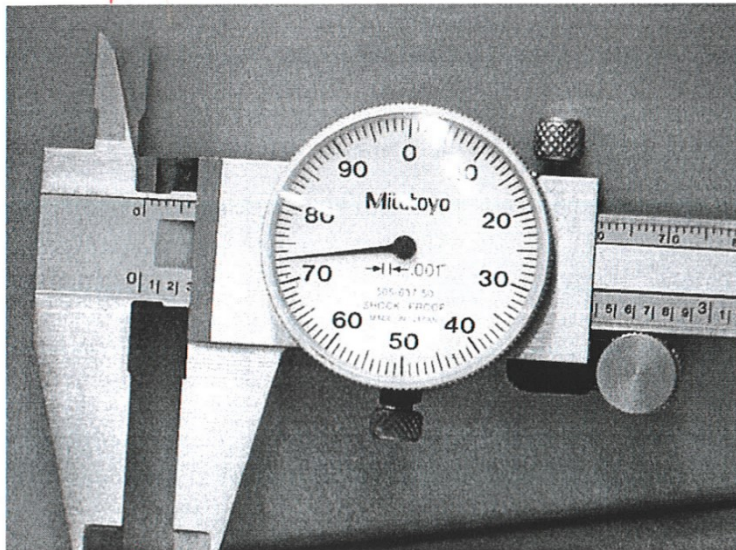
$$\begin{array}{r} 1.00 \\ + .400 \\ + .076 \\ \hline 1.476 \end{array}$$

2. .735



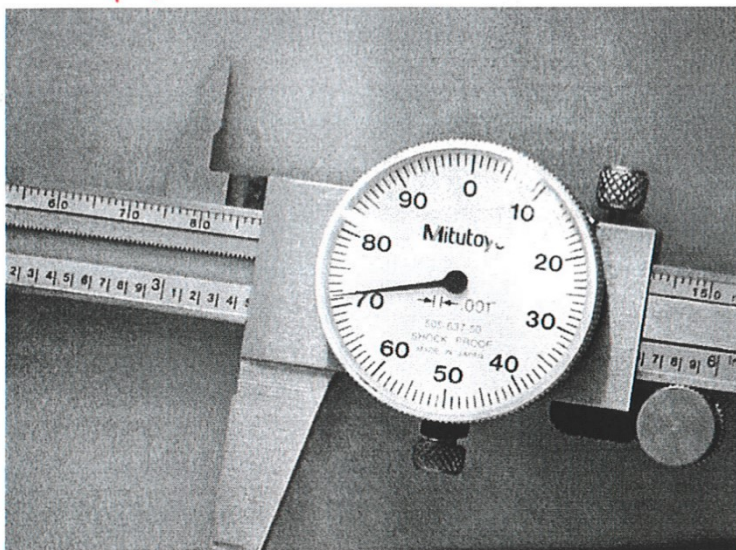
$$\begin{array}{r} 0.00 \\ + .71 \\ + .025 \\ \hline .735 \end{array}$$

3. ~~3.73~~



$$\begin{array}{r} 0.000 \\ + .300 \\ + .073 \\ \hline .373 \\ \times \end{array}$$

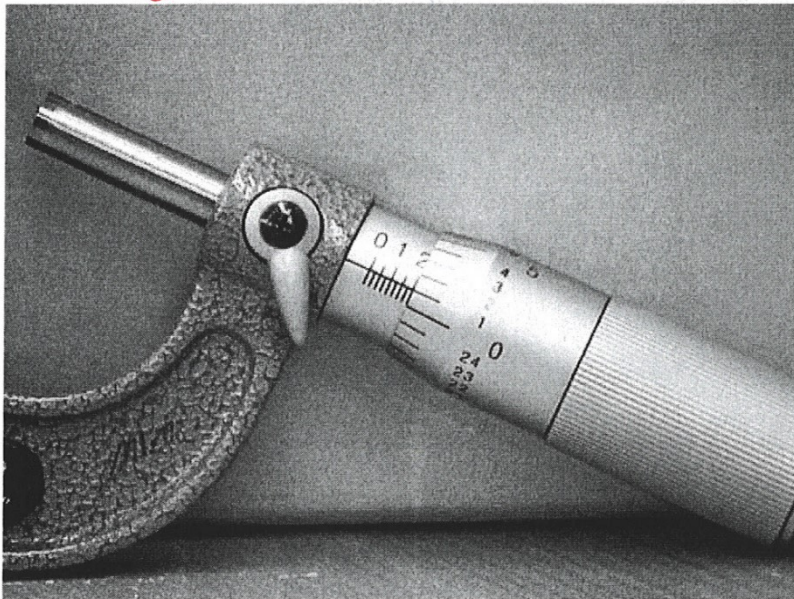
4. ~~3.571~~



$$\begin{array}{r} 3.000 \\ + .500 \\ + .071 \\ \hline 3.571 \\ \times \end{array}$$

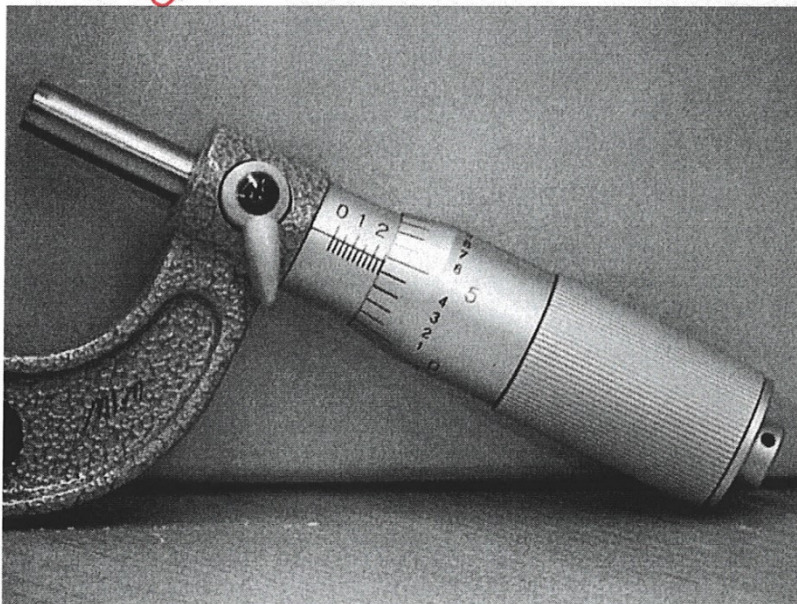
Micrometer:

1. .201



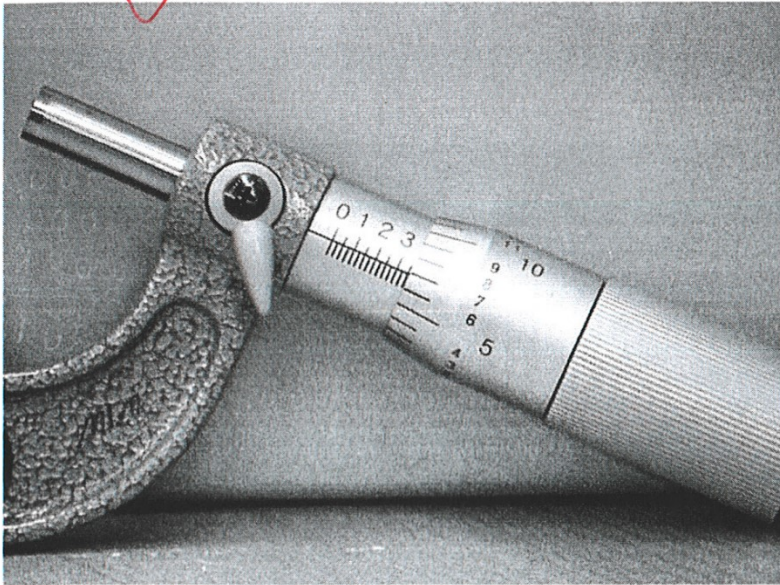
$$\begin{array}{r} .200 \\ + .000 \\ .001 \\ \hline .201 \end{array}$$

2. .255



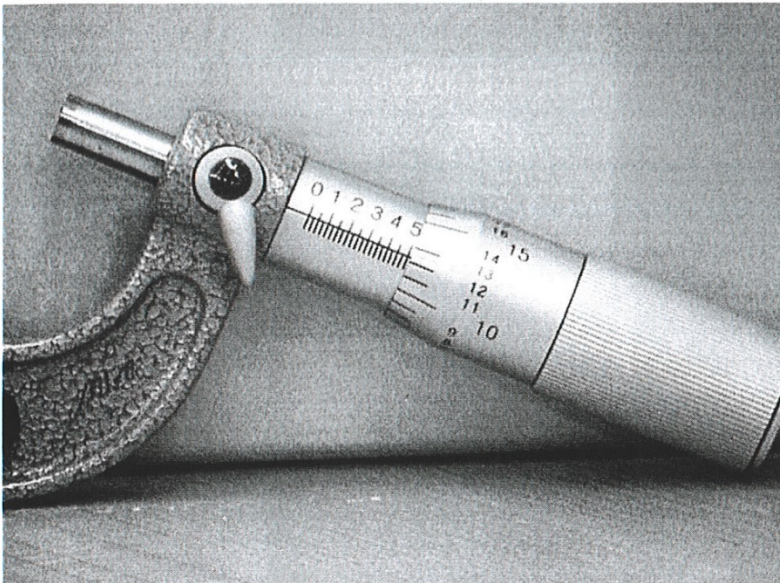
$$\begin{array}{r} .200 \\ + .050 \\ .005 \\ \hline .255 \end{array}$$

3. .357



$$\begin{array}{r} .300 \\ + .050 \\ + .007 \\ \hline .357 \end{array}$$

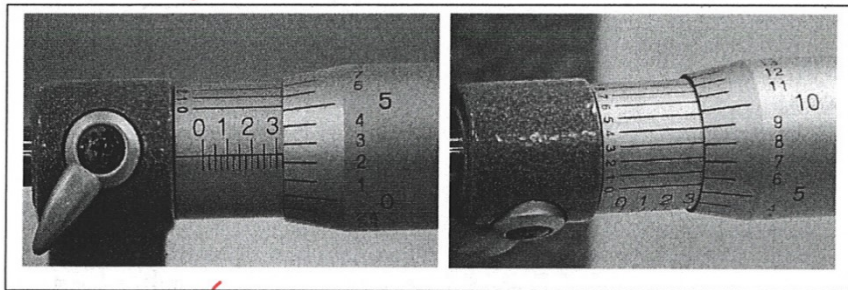
4. .512



$$\begin{array}{r} .500 \\ + .000 \\ + .012 \\ \hline .512 \end{array}$$

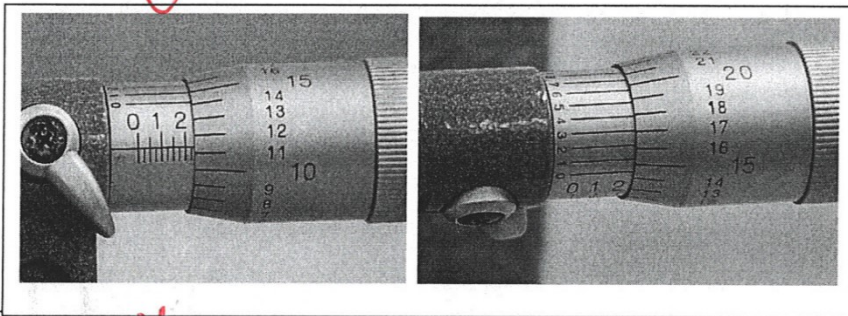
Vernier Micrometer:

1. .3274



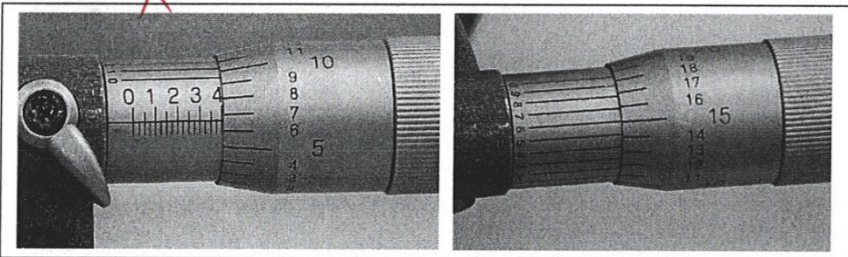
$$\begin{array}{r} .300 \\ + .025 \\ + .002 \\ \hline .3274 \end{array}$$

2. .2363



$$\begin{array}{r} .200 \\ + .025 \\ + .011 \\ \hline .236 \end{array}$$

3. .4674



$$\begin{array}{r} .400 \\ + .000 \\ + .007 \\ \hline .4076 \end{array}$$

**MANUFACTURING PROCESSES LABORATORY
FALL 2021**

Title of Assignment: Quiz 2

TOPICS COVERED

- 1. Lathe structure**
- 2. Lathe safety**

Quiz 2: Lathe Safety and Structure

Print Name _____ Solu. _____ Lab Section _____ P02 _____

1. Can two students operate a lathe at the same time?

No.

2. Can you wear jewelry, a watch, earrings, wrist rings, necklaces, or hoodies when operating a lathe?

No.

3. When cleaning the lathe, can you use compressed air to assure that all sharp chips are cleaned away from the machine?

No.

4. If you feel something is wrong during the operations, such as sudden loud noise and big shaft vibration, what should you do?

Stop the machine and inform the lab technician/instructor.

5. The most common reason(s) of hand injuries is (are) ____ C, D ____.

- A. Not knowing what may happen when the lathe is turned on.
- B. The lathe is rotating at a speed that is too low.
- C. Hands contacting sharp tools or workpieces.
- D. Cleaning the cut chips using bare hands.

6. Before turning on the lathe, what should you check first?

Whether there are any hand tools on the lathe, and whether the workpart and cutting tool are tightly fixed.

7. Are you allowed to take measurement when the spindle of the lathe is spinning?

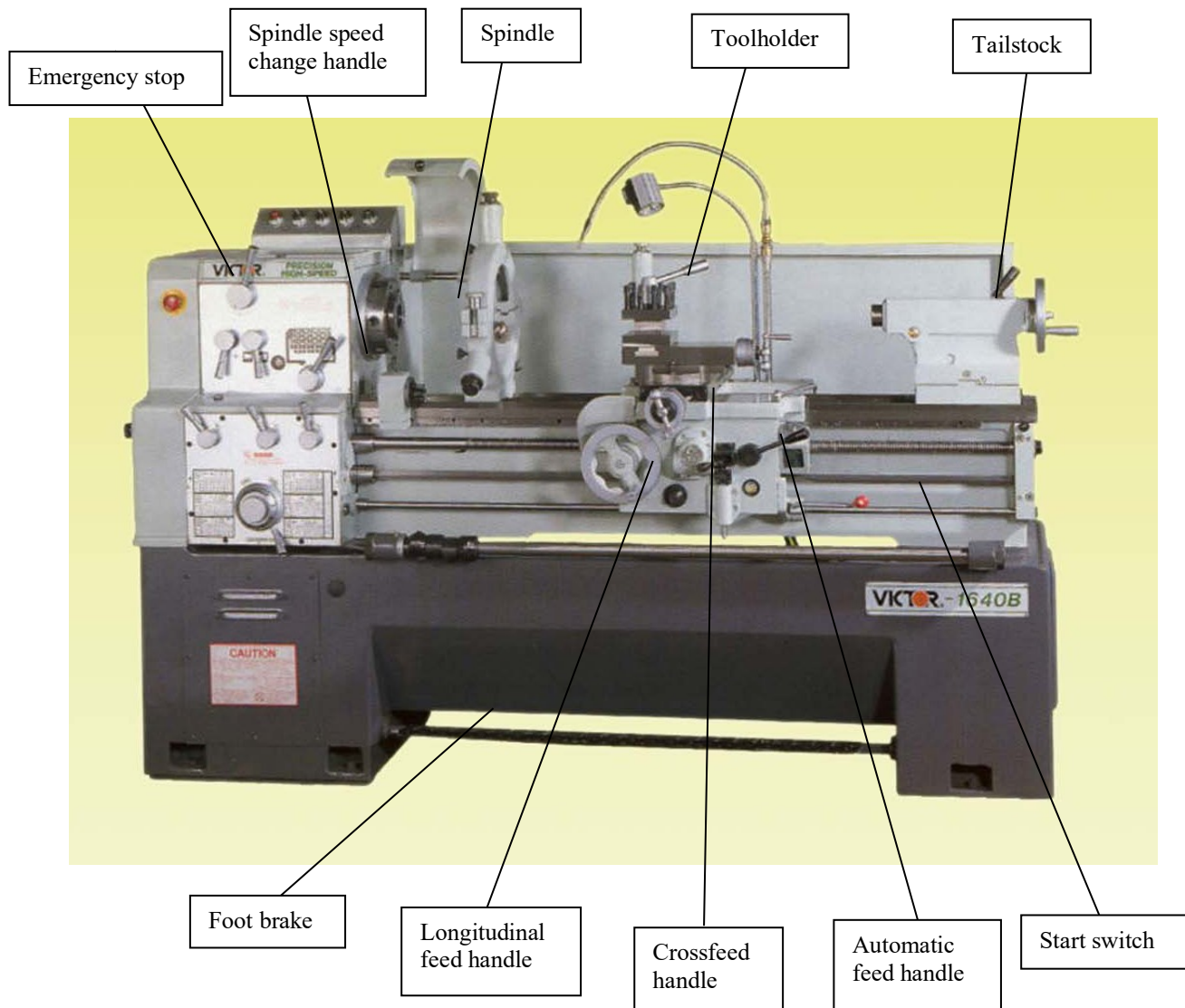
No.

8. When can you change the spindle speed or feed speed?

When the machine is off.

9. Label the following parts on the lathe shown below. (10 pts)

Spindle (collet chuck)
Tailstock
Toolholder
Spindle speed change handle
Crossfeed handle
Longitudinal feed handle
Automatic feed handle
Emergency-stop
Start switch
Foot brake



ABOVE AVERAGE

25/26

Quiz 2: Lathe Safety and Structure

Print Name Devan Mitchell

Lab Section P02

1. Can two students operate a lathe at the same time?

No, only one person

+2

2. Can you wear jewelry, a watch, earrings, wrist rings, necklaces, or hoodies when operating a lathe?

No

+2

3. When cleaning the lathe, can you use compressed air to assure that all sharp chips are cleaned away from the machine?

No, cause fly chips may injure someone

+2

4. If you feel something is wrong during the operations, such as sudden loud noise and big shaft vibration, what should you do?

Turn it off and inform the instructor

+2

5. The most common reason(s) of hand injuries is (are) _____.

- ☒ A. Not knowing what may happen when the lathe is turned on.
☐ B. The lathe is rotating at a speed that is too low.
☒ C. Hands contacting sharp tools or workpieces.
☒ D. Cleaning the cut chips using bare hands.

+1

6. Before turning on the lathe, what should you check first?

make sure it is clean and there isn't chips in the machine

+2

7. Are you allowed to take measurement when the spindle of the lathe is spinning?

No, must stop the machine

+2

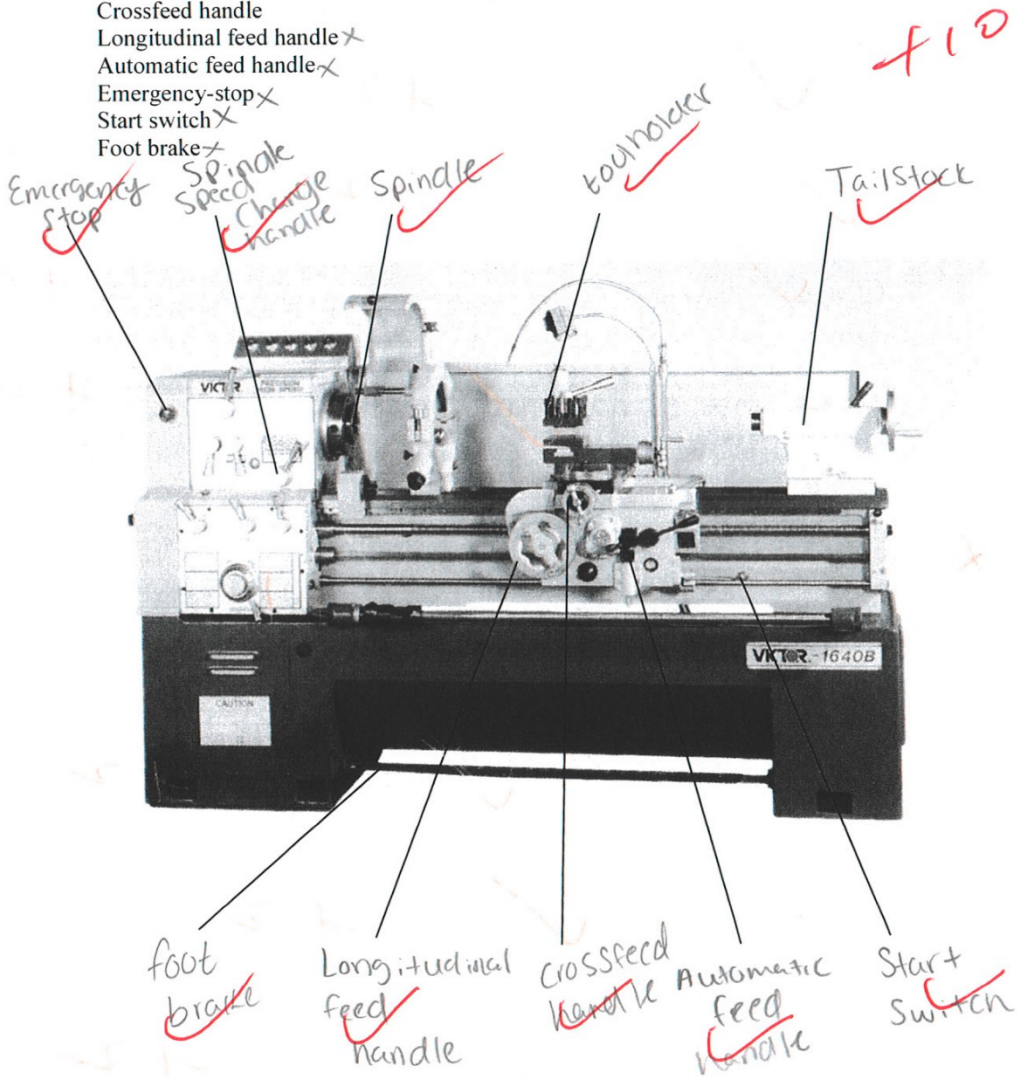
8. When can you change the spindle speed or feed speed?

When the machine is off, since you would need to consult the speed and feed table with instructor to see which one is best

+2

9. Label the following parts on the lathe shown below. (10 pts)

- Spindle (collet chuck) X
- Tailstock X
- Toolholder X
- Spindle speed change handle X
- Crossfeed handle
- Longitudinal feed handle X
- Automatic feed handle X
- Emergency-stop X
- Start switch X
- Foot brake X



AVERAGE

22/26

Quiz 2: Lathe Safety and Structure

Print Name Amya Facion

Lab Section MCIG 3103-P02

1. Can two students operate a lathe at the same time?

No, only one at a time may operate the lathe +2

2. Can you wear jewelry, a watch, earrings, wrist rings, necklaces, or hoodies when operating a lathe?

No, remove all items +2

3. When cleaning the lathe, can you use compressed air to assure that all sharp chips are cleaned away from the machine?

Never, use a cleaning brush +2

4. If you feel something is wrong during the operations, such as sudden loud noise and big shaft vibration, what should you do?

Should stop the machine immediately and get your instructor +2

5. The most common reason(s) of hand injuries is (are) A, C, D +1

A. Not knowing what may happen when the lathe is turned on. ✓

B. The lathe is rotating at a speed that is too low.

C. Hands contacting sharp tools or workpieces. ✓

D. Cleaning the cut chips using bare hands. ✓

6. Before turning on the lathe, what should you check first?

Check the chuck or faceplate by hand. To ensure there is no binding or danger of the work striking the lathe +1

7. Are you allowed to take measurement when the spindle of the lathe is spinning?

Never, stop the machine before taking any measurements +2

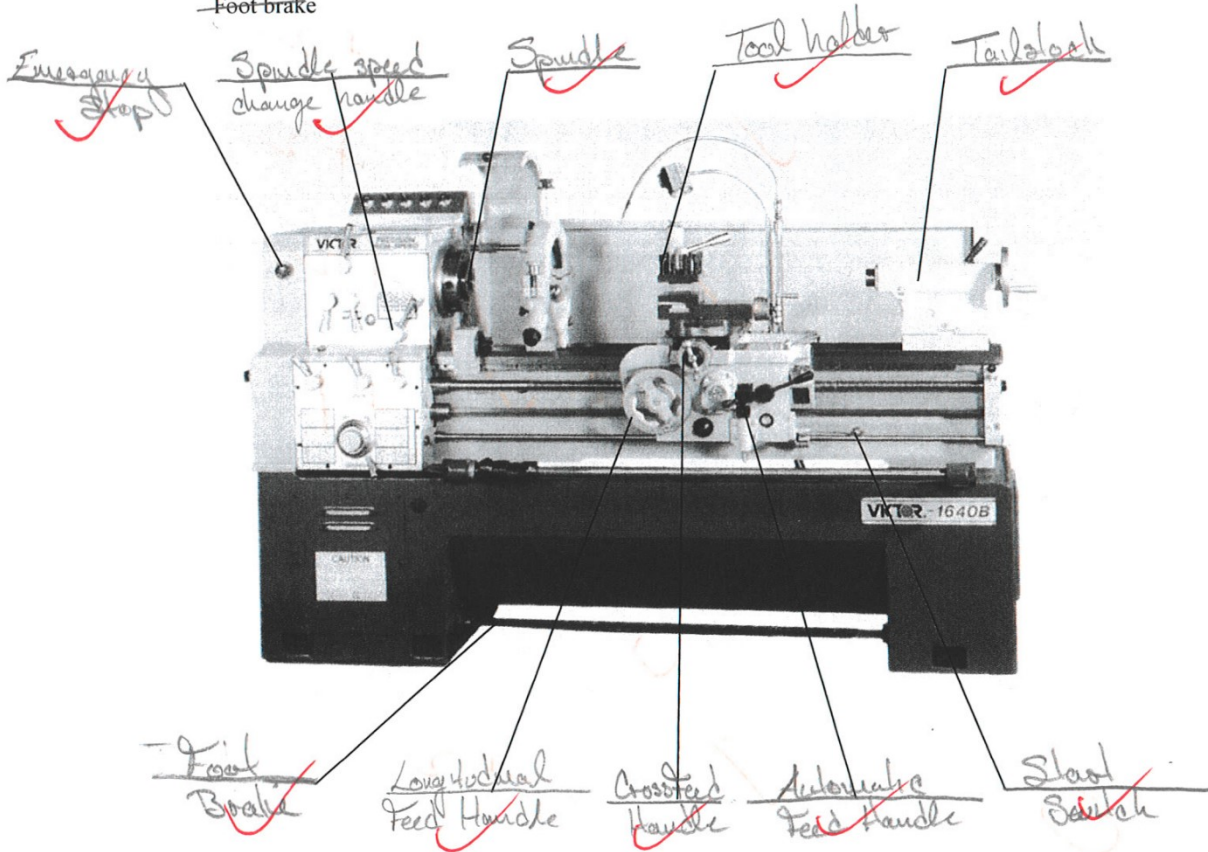
8. When can you change the spindle speed or feed speed?

You should consult the spindle and feed speed before starting the machine to determine the best speed X.

9. Label the following parts on the lathe shown below. (10 pts)

- ~~Spindle (collet chuck)~~
- ~~Tailstock~~
- ~~Toolholder~~
- ~~Spindle speed change handle~~
- ~~Crossfeed handle~~
- ~~Longitudinal feed handle~~
- ~~Automatic feed handle~~
- ~~Emergency stop~~
- ~~Start switch~~
- ~~Foot brake~~

f10



BELOW AVERAGE

16/26

Quiz 2: Lathe Safety and Structure

Print Name Chris Mene

Lab Section P02

1. Can two students operate a lathe at the same time?

NO ✓

+2

2. Can you wear jewelry, a watch, earrings, wrist rings, necklaces, or hoodies when operating a lathe?

NO ✓

+2

3. When cleaning the lathe, can you use compressed air to assure that all sharp chips are cleaned away from the machine?

NO ✓

+2

4. If you feel something is wrong during the operations, such as sudden loud noise and big shaft vibration, what should you do?

Emergency Stop ✓

+1

5. The most common reason(s) of hand injuries is (are) D, C.

- A. Not knowing what may happen when the lathe is turned on.
B. The lathe is rotating at a speed that is too low.
C. Hands contacting sharp tools or workpieces.
D. Cleaning the cut chips using bare hands.

+2

6. Before turning on the lathe, what should you check first?

turn Chuck, or faceplate by hand to be sure no binding or danger of the work striking any part of lathe.

+1

7. Are you allowed to take measurement when the spindle of the lathe is spinning?

NO ✓

+2

8. When can you change the spindle speed or feed speed?

CONST. Speed Feed table

X. ✗

- Spindle (collet chuck)
- Tailstock
- Toolholder
- Spindle speed change handle
- Crossfeed handle
- Longitudinal feed handle
- Automatic feed handle
- Emergency-stop
- Start switch
- Foot brake



MANUFACTURING PROCESSES LABORATORY
FALL 2021

Title of Assignment: Quiz 3

TOPICS COVERED

- 1. Drill bit sizes for drilling**
- 2. Milling machine structure**

Quiz 3

Student Name: Solution

Section: P02

1. Write the Major OD and select the Drill Bit Size for the following female threads. (12 pts)

Item	Female Threads	Major OD (in)	Material	Drill Bit Size (in)
1	1/4-28-UNF-2B	1/4 or 0.25	Stainless Steel	1 or 0.2280
2	7/16-14-UNC-2B	7/16 or 0.4375	Plastics	U or 0.3680

2. What is an undercut? What is the purpose of using undercuts in turning operations? (10 pts)

An undercut is a special type of recessed surface in manufacturing. In turning it refers to a recess in a diameter.

- 1) to provide clearance for the cutting tool, and also referred to as thread relief
- 2) used on shafts that have diameter changes so that a mating part can seat against the shoulder

3. Specify the function of the following components of a milling machine, shown in the following picture. (8 pts)

1. On/off switch: For turning the spindle ON or OFF, and for changing the direction of spindle rotation.

2. Brake: For a manually quick stop of the rotating spindle right after it is turned off.

3. Speed knob: For adjusting the spindle rotation speed (in RPM).

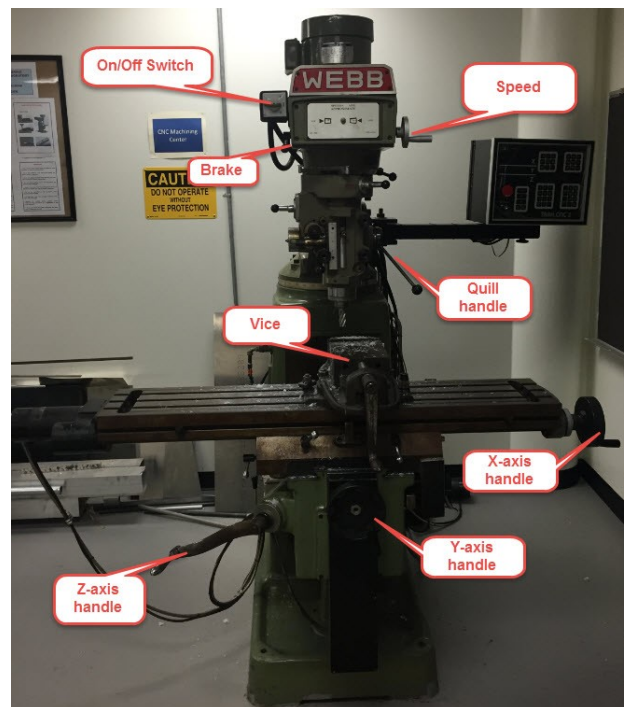
4. Vice: For clamping workpieces onto the work table.

5. Quill handle: For moving the cutting tool up or down in the Z-axis direction

6. X-axis handle: For moving the work table in the X+ or X- direction (left or right).

7. Y-axis handle: For moving the work table in the Y+ or Y- direction (front or back).

8. Z-axis handle: For moving the work table in the Z+ or Z- direction (up or down).



ABOVE AVERAGE

30/30

Quiz 3

Student Name: Austin Smith

Section: P02

1. Write the Major OD and select the Drill Bit Size for the following female threads. (12 pts)

Item	Female Threads	Major OD (in)	Material	Drill Bit Size (in)
1	1/4-28-UNF-2B	1 1/4 ✓	Stainless Steel	#11.2280 ✓
2	7/16-14-UNC-2B	7/16 ✓	Plastics	U/360 ✓

2. What is an undercut? What is the purpose of using undercuts in turning operations? (10 pts)

An undercut is a special type of recessed surface in manufacturing provides clearance for the cutting tool and, or also referred to as thread relief

3. Specify the function of the following components of a milling machine, shown in the following picture. (8 pts)

1. On/off switch:

For turning the spindle on or off and for changing the direction of spindle rotation

2. Brake:

For manually quickstop of the rotating spindle right after it is turned off

3. Speed knob:

For adjusting the spindle rotation speed

4. Vice:

For clamping workpieces onto the work table

5. Quill handle:

For moving the cutting tool up or down in the Z-axis direction

6. X-axis handle:

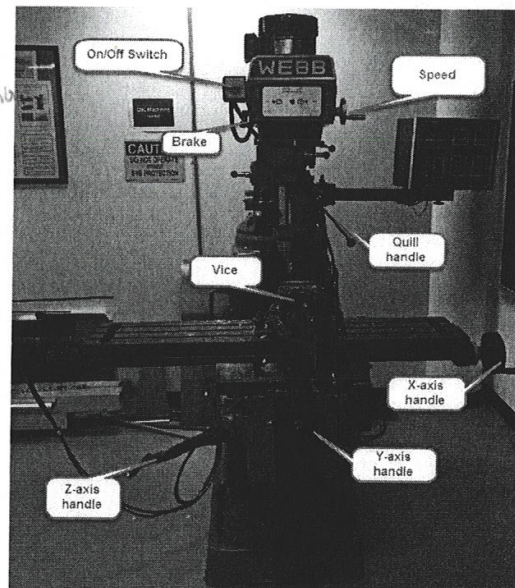
For moving the work table in the X or X- direction

7. Y-axis handle:

For moving the work table in Y or Y- direction

8. Z-axis handle:

For moving the work table in the Z+ or Z- direction



AVERAGE

26/30

Quiz 3

Student Name: Oscar Perez

Section: P02

1. Write the Major OD and select the Drill Bit Size for the following female threads. (12 pts)

Item	Female Threads	Major OD (in)	Material	Drill Bit Size (in)
1	1/4-28-UNF-2B	.2500 inch	Stainless Steel	.2283
2	7/16-14-UNC-2B	.4375 inch	Plastics	.3906

2. What is an undercut? What is the purpose of using undercuts in turning operations? (10 pts)

- An undercut is a special type of recessed surface in manufacturing.
- They are used to provide clearance for the cutting tool, and also referred to as thread relief.

3. Specify the function of the following components of a milling machine, shown in the following picture. (8 pts)

1. On/off switch:

Turn the machine tool on and off

2. Brake: Used to stop milling process only when machine tool is turned off right before.

3. Speed knob: Used to increase or decrease milling speed.

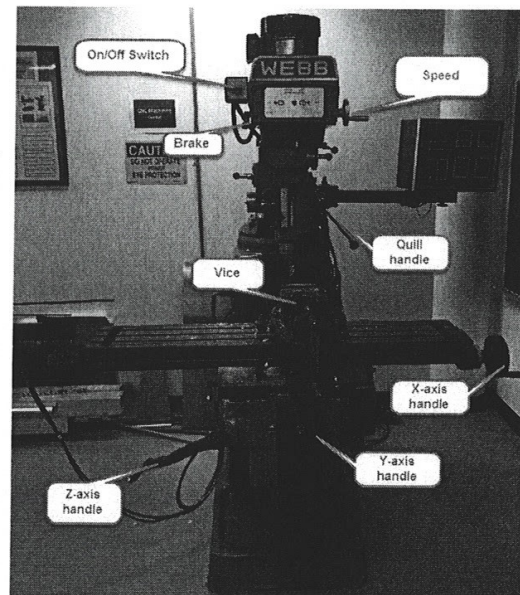
4. Vice: Used to keep milling object in place

5. Quill handle: Used to speed machining process

6. X-axis handle: Used to move table in the X-direction

7. Y-axis handle: Used to move table in the Y-direction

8. Z-axis handle: Used to move table in the Z-direction (up & down)



BELOW AVERAGE

Quiz 3

Student Name: Chinonso Okezie

Section: P02

1. Write the Major OD and select the Drill Bit Size for the following female threads. (12 pts)

Item	Female Threads	Major OD (in)	Material	Drill Bit Size (in)
1	1/4-28-UNF-2B	1/4	Stainless Steel	0.3125
2	7/16-14-UNC-2B	7/16	Plastics	0.220

2. What is an undercut? What is the purpose of using undercuts in turning operations? (10 pts)

A special type of recessed surface in manufacturing. Refers to a recess in a diameter.

3. Specify the function of the following components of a milling machine, shown in the following picture. (8 pts)

1. On/off switch:

Turns machine on and off.

2. Brake:

Stops machine.

3. Speed knob:

Increases or decreases the speed.

4. Vice:

Placement holder.

5. Quill handle:

Raises and lowers the jaw.

6. X-axis handle:

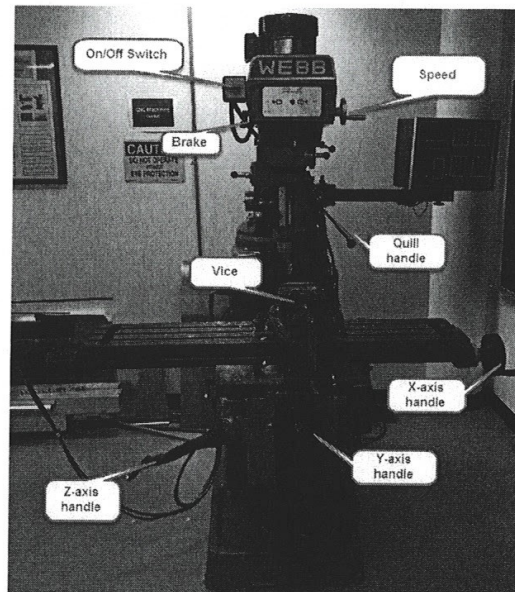
Moves plane left and right.

7. Y-axis handle:

Moves plane up and down.

8. Z-axis handle:

Moves plane forward and backward.



**MANUFACTURING PROCESSES LABORATORY
FALL 2021**

Title of Assignment: Quiz 4

TOPICS COVERED

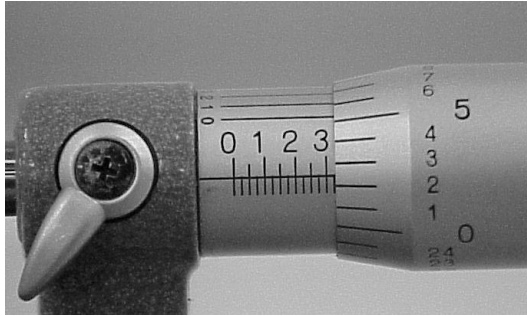
- 1. Reading of measurement devices**
- 2. Tool on lathe**

Quiz 4

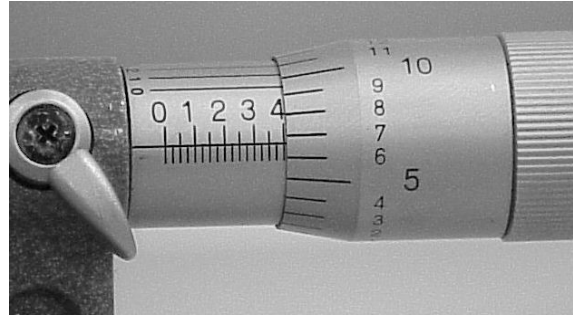
Print Name: _____ Solution _____ Section No.: _____ P02 _____

1. Write down the readings of the following two micrometers, ignoring the Vernier. (6 pts)

(1) _____ 0.327 or 0.328 _____

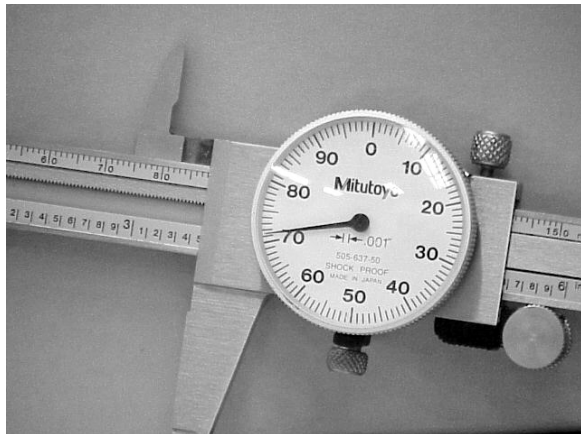


(2) _____ 0.406 or 0.407 _____

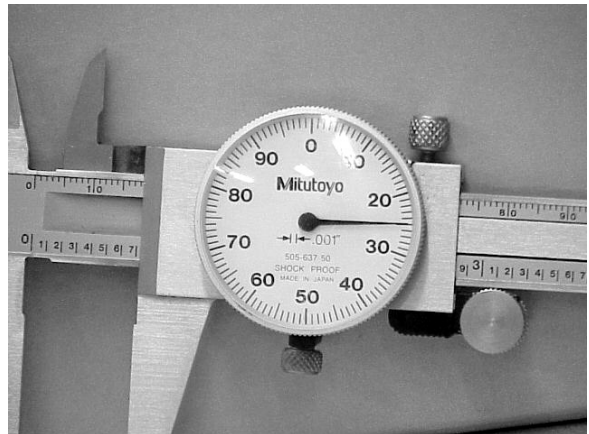


2. Write down the readings of the following two calipers. (6 pts)

(1) _____ 3.471 or 3.472 _____



(2) _____ 0.725 _____



3. What is the function of a "center drill bit"? (8 pts)

Center drilling is to drill a pilot hole that will act as the center of rotation for possible following operations. It is typically performed using a drill with a special shape, known as a center drill bit.

ABOVE AVERAGE

20/20

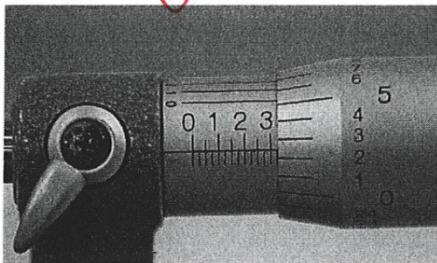
Quiz 4

Print Name: malakia lee

Section No. : 002

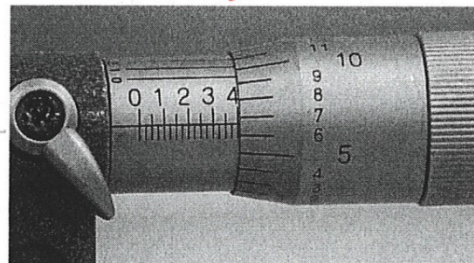
1. Write down the readings of the following two micrometers, ignoring the Vernier. (6 pts)

(1) .327



.300
+.025
+.002
= .327

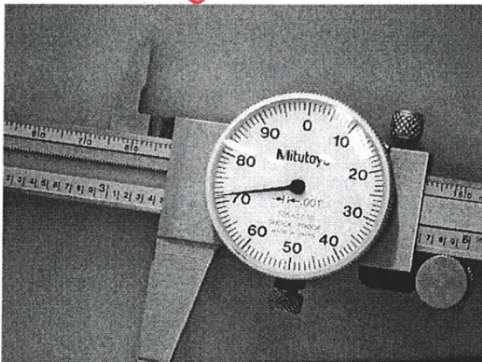
(2) .407



.400
+.000
+.007
= .407

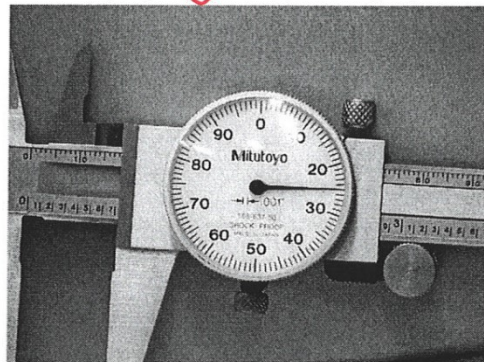
2. Write down the readings of the following two calipers. (6 pts)

(1) 3.471



3.00
+.40
+.071
= 3.471

(2) .725



0.00
+.70
+.025
= .725

3. What is the function of a "center drill bit"? (8 pts)

To drill a pilot hole that will act as the center of rotation.

AVERAGE

17/20

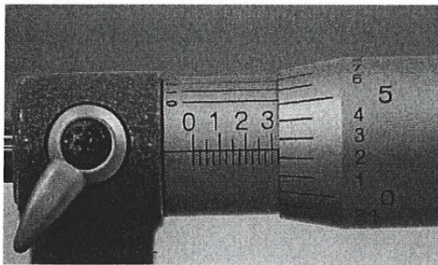
Quiz 4

Print Name: Dewan Mitchell

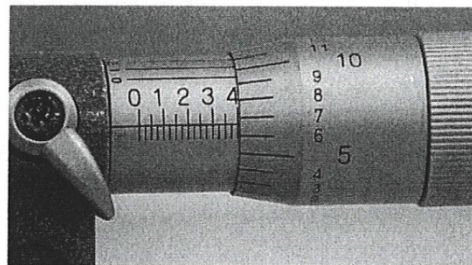
Section No. : P02

1. Write down the readings of the following two micrometers, ignoring the Vernier. (6 pts)

(1) 0.32~~5~~

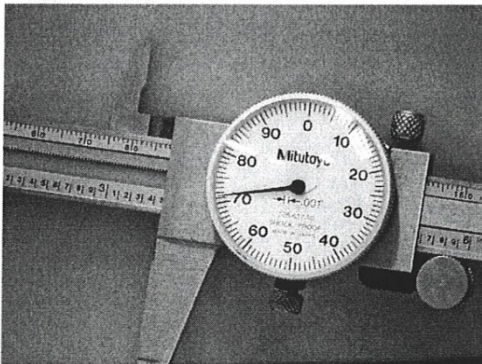


(2) 0.46~~7~~

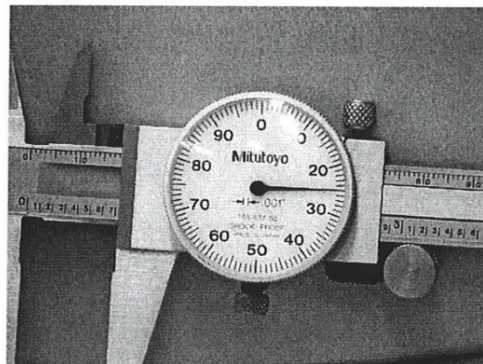


2. Write down the readings of the following two calipers. (6 pts)

(1) 3.4~~7~~1



(2) 0.7~~2~~5



3. What is the function of a "center drill bit"? (8 pts)

TO create a pilot hole
that will act as the center
of rotation for possible following
operation

BELOW AVERAGE

12/20

Quiz 4

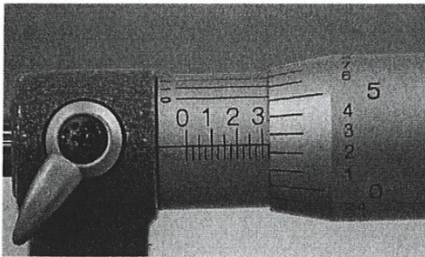
Print Name: Jade A. Coleman Section No.: P02

1. Write down the readings of the following two micrometers, ignoring the Vernier. (6 pts)

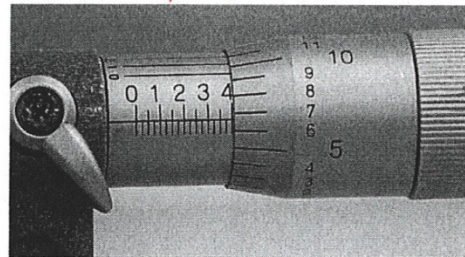
(1) 0.3271 in.

0.3000
0.0250
0.0020
0.0001

0.3271



(2) 0.4062 in.

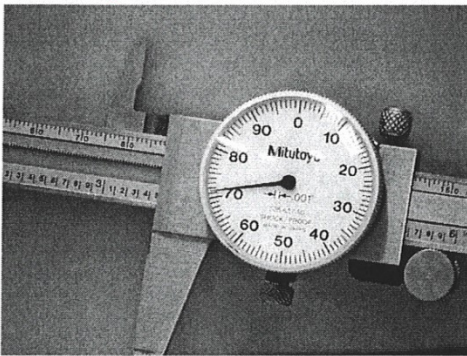


0.4000
0.0060
0.0002

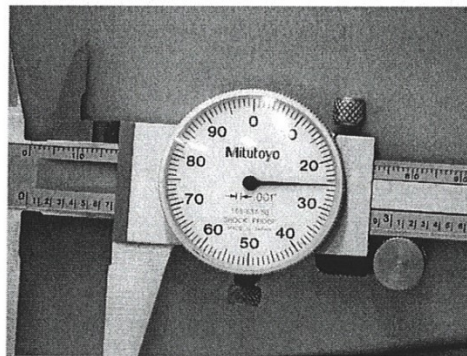
0.4062

2. Write down the readings of the following two calipers. (6 pts)

(1) 3.471 in.



(2) 0.725 in. +6



3. What is the function of a "center drill bit"? (8 pts)

Center drill bit are cutting tools used to create round holes, with circular cross-sections. A drill press is used to rotate and hold together. ✓

+6.

**MANUFACTURING PROCESSES LABORATORY
FALL 2021**

PROJECT REPORT # 1

MANUFACTURE OF A HAMMER

TOPICS COVERED IN PROJRCT

- 1. Learn to understand and create engineering drawings.**
- 2. Learn to take precise measurements.**
- 3. Provide hands on experiences on operating milling machine and lathe following instructions and safety guidelines.**
- 4. Strengthen summarizing and writing skills.**
- 5. Assess awareness of the impact of engineering solutions in a global and societal context.**

Print Name: _____ Lab Section #: P02 Grade: _____

Manufacture of A Plastic Hammer (To be completed individually)

Report Due: Nov. 4, 2021

PROJECT DETAILS

A plastic hammer was manufactured using the machining equipment in the manufacturing lab in this project. It is composed of three components: hammerhead, handle, and shaft. This project involves 3D CAD models, engineering drawings, manufacturing process descriptions, and the handmade hammer prototype.

REPORT REQUIREMENTS

All details of this project should be included in this final report, which should contain the following contents:

- 1) Use this page as the cover page of your report with your name and the section number.
- 2) A project summary and a brief description of what you have learned from this project.
- 3) Screenshots of the 3D CAD model, the engineering drawing of the hammerhead, and its detailed manufacturing procedures.
- 4) Screenshots of the 3D CAD model, the engineering drawing of the hammer shaft, and its detailed manufacturing procedures.
- 5) Screenshots of the 3D CAD model, the engineering drawing of the hammer handle, and its detailed manufacturing procedures.
- 6) Screenshots of the 3D CAD model, the engineering drawing of the hammer assembly, and the photo of the plastic hammer made in the lab.

Note that the report should be prepared using a **Word document** and should be clear and readable. The engineering drawings should be prepared using any CAD software.

SUBMISSION OF THE HAMMER PROJECT

Submit a **hard copy** of the report to your instructor, **and a soft copy on eCourses in Word format** under the link: [Hammer Project Final Report Submission](#).

GRADING OF HAMMER PROJECT

The grade of the final project is composed of the following:

- 1) Cover page (5%)
- 2) Project summary (10%)
- 3) Engineering drawings (40%)
- 4) Detailed manufacturing procedures (30%)
- 5) Photo of the hammer (5%)
- 6) eCourses submission of the final report (10%)

**ABOVE AVERAGE
PROJECT REPORT**

MCEG 3103

Manufacturing Lab (Hammer Project)

Print Name: Devan Mitchell

Lab Section #: P02

Grade: 96

Manufacture of A Plastic Hammer (To be completed individually)

Report Due: Nov. 4, 2021

PROJECT DETAILS

A plastic hammer was manufactured using the machining equipment in the manufacturing lab in this project. It is composed of three components: hammerhead, handle, and shaft. This project involves 3D CAD models, engineering drawings, manufacturing process descriptions, and the handmade hammer prototype.

REPORT REQUIREMENTS

All details of this project should be included in this final report, which should contain the following contents:

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- 5) Screenshots of the 3D CAD model, the engineering drawing of the hammer handle, and its detailed manufacturing procedures.
- 6) Screenshots of the 3D CAD model, the engineering drawing of the hammer assembly, and the photo of the plastic hammer made in the lab.

Note that the report should be prepared using a **Word document** and should be clear and readable. The engineering drawings should be prepared using any CAD software.

SUBMISSION OF THE HAMMER PROJECT

Submit a **hard copy** of the report to your instructor, and a **soft copy** on eCourses in **Word format** under the link: [Hammer Project Final Report Submission](#).

GRADING OF HAMMER PROJECT

The grade of the final project is composed of the following:

- 1) Cover page (5%) +5
- 2) Project summary (10%) +10
- 3) Engineering drawings (40%) +38
- 4) Detailed manufacturing procedures (30%) +24
- 5) Photo of the hammer (5%) +5
- 6) eCourses submission of the final report (10%) +10

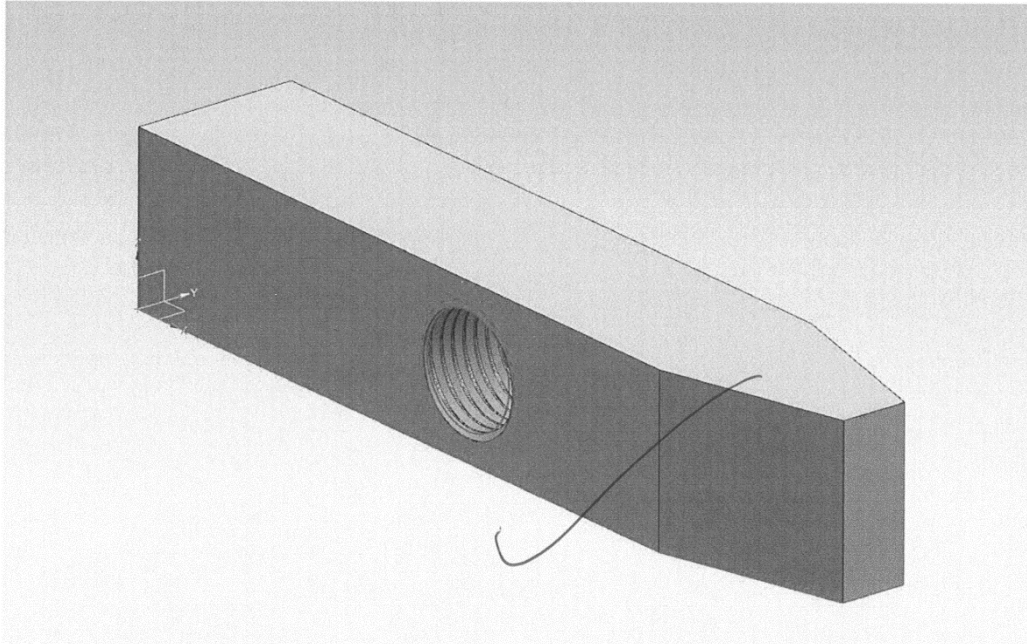
92
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Summery:

In conclusion while doing the Hammer Project I was able to learn the fundamentals of the manufacturing process. Also was able to learn valuable skills on using dial calipers and machines such as the lathe, milling machine, and drill press. Overall, I would say the Hammer project was a success due to I was able to get firsthand experience in the manufacturing process and also learn new skills such as using new machines and learning how to make threads.

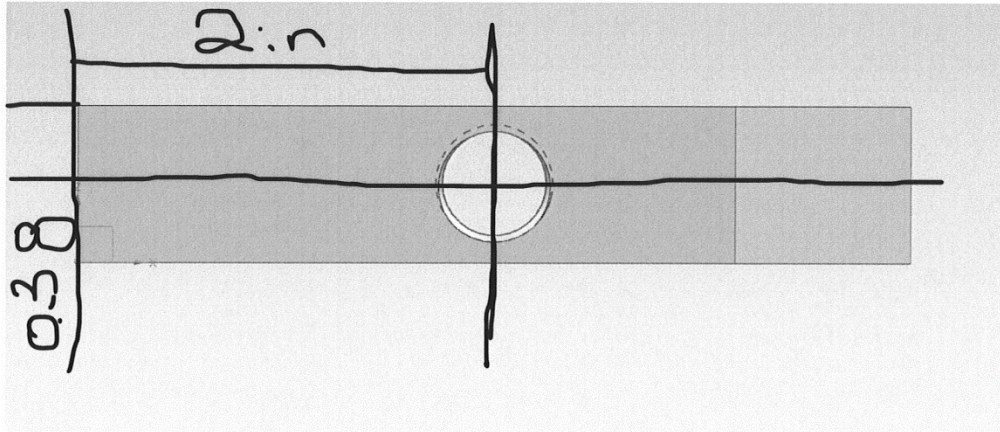
f10

Design and Manufacturing of the Hammerhead



This project includes three parts Hammerhead, Shaft, and Handle. For manufacturing the Hammerhead, we will be using a CNC Milling Machine and a Drilling Machine, to produce the Hammerhead. To produce the following procedure must be followed:

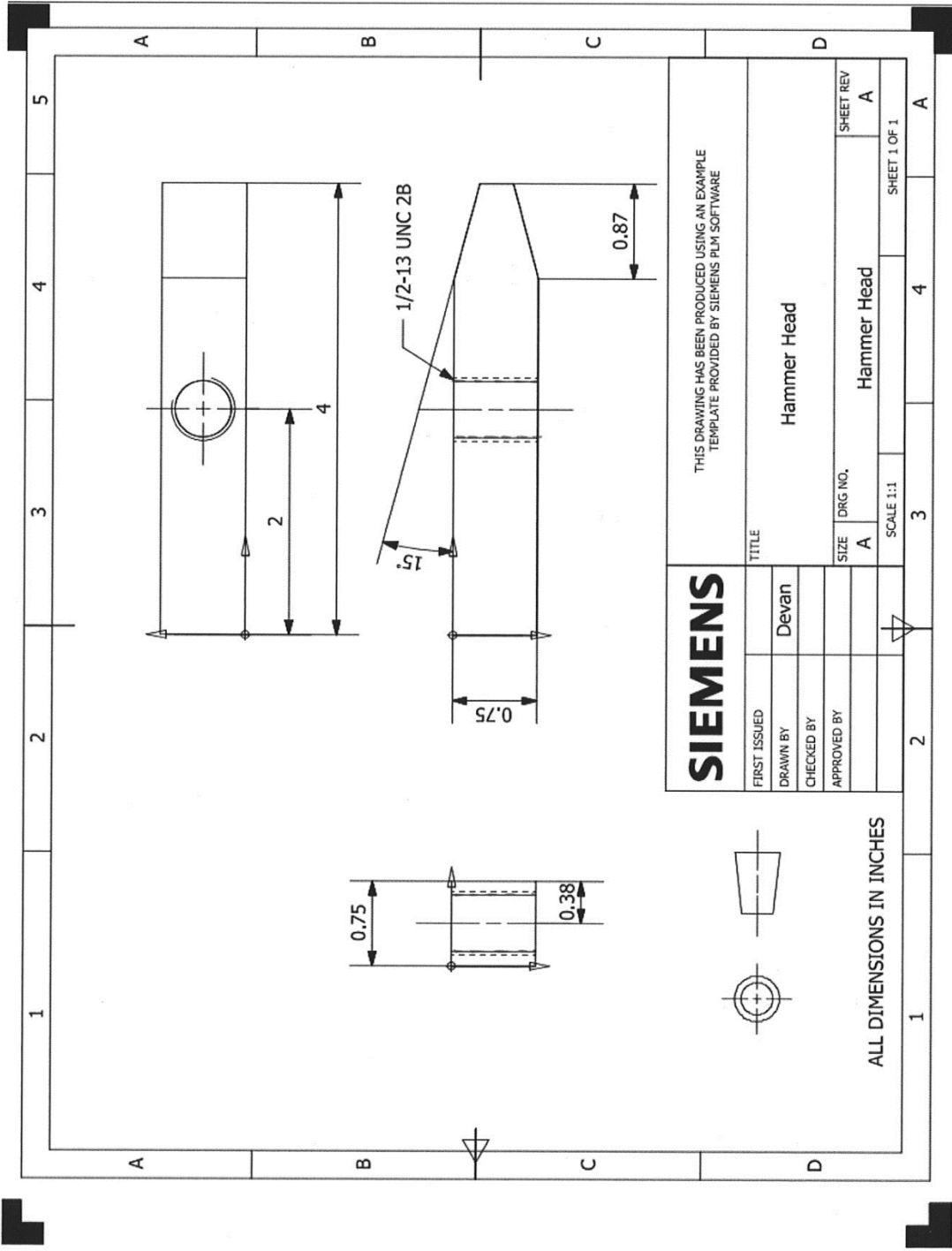
- Using a dial caliper is used to measure and mark 0.87 inches from the edge on both sides of the ABS plastic piece to indicate where the plastic would need to be cut
- After the location is defined, the ABS plastic piece is secure in the CNC milling machine using a die as stated on the drafting sheet
- Now the piece is adjusted and moved in the x, y, and z direction using the three designated handles on the Milling Machine
- The machine is now turned on and moved in the x and y direction until the piece is cut and smooth, the same procedure would need to be followed on the other side of the ABS plastic. Which would be marking 0.87 inches on the piece then readjusting the part in a 15-degree angle and using the Milling Machine to complete the cutting only moving in the x and y direction until necessary to move in the z direction to make that 15-degree angle and the cutting area is smooth
- Once both sides of ABS plastic have been cut you will remove the piece from the machine and move to prepare for the drilling machine
- Using a dial caliper to measure the center of the piece an intersection will be marked. In our case it would be used to measure 0.38 inches and 2 inches



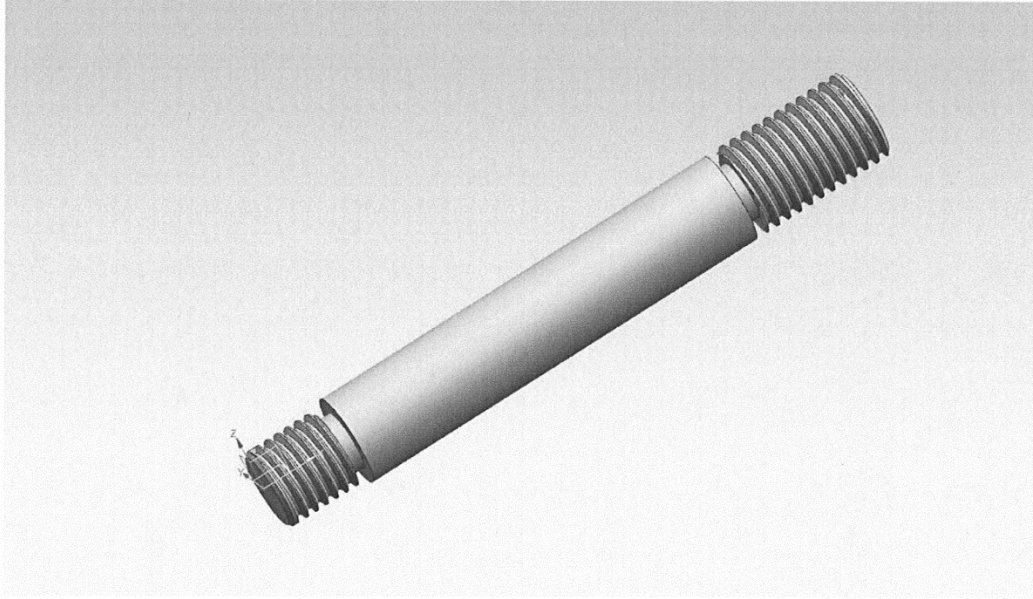
- Once the center is defined, a drill press is used to create the smooth hole. This process begins by securing the piece and setting the proper cutting speed
- Next, the center drill bit is inserted and set on the centerline of the piece, then drilled to create a center hole
- Tool bit is then removed and changed for a 27/64 drill bit
- Continue to drill to create 27/64 in hole into the ABS plastic *drilling depth?*
- Once hole is created move to the lathe to create the hole thread
- Use 1/2 in. blade, place piece in hole, then twist clockwise and counterclockwise to create threading

+9

49



Design and Manufacturing of the Hammer Shaft



The hammer shaft is one of the three essential parts necessary to complete the assembly of the Hammer Head Project. The group was assigned to create a hammer shaft using the lathe machine and the threading tool. To produce the shaft, the group followed these procedures

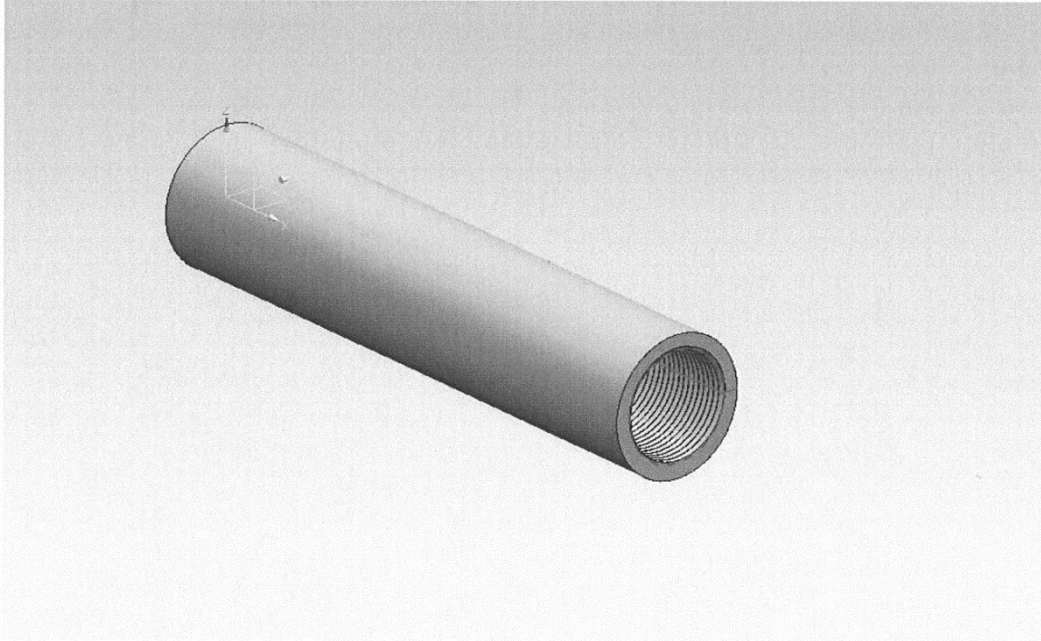
- Beginning with the dial caliper is used to measure and mark 1.35 in. from the edge of the ABS plastic piece to indicate where the piece needs to be cut
- Next would need to zero out the machine after placing the material into the machine, zeroing out the machine must be done after each measurement
- After, move the locking device clockwise until the piece is secured and locked in place
- After securing the piece, align the blade with the initial mark that was made with the dial caliper, allow the blade to slightly touch the mark on the piece
- Next, you'll start the machine and move the dial until it meets the material slightly then zero out the machine
- After, adjust dial to 0.149 in. to the make the undercut. The diameter should be 0.61 in.
- Need to also turn the larger end from $\varnothing 0.759$ to $\varnothing 0.75$

+6

- Now, you'll release the material from the machine and place the material into the vice to begin making the threads
- Before adding the thread, you would need to add/create the chamfer so it would be easier to screw the tool in. The chamfer tool would make a 45° angle
- Place the material at a 90-degree angle so when making the threads it is straight. You'll place the threading tool which should be die size $\frac{1}{2}$ -13 UNC on top of the material and rotate counterclockwise down the material until reaching the undercut
- After reaching the undercut you'll rotate clockwise to remove the tool
- After completing the top/ larger end of the shaft you would move to the smaller end
- The smaller end has the same steps/ procedures as mentioned to make the larger end
- Key differences would be that the diameter should be which should be at 0.5 in and to create an undercut with a length of 0.125 in *No mention of roughing and finish passes of the smaller end. -2*
- After completing the same steps as mentioned for the larger end to the smaller end you would take the material out of the machine again to create the threads
- Again, before creating the threads, you would need to create the chamfer which would add a 45° angle
- For the smaller end of the shaft, you would be needing the die size $\frac{3}{4}$ -10 UNC and you would rotate the tool counterclockwise again until you have reached the undercut of the material



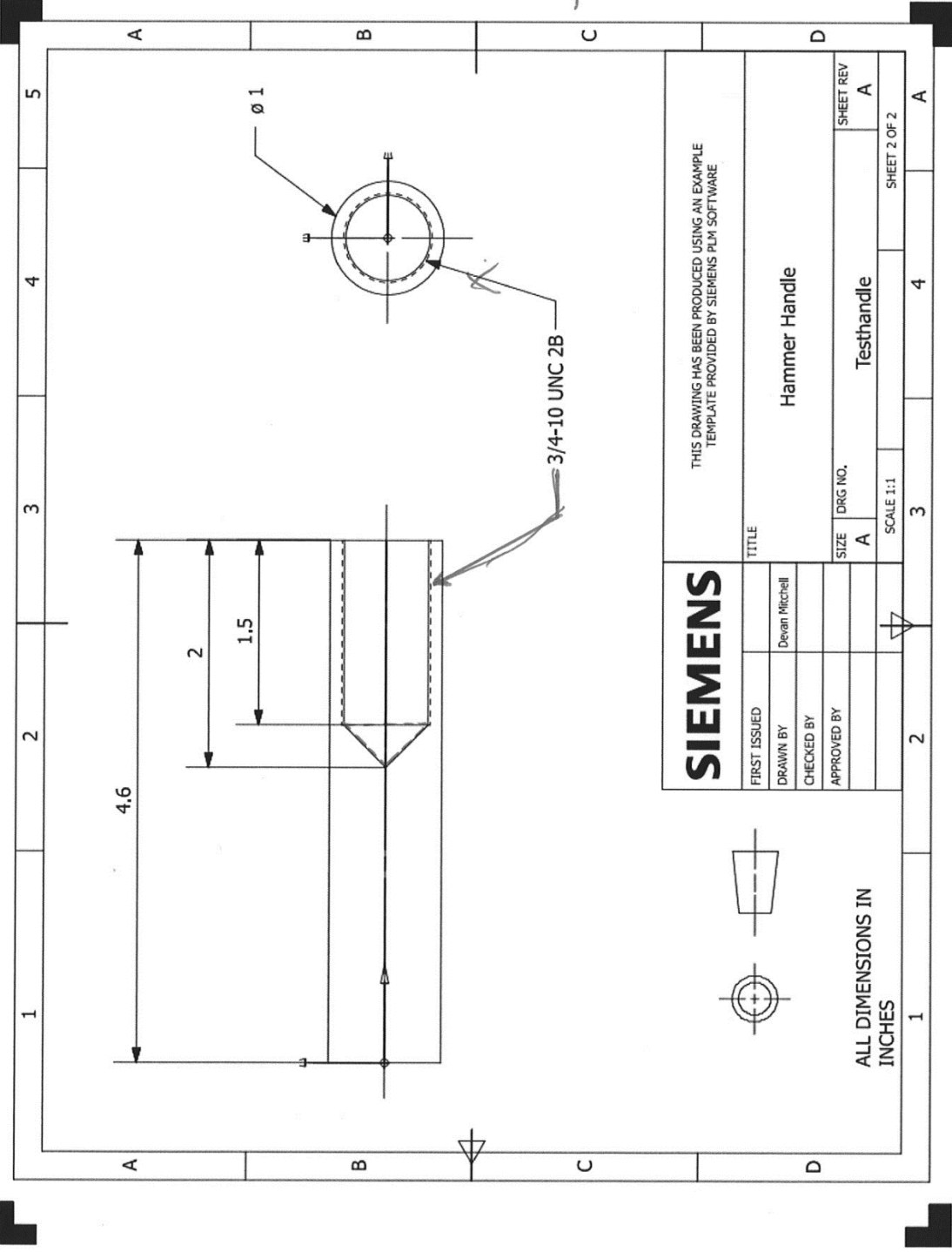
Design and Manufacturing of the Hammer Handle



The hammer handle is one of the three essential parts necessary to complete the assembly of the Hammer Head Project. The group was assigned to create a hammer handle using the lathe machine and the threading tool. To produce the handle, the group followed these procedures

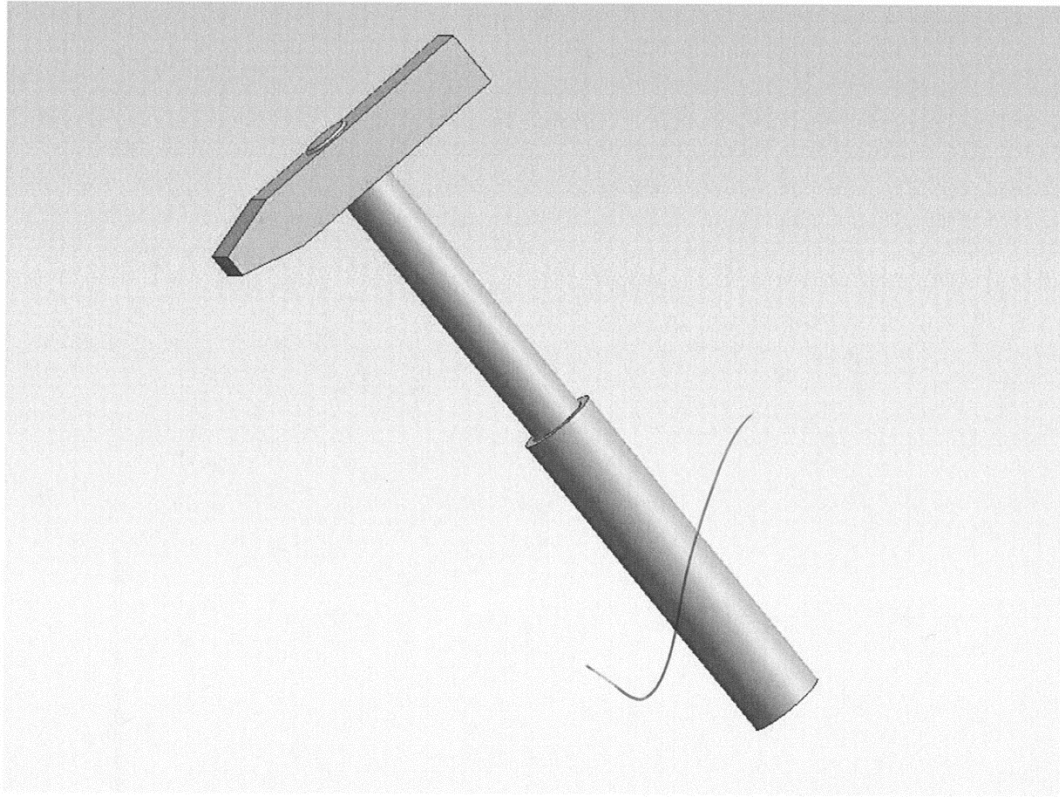
- First, you'll place the material into the spindle and lock the material down
- Make sure the $\frac{3}{4}$ in drill bit is locked in the tailstock
- Then move the drill bit close to the material making sure that it is in the center of the material
- Start drilling into the piece slowly creating the hole within the handle
- You'll only be drilling a 2 in hole within the handle, so you'll need to turn the tailstock until then and mark the distance when the 2 in is reached *Needs to mark before drilling*
- Now you'll rotate the tailstock handle in the opposite direction to remove the drill bit from the material
- Now you'll turn off the machine and begin to create the threads
- To create the threads, you will place the material into the locking table
- Using a $\frac{3}{4}$ - 10 UNC handle taps on the hole made on the drill press to begin making the threads
- Twist the tap in clockwise direction until the threads are made and to remove would be twisting in a counterclockwise direction

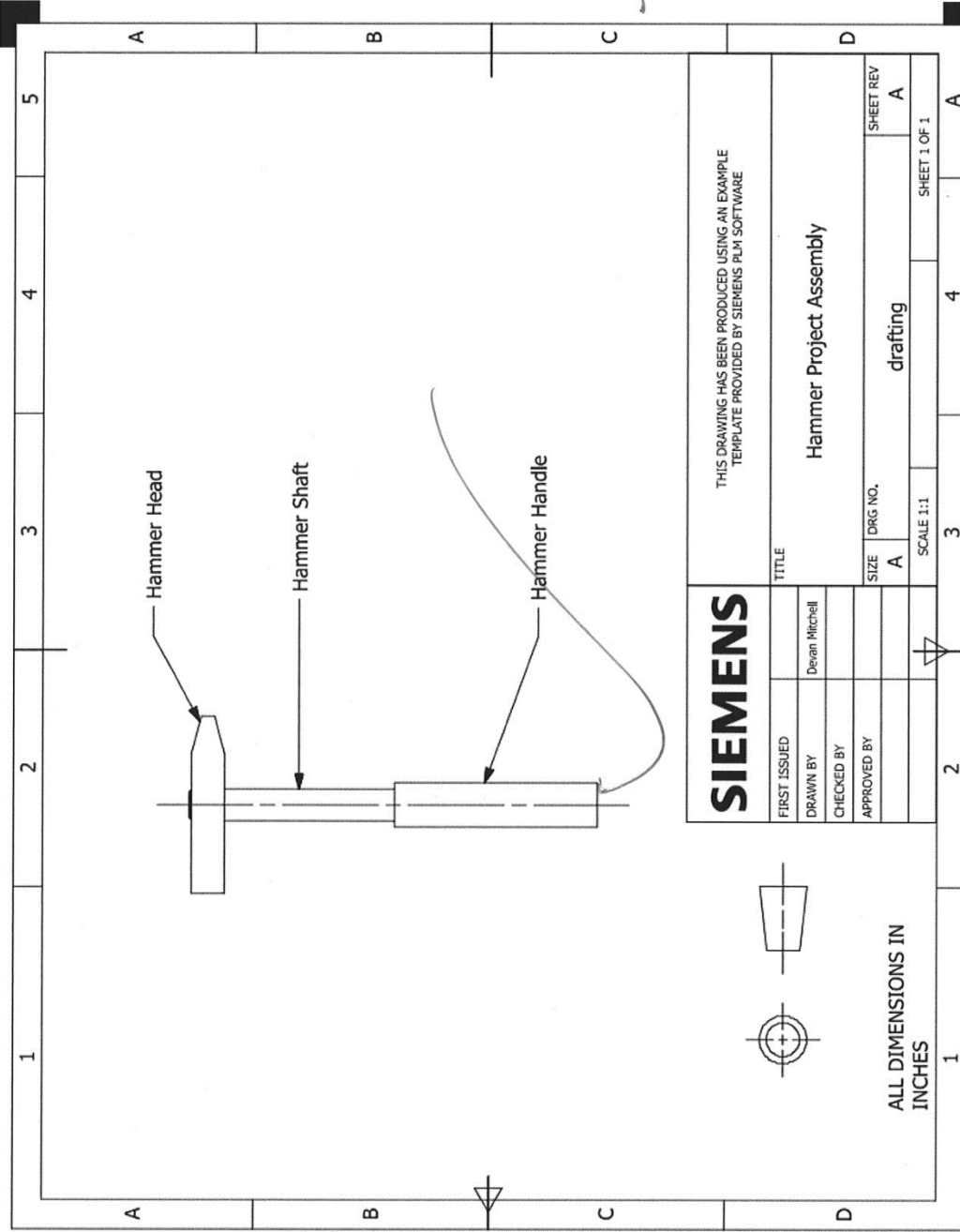
+9.

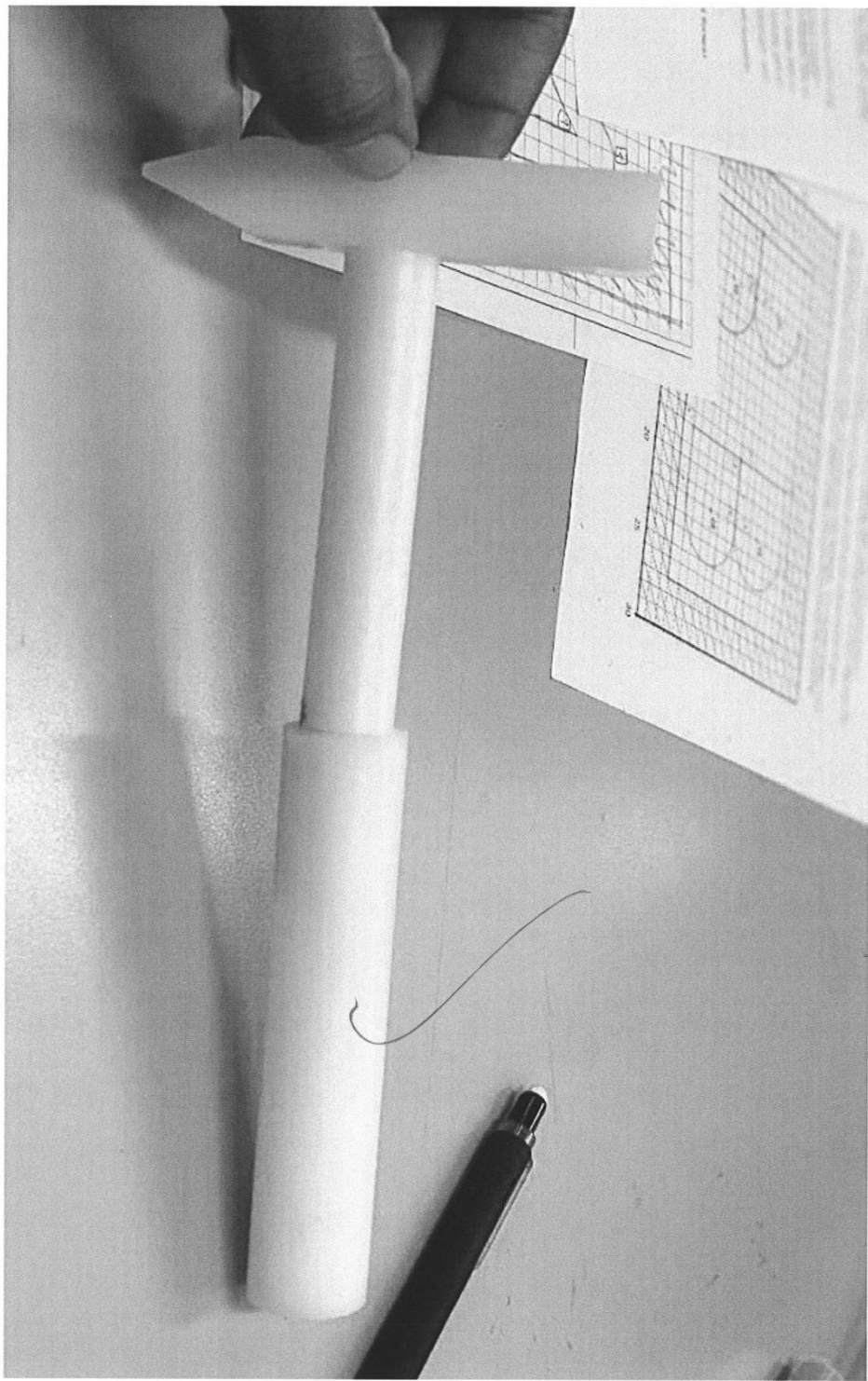


t9

Hammer Project Assembled







f5

**AVERAGE
PROJECT REPORT**

Print Name: Austin Smith Lab Section #: P02 Grade: 78**Manufacture of A Plastic Hammer** (To be completed individually)**Report Due: Nov. 4, 2021****PROJECT DETAILS**

A plastic hammer was manufactured using the machining equipment in the manufacturing lab in this project. It is composed of three components: hammerhead, handle, and shaft. This project involves 3D CAD models, engineering drawings, manufacturing process descriptions, and the handmade hammer prototype.

REPORT REQUIREMENTS

All details of this project should be included in this final report, which should contain the following contents:

- 1) Use this page as the cover page of your report with your name and the section number.
- 2) A project summary and a brief description of what you have learned from this project.
- 3) Screenshots of the 3D CAD model, the engineering drawing of the hammerhead, and its detailed manufacturing procedures.
- 4) Screenshots of the 3D CAD model, the engineering drawing of the hammer shaft, and its detailed manufacturing procedures.
- 5) Screenshots of the 3D CAD model, the engineering drawing of the hammer handle, and its detailed manufacturing procedures.
- 6) Screenshots of the 3D CAD model, the engineering drawing of the hammer assembly, and the photo of the plastic hammer made in the lab.

Note that the report should be prepared using a **Word document** and should be clear and readable. The engineering drawings should be prepared using any CAD software.

SUBMISSION OF THE HAMMER PROJECT

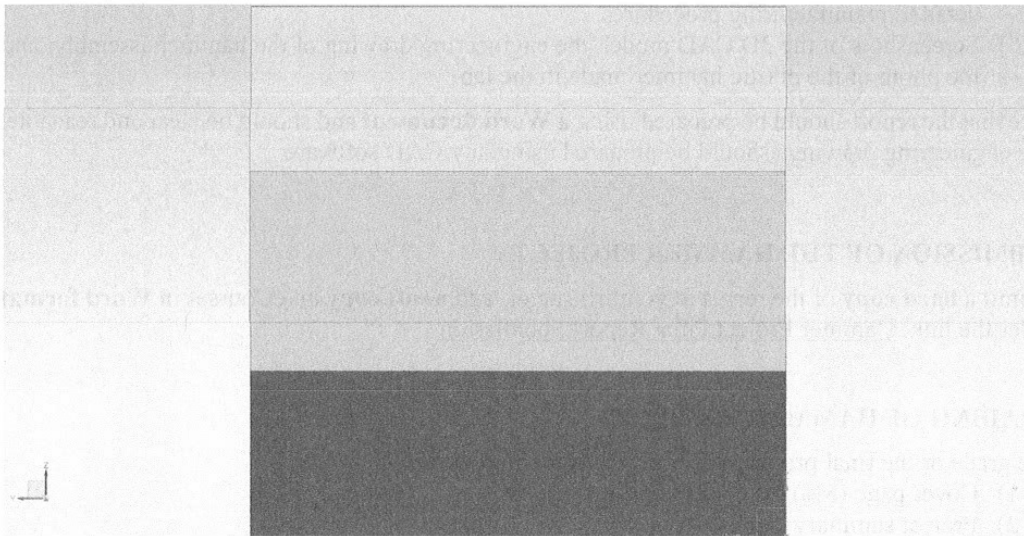
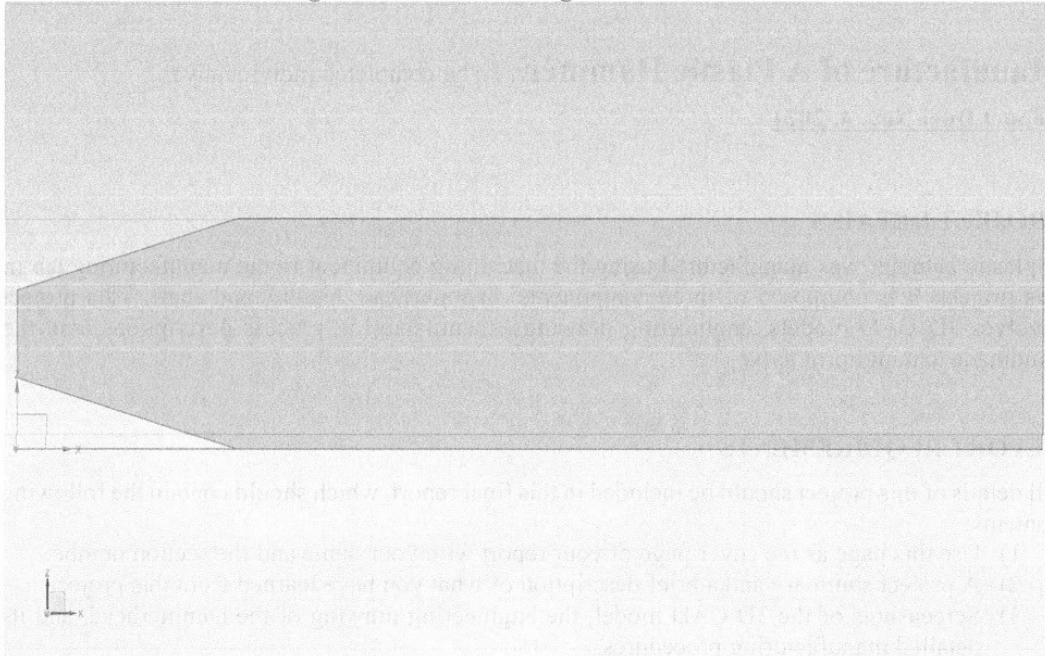
Submit a **hard copy** of the report to your instructor, and a **soft copy** on eCourses in **Word format** under the link: Hammer Project Final Report Submission.

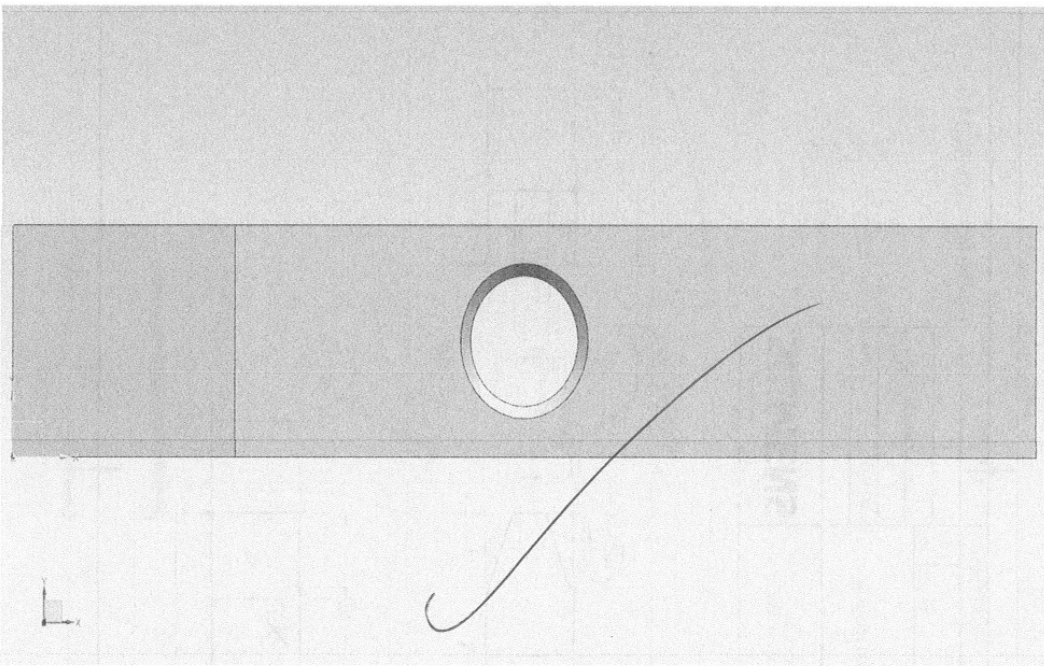
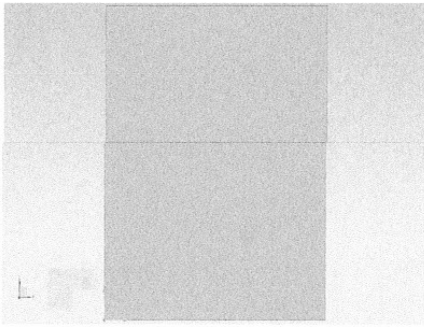
GRADING OF HAMMER PROJECT

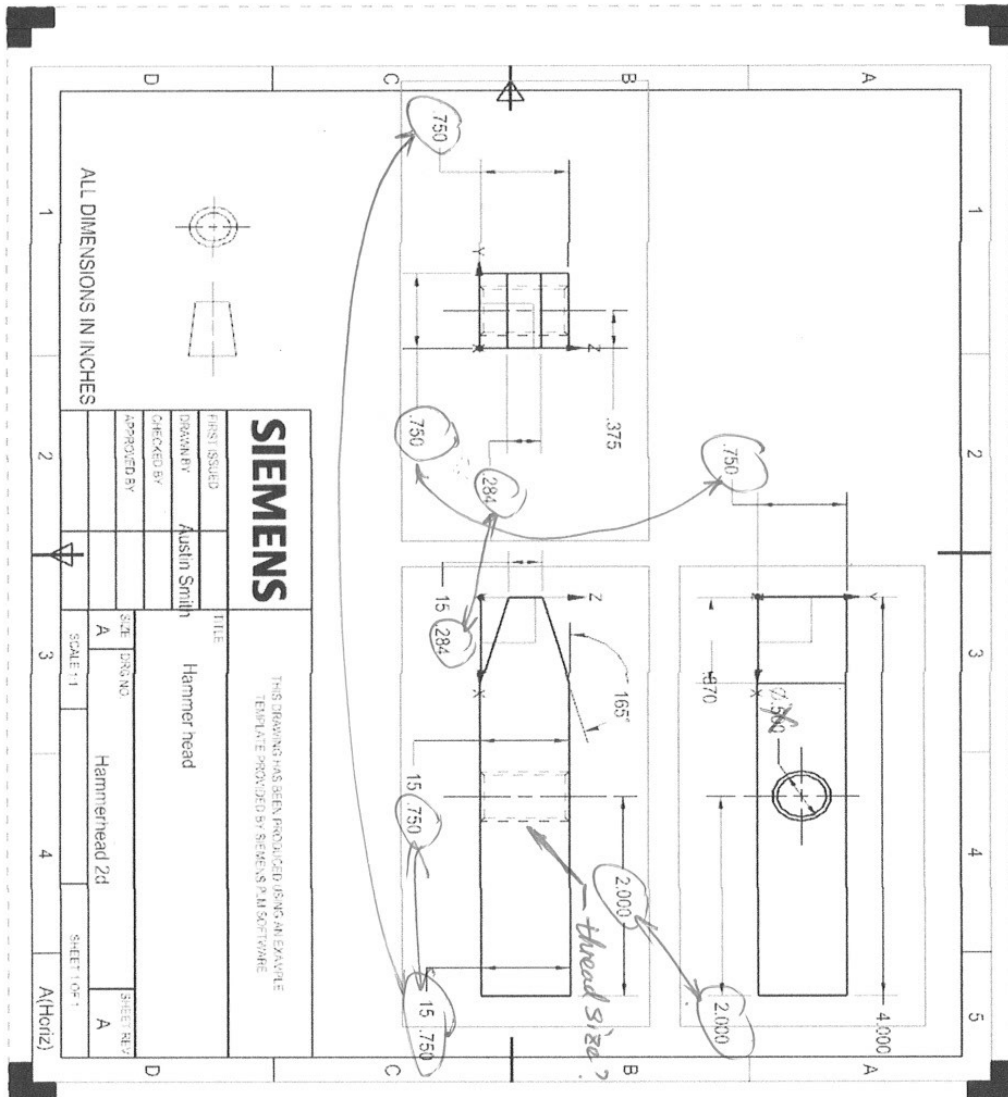
The grade of the final project is composed of the following:

- 1) Cover page (5%) +5
- 2) Project summary (10%) +0
- 3) Engineering drawings (40%) +19
- 4) Detailed manufacturing procedures (30%) +22
- 5) Photo of the hammer (5%) +5
- 6) eCourses submission of the final report (10%) +10

61

Design and Manufacturing of the Hammerhead





Manufacturing processes of Hammer Head

Step 1:

Take a 4 inch plastic rectangle measure and mark off .87 inches.

Step 2:

Place the rectangle into the Milling machines vice with metal attachment set at 15 degrees.

Step 3:

Turn the Milling Machine on then proceed to move the X axis in the negative direction until the hammer head is on the left side of the drilling tool. Move the Z axis up until the tool is touching the hammer head. Then proceed to move the X and Y axis on the machine cutting the material. As that process is going on continue to move the piece in the Z axis until you have the desired angle cut out.

Step 4:

Turn the machine off. Turn the hammer head over and repeat Step 3.

Step 5:

On the opposite side of where you have cut on the Milling Machine mark and measure from the back to edge to the center of hammer head 2 inches. Then measure and mark from the side edge to the center .375 inches.

Step 6:

Place hammer head into the drill presses vice. Put a center drill piece into drill chuck. Turn on machine. Use quill to drill a center hole into the mark that was made on hammer head. Turn off machine. Remove center drill piece from drill chuck and replace it with a 27/64 inch drill bit into drill chuck. Turn on machine. Use quill to drill out the rest of the hole. Moving up and down until hole is completely clear. Turn off machine and remove hammer head. *drilling depth = ?*

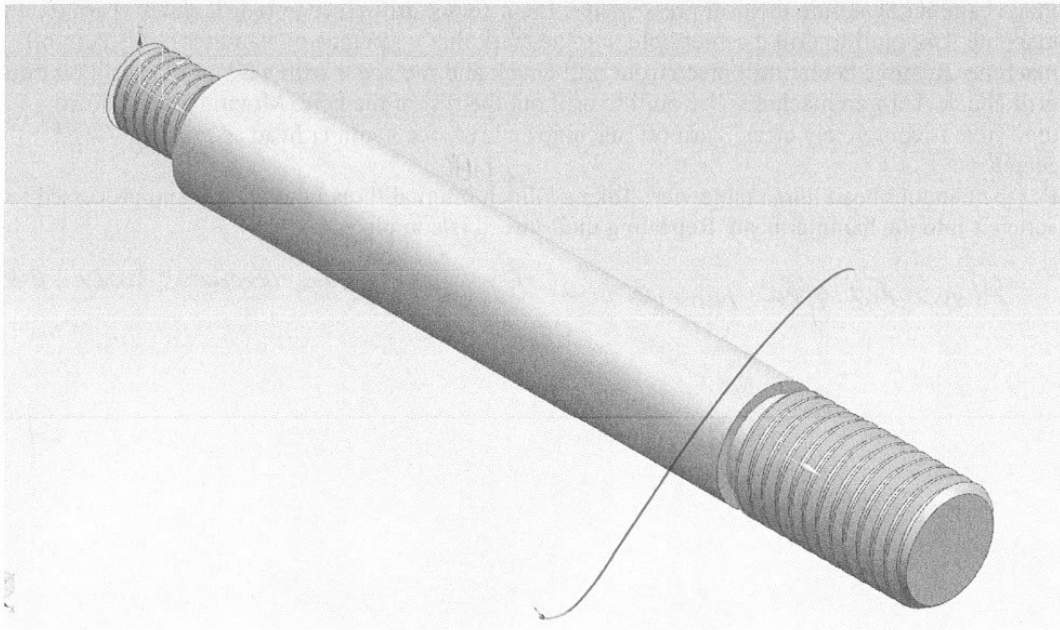
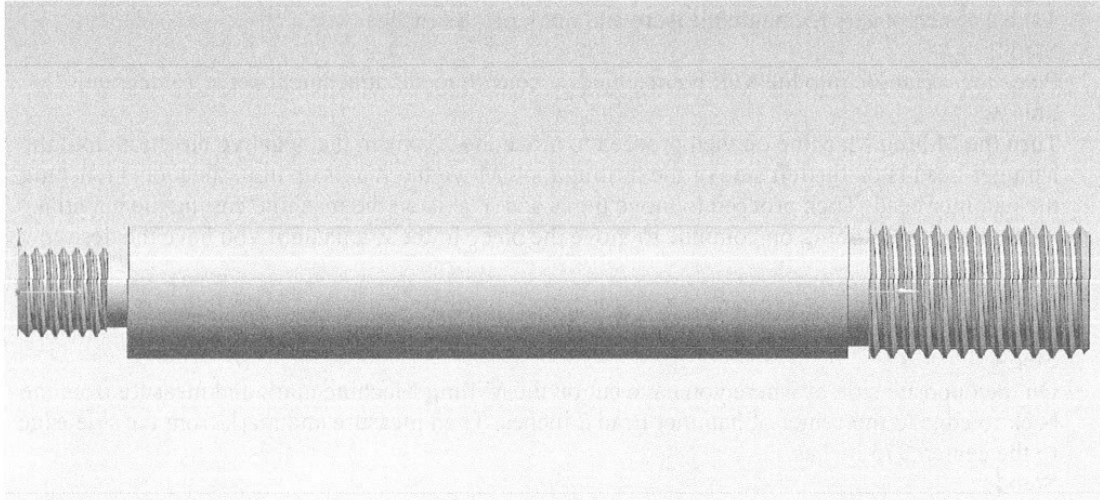
Step 7:

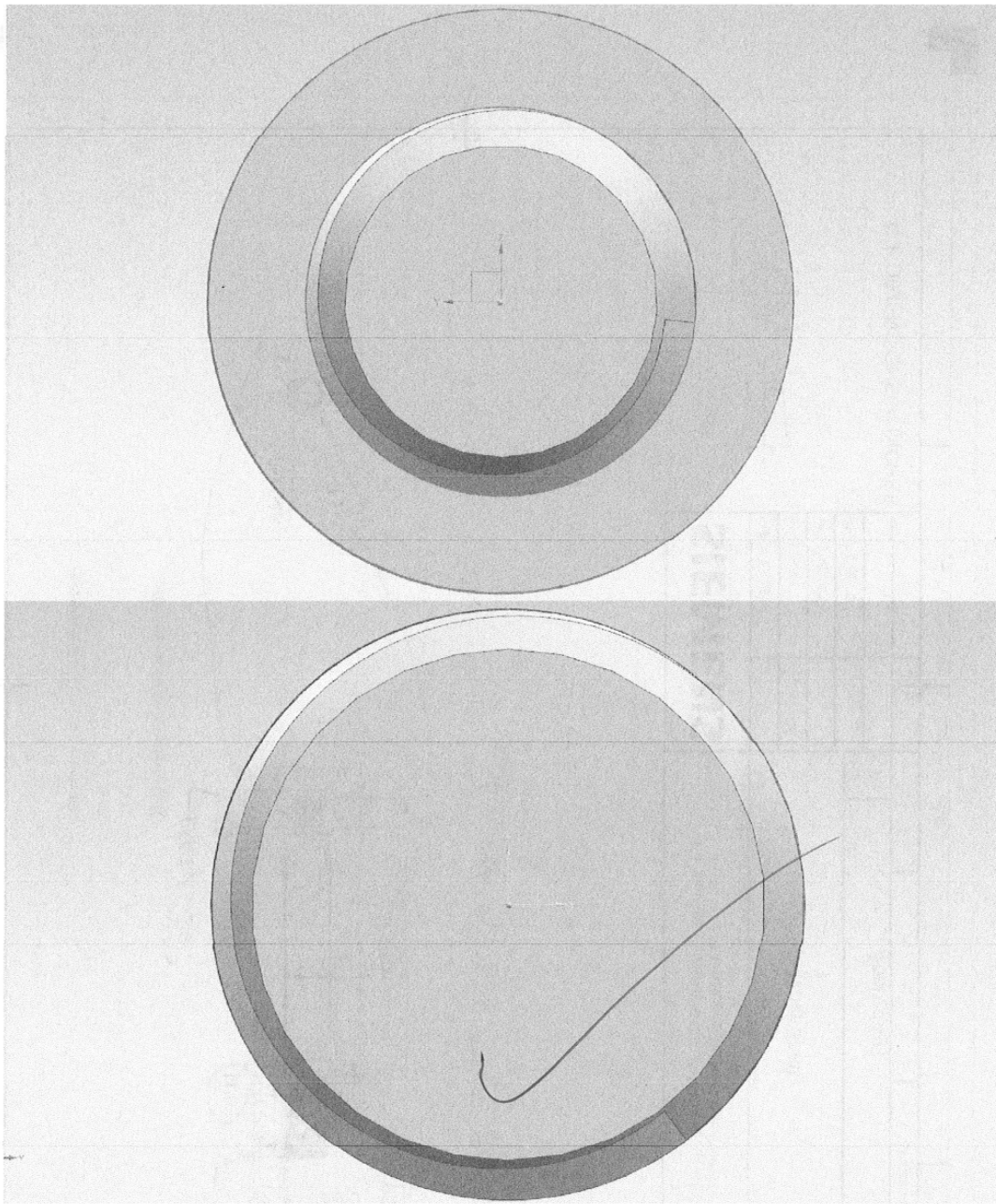
Put the hammer head into a table vice. Take a ^{1/3 UNC} 1/2 inch internal thread cutting tap and processed to screw it into the hammer head. Repeating until thread is complete.

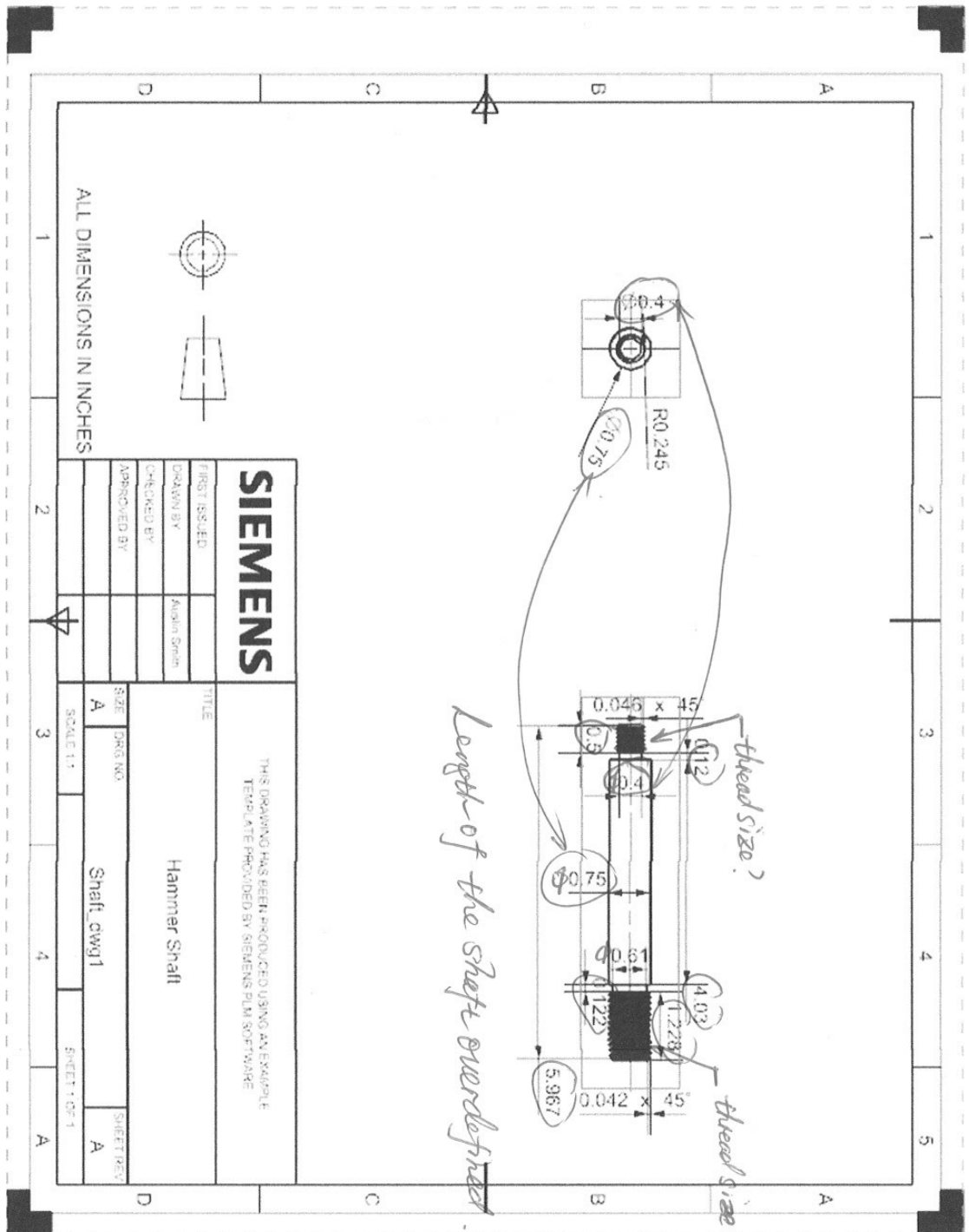
How did you remove the tap after the thread's been cut?

+8

Design and Manufacturing of the Shaft







+2

Manufacturing processes of Hammer Shaft

Step 1:

Take a $\frac{1}{8}$ inch plastic cylinder and use a caliper to measure and scratch at 0.8 inches from the top.

Step 2:

Place the cylinder into the Spindle on the lathe machine and lock it into place and place cutter tool into Tool Holder.

Step 3:

Line the cutter up at front of cylinder 0 then start machine and allow the machine to cut and move down to your mark at 0.8 inches. Then turn off machine.

Step 3:

Zero out the cross feed handle wheel then back up the tool. Line it back up at 0.8 of the cylinder and change the cross feed handle wheel 0.12 inches. Then turn own machine and cut away the material. Turn off machine. And back up tool.

Step 4:

Move cross feed handle to 0.25 and move cutter back onto cylinder and cut away material. Then turn off machine. *No mention of 2 roughing passes and 1 finishing pass. -2*

Step 5:

Place cutting tool at 0.8 inches and create an undercut by using the cross feed handle till you have cut away .35 inches. Move cutter away from cylinder and cut off the machine.

Step 6:

Remove cylinder from the Spindle. Turn it around use an caliper to mark 1.35 inches from the bottom. Place the cylinder into the Spindle on the lathe machine and lock it into place and place cutter tool into Tool Holder.

Step 7:

Line the cutter up at front of cylinder 0 then start machine and allow the machine to cut and move down to your mark at 1.35 inches. Then turn off machine.

Step 8:

Zero out the cross feed handle wheel then back up the tool. Line it back up at 1.35 inches of the cylinder and change the cross feed handle wheel 0.12 inches. Then turn own machine and cut away the material. Turn off machine. And back up tool.

Step 9:

Remove cylinder from the Spindle.

Step 10:

Use a 45° Chamfering tool to make cuts on both ends. Place top end inside tool and turn it like a pencil sharpener and do the same to the bottom.

Step 11:

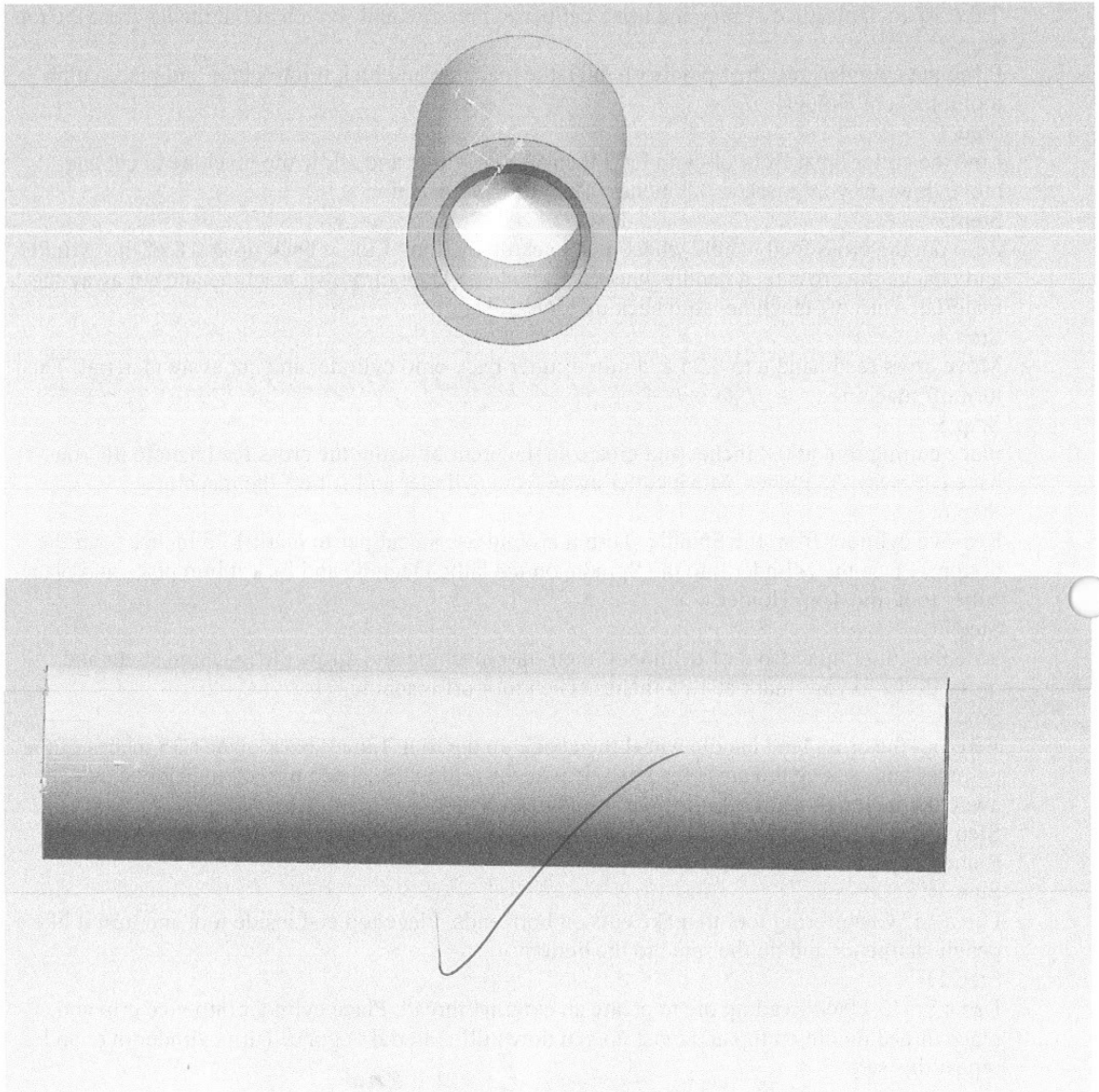
Use a $\frac{1}{2}$ -13-UNC threading die to create an external thread. Place cylinder into vice grip and place threading die on top and twist up and down till material is gone. Turn cylinder over and repeat this step.

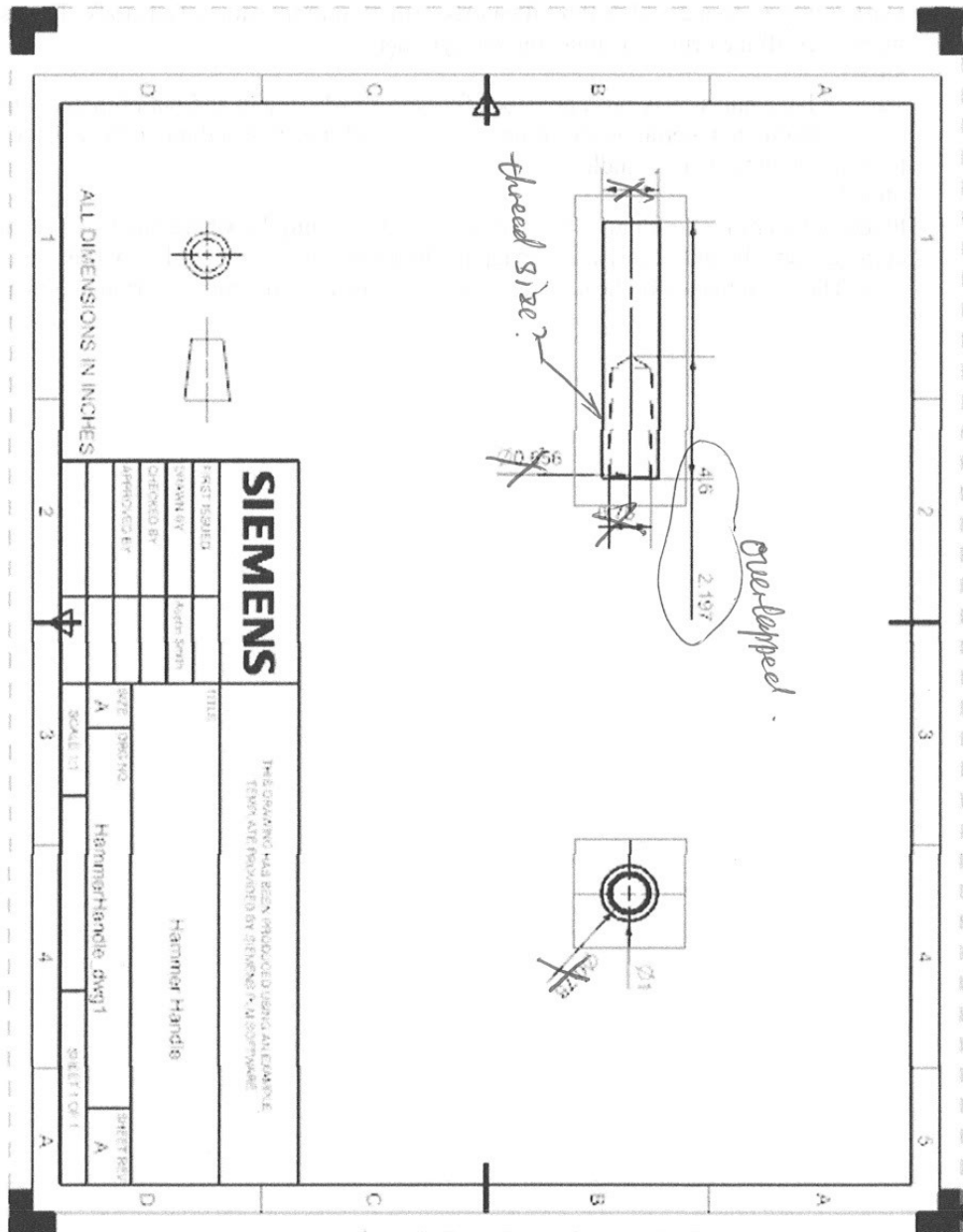
Die size for the larger end?

How to remove the dies after threads are cut on both ends? -2

+4

**Design and Manufacturing of the
Hammer Handle**





Manufacturing processes of Hammer Handle

Step 1-

Place 4.6 inch cylinder into the lathe collet and lock it into place in the lathes spindle.

Step 2-

Mark 2 inches on a 21/32 drill bit then lock drill bit into the lathes Tail stock. Then slide the tail stock over till the drill bit is touching the cylinder.

Step 3-

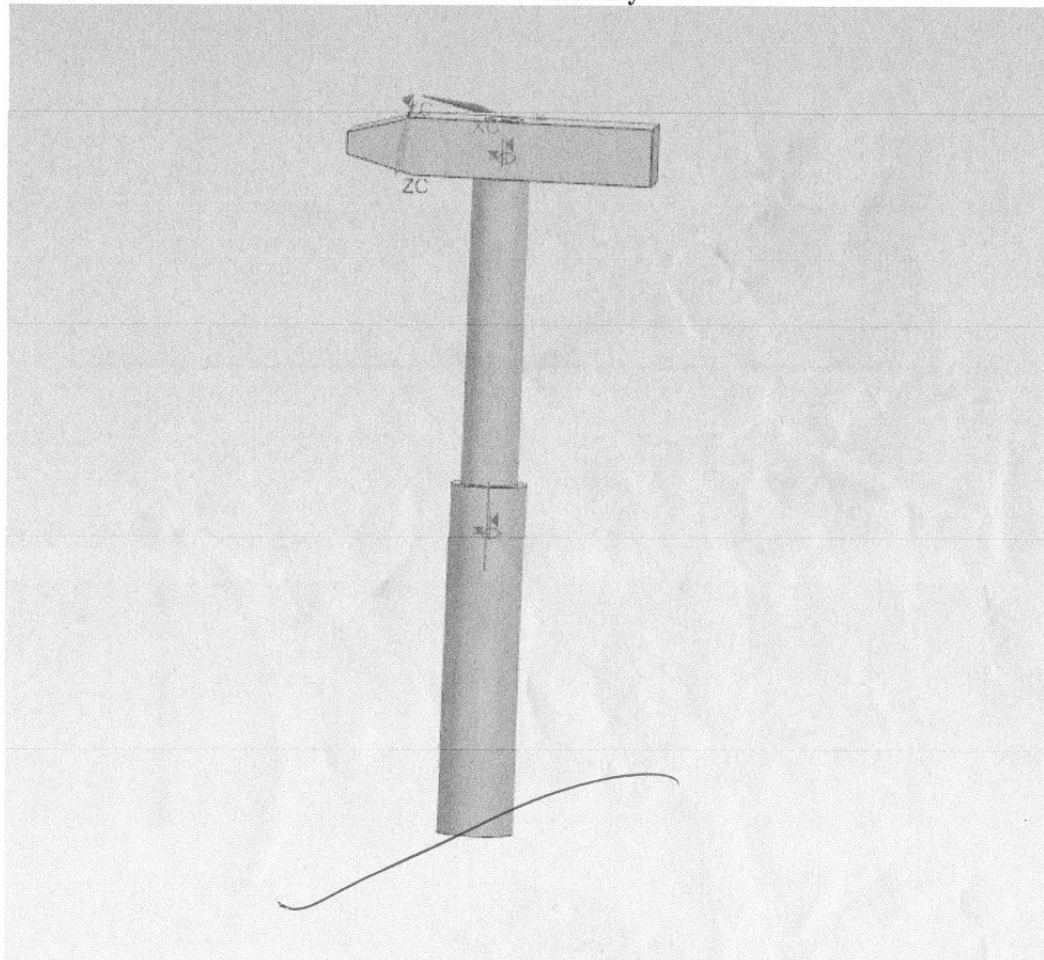
Turn on lathe and slowly push tail stock forward slowly. Go in and out of material in order to remove build up material inside. When done turn off the lathe and move the tailstock back. Remove cylinder from spindle.

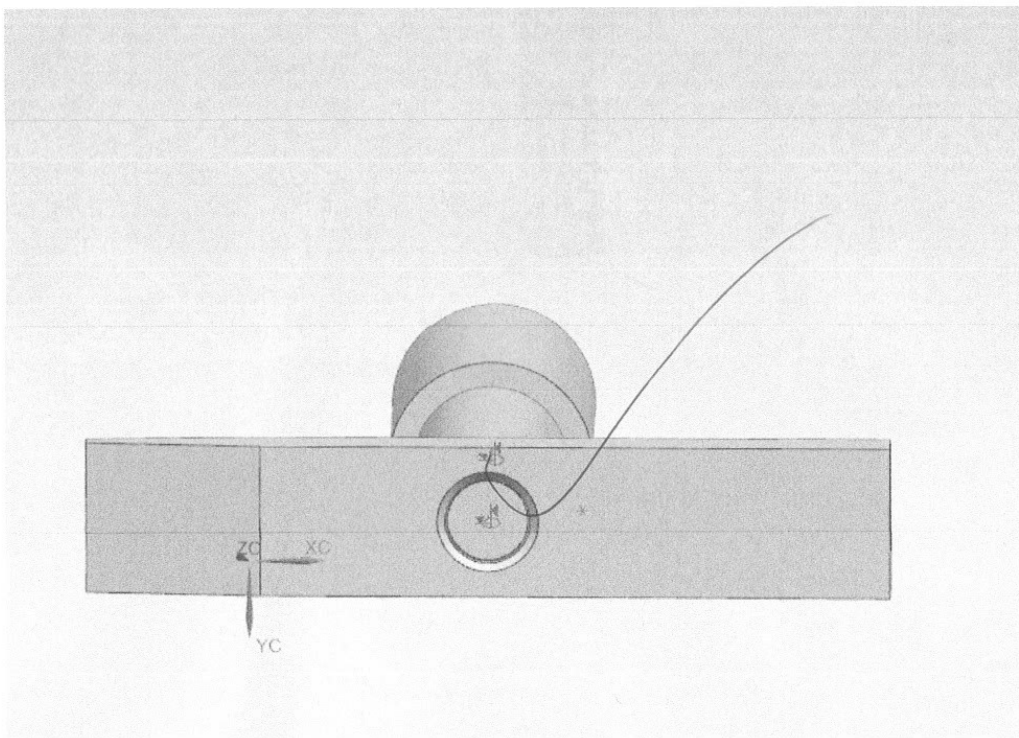
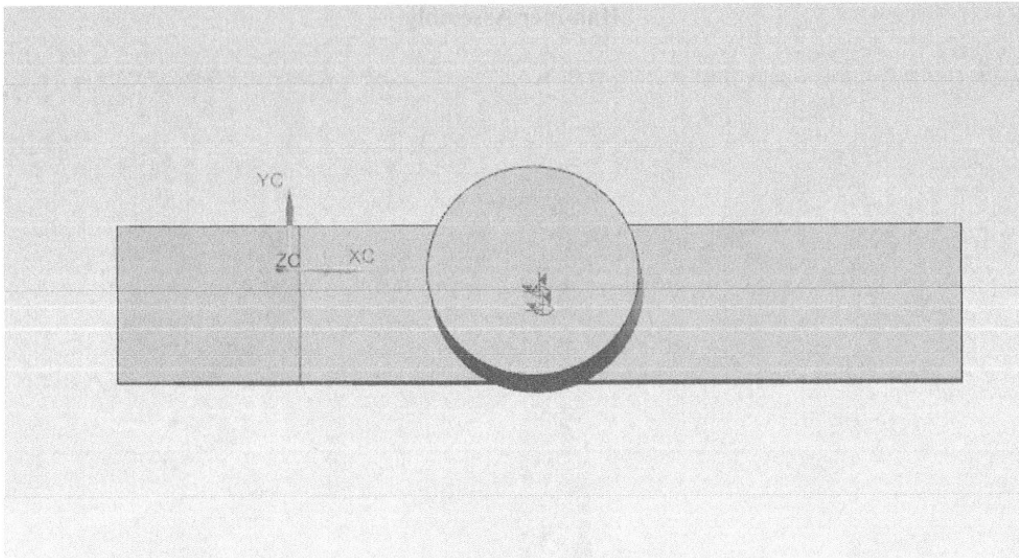
Step 4-

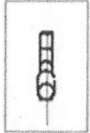
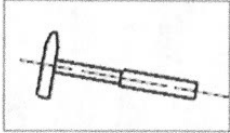
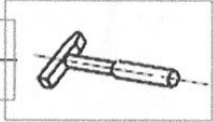
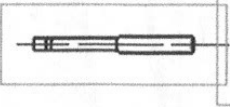
Place cylinder into bench grip. Place a 3/4-10 UNC tap into the hole that was just made in the cylinder. Slowly and evenly turn the tap in clockwise direction in order to thread the inside of the hole. Then turn the tap in the counter clockwise direction to remove it from cylinder.

+10

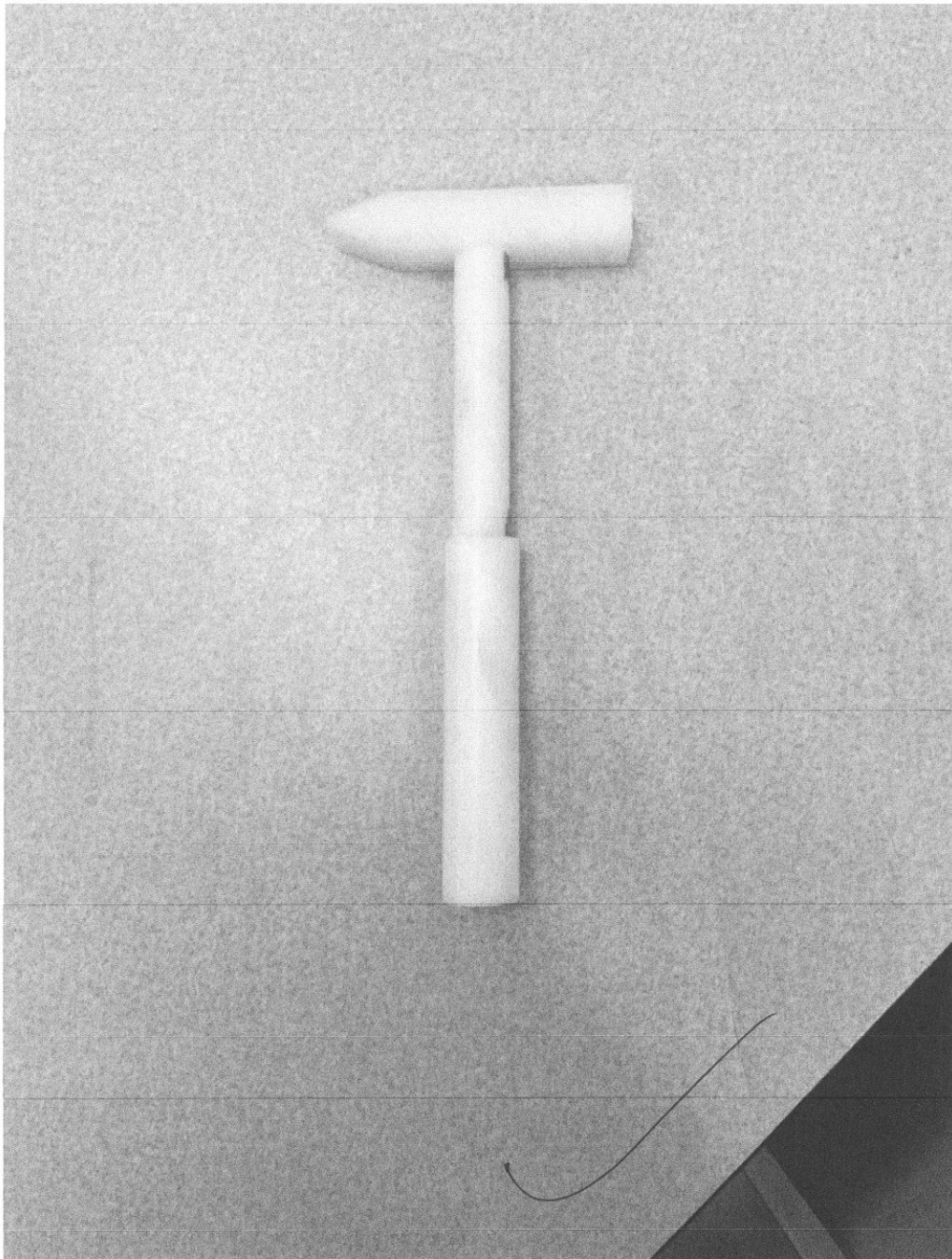
Hammer Assembly





1		2		3		4		5	
A		B		C		D		A	
									
Missing part list table - 3 Missing number of parts									
ALL DIMENSIONS IN INCHES									
SIEMENS									
THIS DRAWING HAS BEEN PRODUCED USING AN EXAMPLE TEMPLATE PROVIDED BY SIEMENS PLM SOFTWARE									
Hammer Assembly									
SIZE: A									
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dwg1									
SHEET 1 OF 1									
A									

t6



+5

**BELOW AVERAGE
PROJECT REPORT**

Print Name: Anoia Facion

Lab Section #: _____ P02

Grade: 63

Manufacture of A Plastic Hammer (To be completed individually)

Report Due: Nov. 4, 2021

PROJECT DETAILS

A plastic hammer was manufactured using the machining equipment in the manufacturing lab in this project. It is composed of three components: hammerhead, handle, and shaft. This project involves 3D CAD models, engineering drawings, manufacturing process descriptions, and the handmade hammer prototype.

REPORT REQUIREMENTS

All details of this project should be included in this final report, which should contain the following contents:

- 1) Use this page as the cover page of your report with your name and the section number.
- 2) A project summary and a brief description of what you have learned from this project.
- 3) Screenshots of the 3D CAD model, the engineering drawing of the hammerhead, and its detailed manufacturing procedures.
- 4) Screenshots of the 3D CAD model, the engineering drawing of the hammer shaft, and its detailed manufacturing procedures.
- 5) Screenshots of the 3D CAD model, the engineering drawing of the hammer handle, and its detailed manufacturing procedures.
- 6) Screenshots of the 3D CAD model, the engineering drawing of the hammer assembly, and the photo of the plastic hammer made in the lab.

Note that the report should be prepared using a Word document and should be clear and readable. The engineering drawings should be prepared using any CAD software.

SUBMISSION OF THE HAMMER PROJECT

Submit a hard copy of the report to your instructor, and a soft copy on eCourses in Word format under the link: Hammer Project Final Report Submission.

GRADING OF HAMMER PROJECT

The grade of the final project is composed of the following:

- 1) Cover page (5%) +4
- 2) Project summary (10%) +0
- 3) Engineering drawings (40%) +7
- 4) Detailed manufacturing procedures (30%) +19
- 5) Photo of the hammer (5%) +0
- 6) eCourses submission of the final report (10%) +10

40
=

+7

1. A plastic polymer block with a 4 x 0.75 dimension is given to us. With the block we used a dial caliper to make the measurement of length for the slope (0.87in) given to us by the handout. A line was drawn to indicate that we would stop at the line.
2. We took the block to the milling machine, placed a 15° pre-made bar and use the vice grips to hold it in place.
3. We would then use the x-y and z-axis to place it in the center of the block.
4. Turn on the machine, move the block away with the x-axis and use the z-axis to raise it by 90°. You would then use the x- and y-axis to remove all of the excess you wish to trim.
5. Continue this process until you reach the line that you indicated.
6. Once completed, wait till it comes to a complete stop, turn off the machine, rotate the block to the opposite side and redo steps 1-5.
7. Once this is done, take the dial caliper and measure the length of the block, then halve that measurement and mark it on the block (~~1.875~~-in) *and 0.38" in width.*
8. Take the block to a drill press with a center drill bit.
9. Placing the block in the vice grips and ensuring that the block is centered against the center drill bit, you secure it in place.
10. Turning on the machine, you drill it just a quarter of the way through. *center drilling process.*
11. Looking at the dimensions given on the hand sheet, you find out the necessary sizing of the drill bit; it was $\frac{1}{2}$ -~~13~~ UNC 2B in this case.
12. Once you replace the drill bits, you turn on the machine and drill through the polymer block. Allow a few passes to ensure that the hole is made completely and there are no frays.
13. Turn off the machine and remove the block from the press.
14. Taking a thread tap (that was $\frac{1}{2}$ -13 UNC 2B), you twist into the hole that was made. Ensure that you thread it completely through the hole, allowing all the frays and grooves to be made thoroughly.
15. Ensuring that you've gone through the motion at least twice, reverse the direction of the thread tap to remove it from the shaft.
16. Using a tool, not your hands, brush away the excess frays.

+5

17. For this process, we are given a 0.752-in diameter, 5.85-in long cylindrical shaft. With this cylinder we grab a dial caliper to measure the diameter of the shaft to do math for necessary dimensions.
18. The undercut is measured at 0.61-in, to find the necessary measurement for the lathe we take the measurement of the shaft and subtract the undercut measurement to get 0.142-in. This cut will be made, starting 1.23-in away from the edge, which is measured and marked with the dial caliper.
19. Next measurement taken is from the given measurement of the handout, 0.75-in, we subtract that from the new shaft measurement, 0.752-in to get 0.002-in. This is the thread portion.
20. Next, the shaft is taken to the lathe machine and placed in the spindle and tightened into place.
21. Once secured, you then choose the tool you will be using for the cutting process and place it onto the cutting tool post, securing it into place.
22. Once both the shaft and cutting tool are in place, the longitude and cross feed handle are then used to position the tool till it just touches the surface; this is your zero point.
23. Then, set the dial on the cross-feed handle measurement to 0.142-in as this will be how far the machine will cut into the shaft. The lathe machine will run manually for the undercut.
24. Turn the machine on and set the speed, then hit the start switch and allow the carriage to move. Once it cuts to the final point, turn the start switch to off and wait for the spindle to stop.
25. Measure the undercut with the dial caliper, the measurement doesn't have to be exact, and however it should be close.
26. Turn the shaft over and repeating the process of securing, we exchanged the cutting tool for a chamfering tool. This allowed us to create the 45 chamfered rim.
27. Remove the shaft from the spindle and retrieve a threading die.
28. A threading die, with the size capabilities of $\frac{1}{2}$ - 13 UNC 2B, is then used to accurately thread the external portion of the end with the initial undercut.
29. Now operating for the opposite end of the shaft, the dial caliper is used to take the measurements of the smaller end. Length is 0.68-in, width is 0.12in. Steps 4-9 are then carried out to.
30. The undercut for the smaller end is measured at 0.4-in and the threading is done using a $\frac{3}{4}$ - 10 UNC 2B.

- o No mention of 2 roughing passes and 1 finishing pass - 3
- o No mention of how to remove the dies after threads were cut on both ends - 2

31. A 2-in line is measured with the dial caliper and marked on a 4-in shaft.

32. The shaft is then inserted into the lathe machine. Using a drilling tool and a lather center, drill about 2-in into the center of the shaft.

33. 1.5-in of the shaft will be threaded.

35. Using the longitude feed handle to move the drill forward to create the hole; be sure to go slowly. *No mention of the thread cutting process. - 2*

36. Drill goes into the shaft to make a hole.

37. Remove shaft from machining.

38. Taking your already threaded hammer shaft, and using the dial caliper, mark 0.8-in.

39. T-shaft placed in lather machine with threaded part going inside machine first; secure shaft.

40. Diameter is measure at 0.754-in, notch is at 0.59-in, thickness is at 1.9-in and threaded areas is 0.5-in ($\frac{1}{2}$ -13 UNC 2B)

41. Feeder used in the x-direction will be used to mark the shaft.

42. Next 3 cuts will be measured on the shaft at 0.1-in, another 0.1-in, and 0.054-in; place the machine on auto to make these incisions.

43. Next the 0 point need to be found, then measuring the undercut at 0.19-in you will begin cutting (you must do it manually); ending diameter will be 0.40

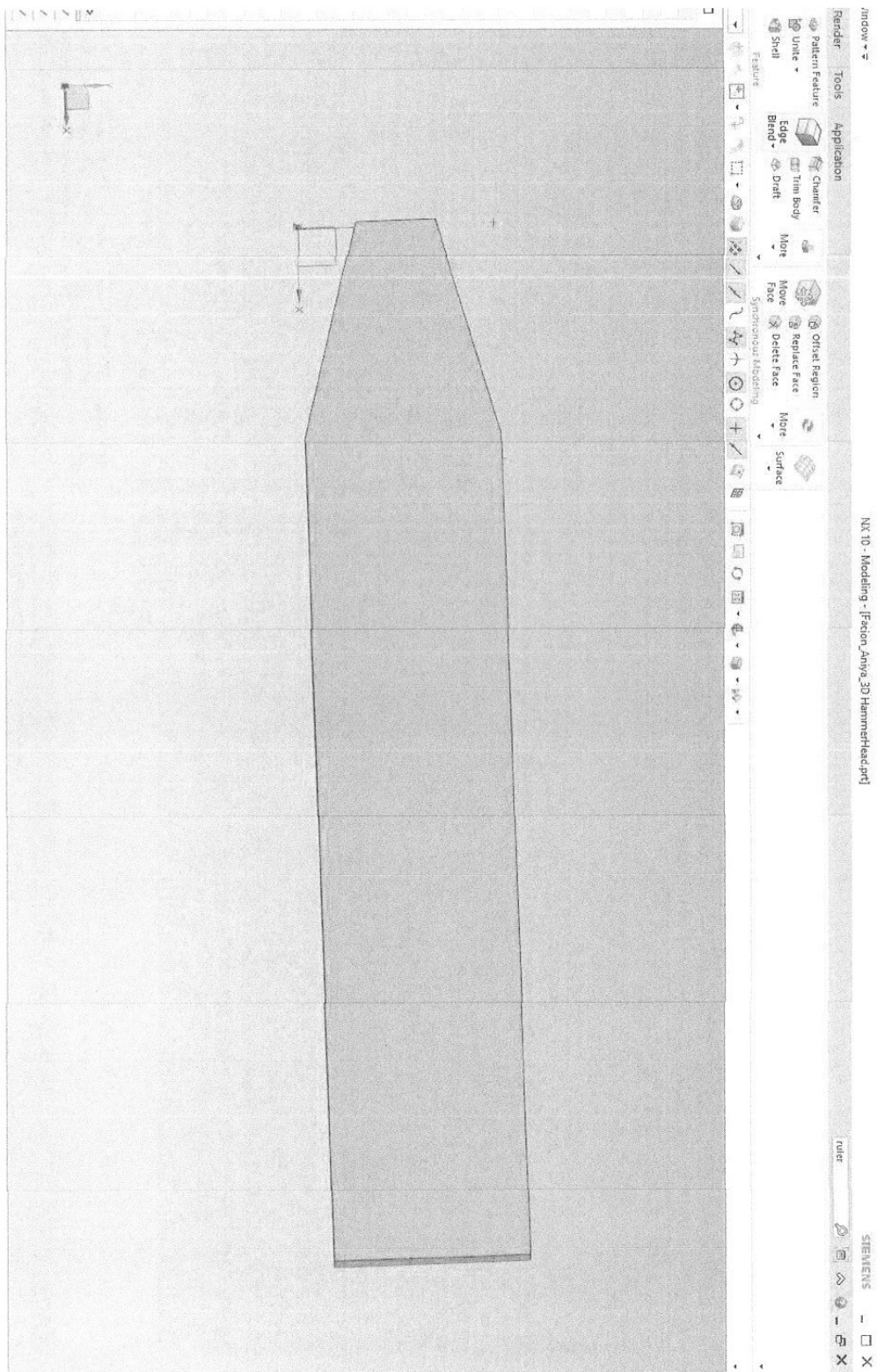
44. Place the holed shaft into the vice.

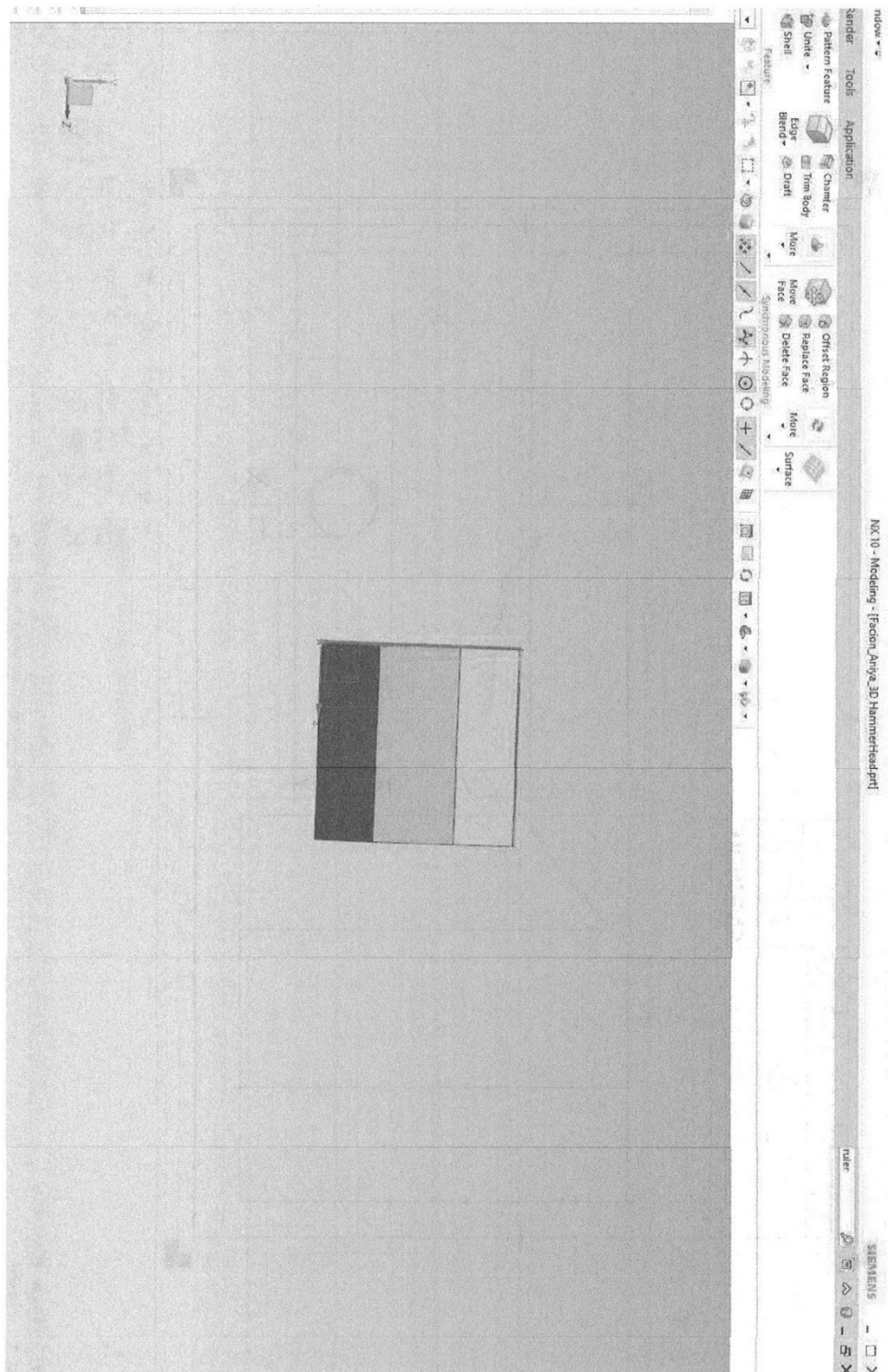
45. Thread inside of the holed shaft with a measurement of $\frac{3}{4}$ -10 UNC 2B until you have reached the designated line on the threaded tool; thread a little further down to ensure it is fully threaded.

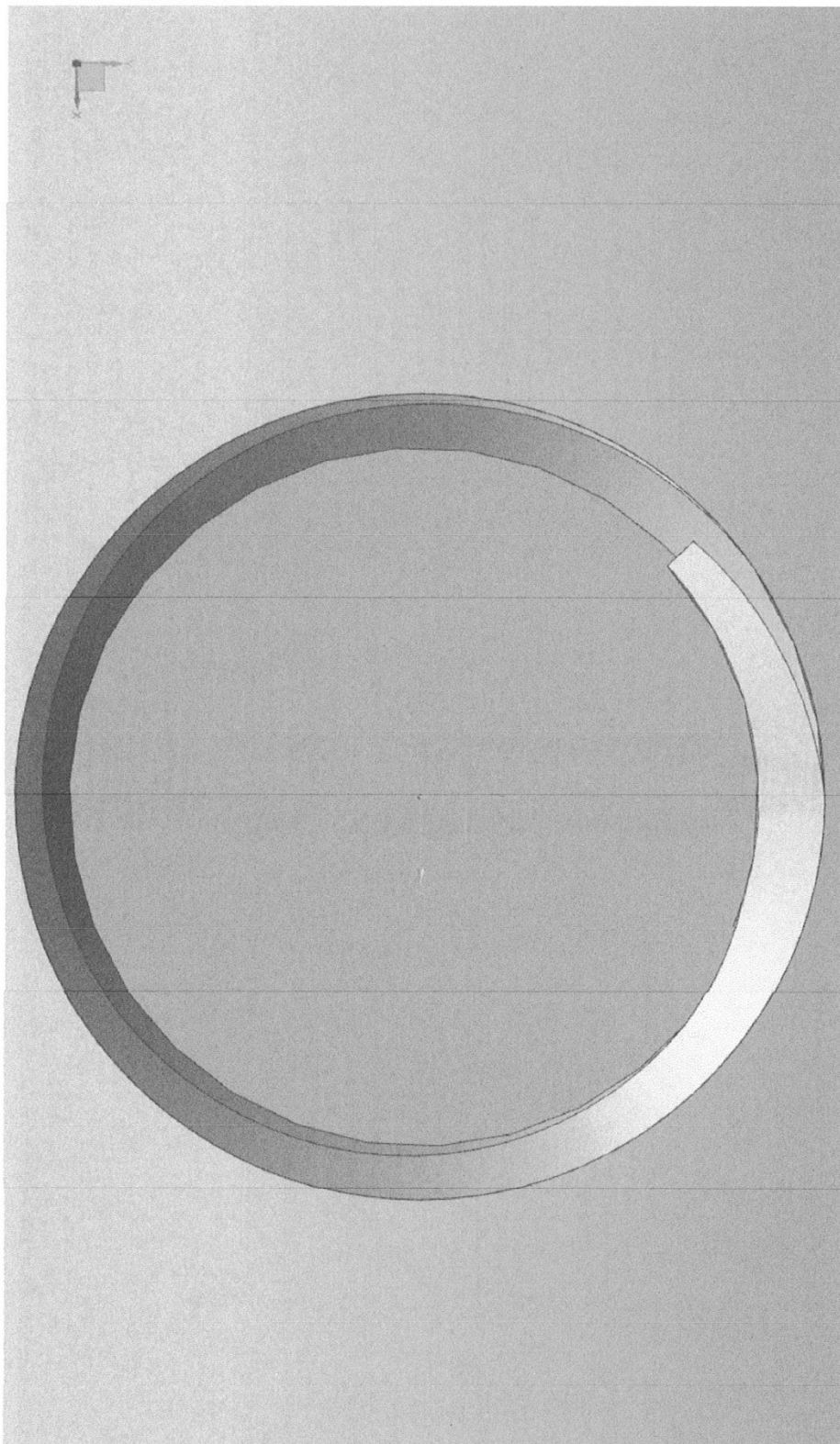
46. Then you will thread the smaller end of the T-Shaft.

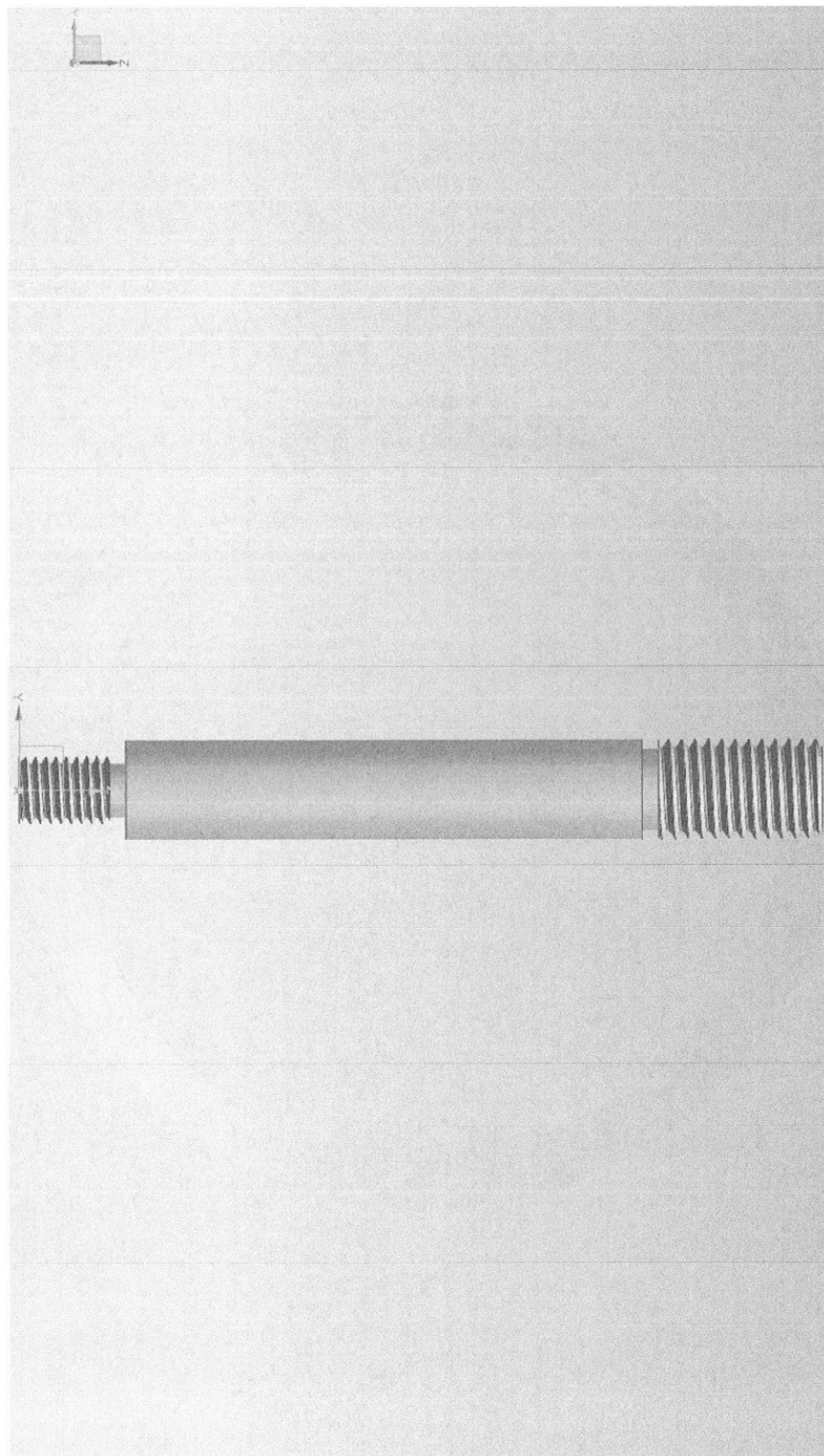
47. Complete assembly by attaching pieces together.

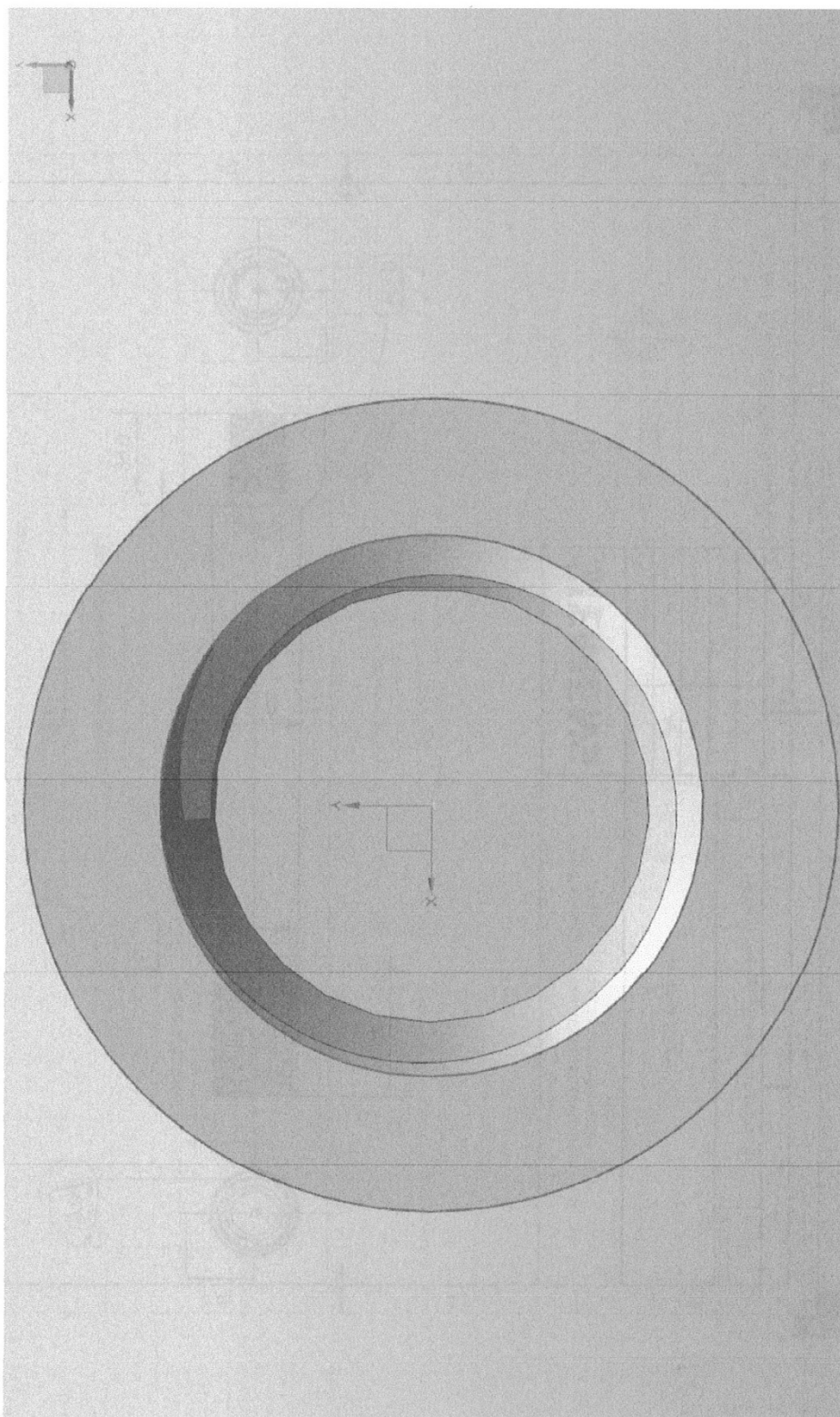
↑
It seems this section belongs to the shaft section.

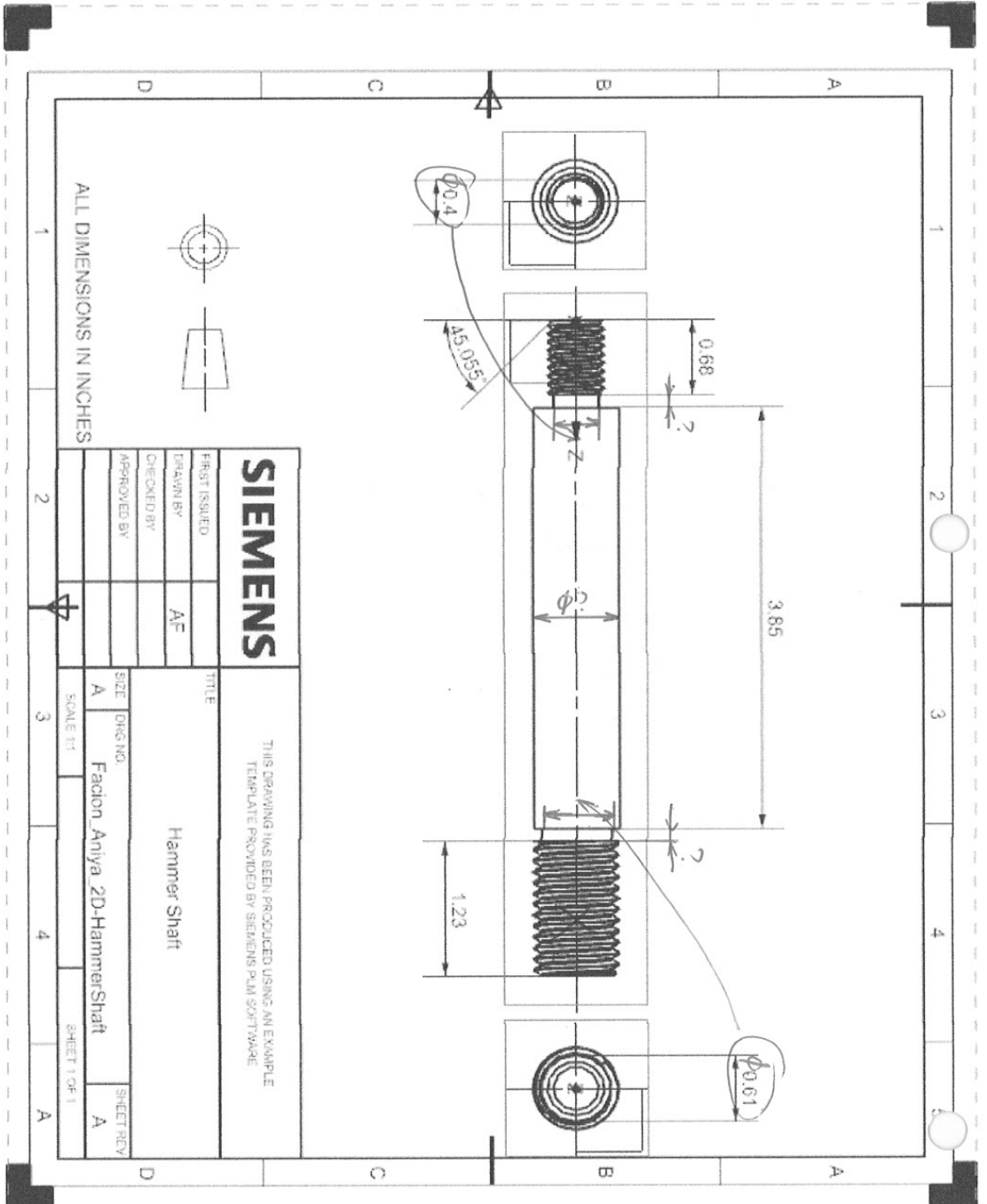




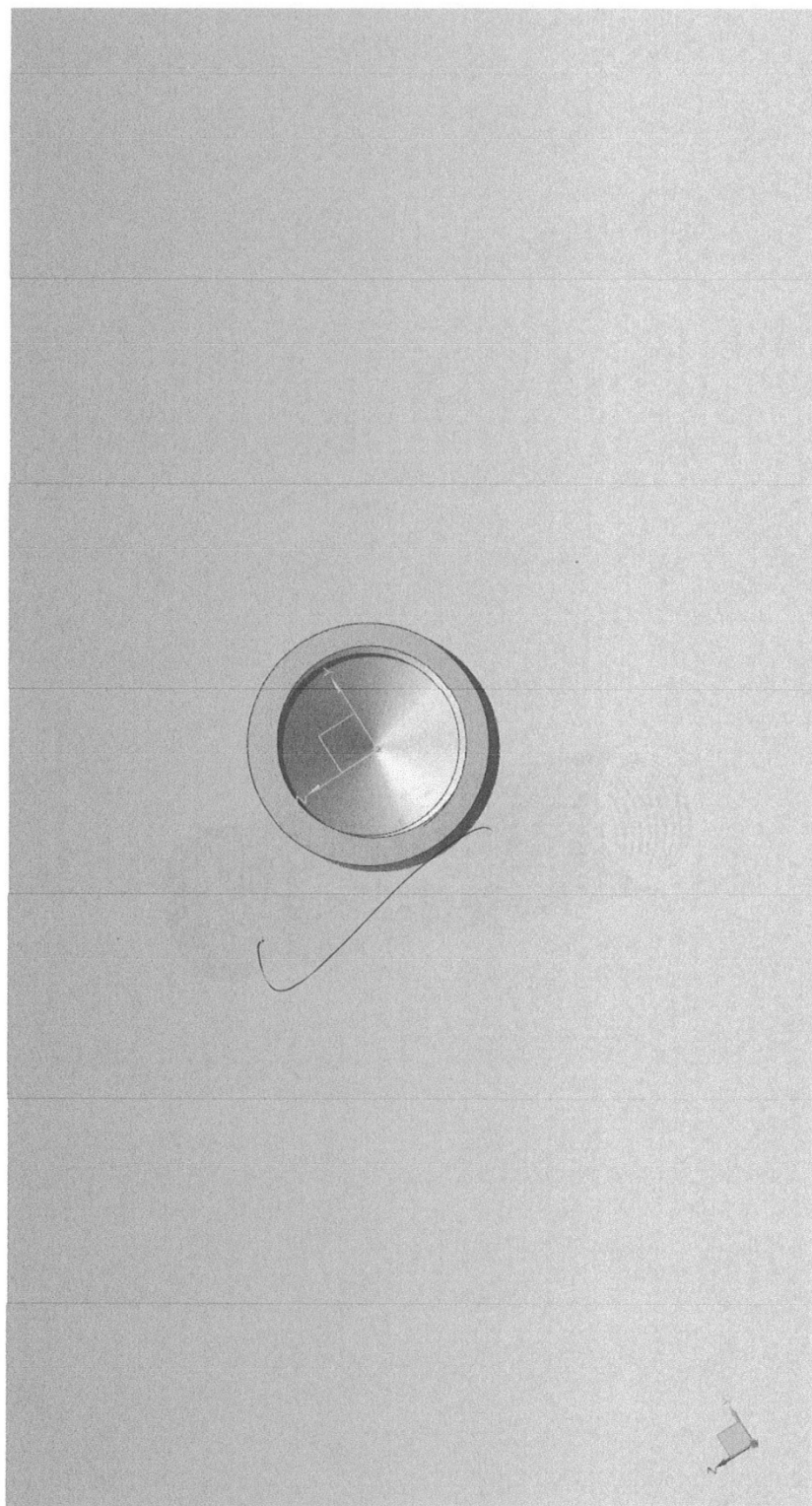


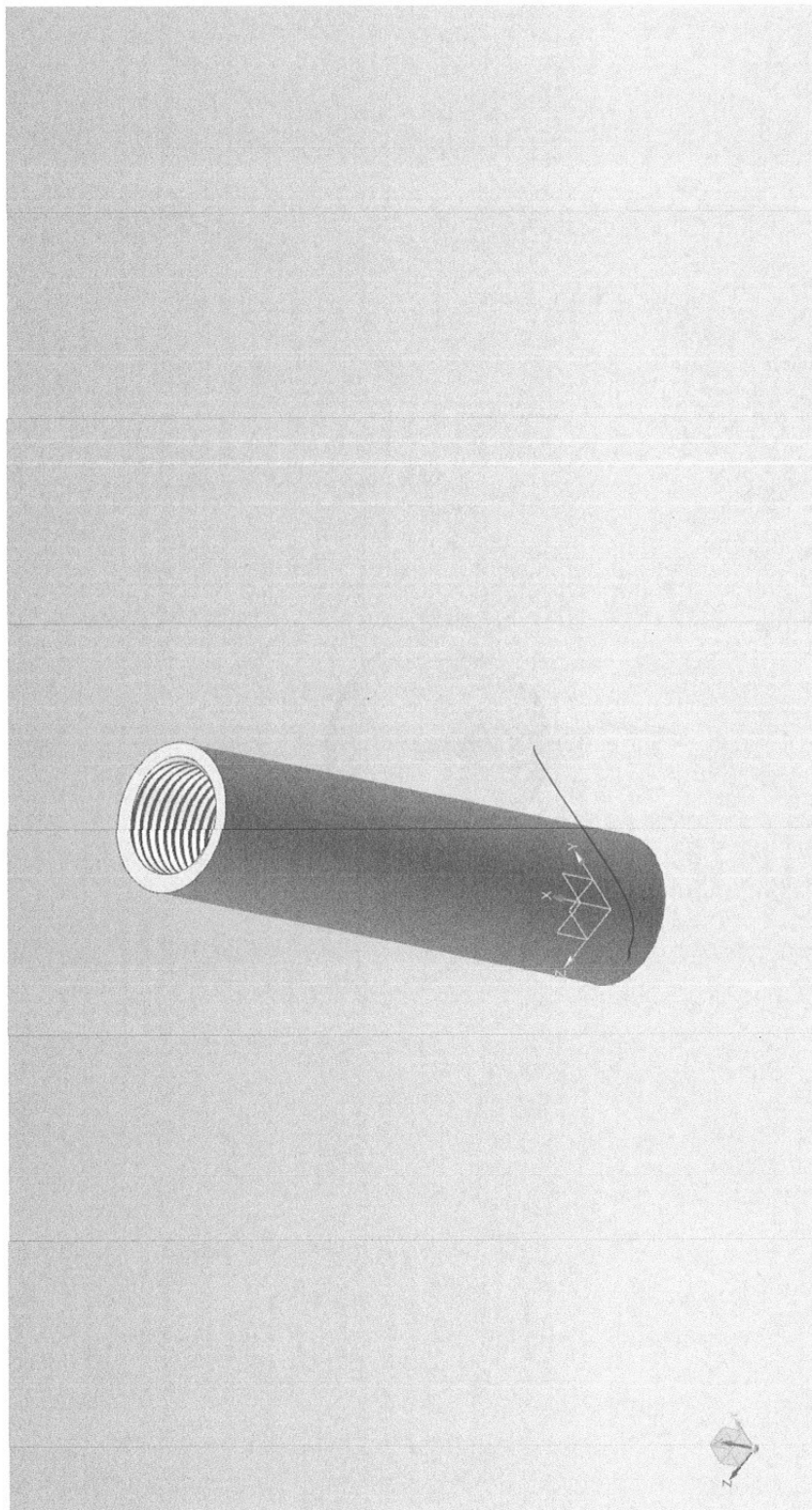




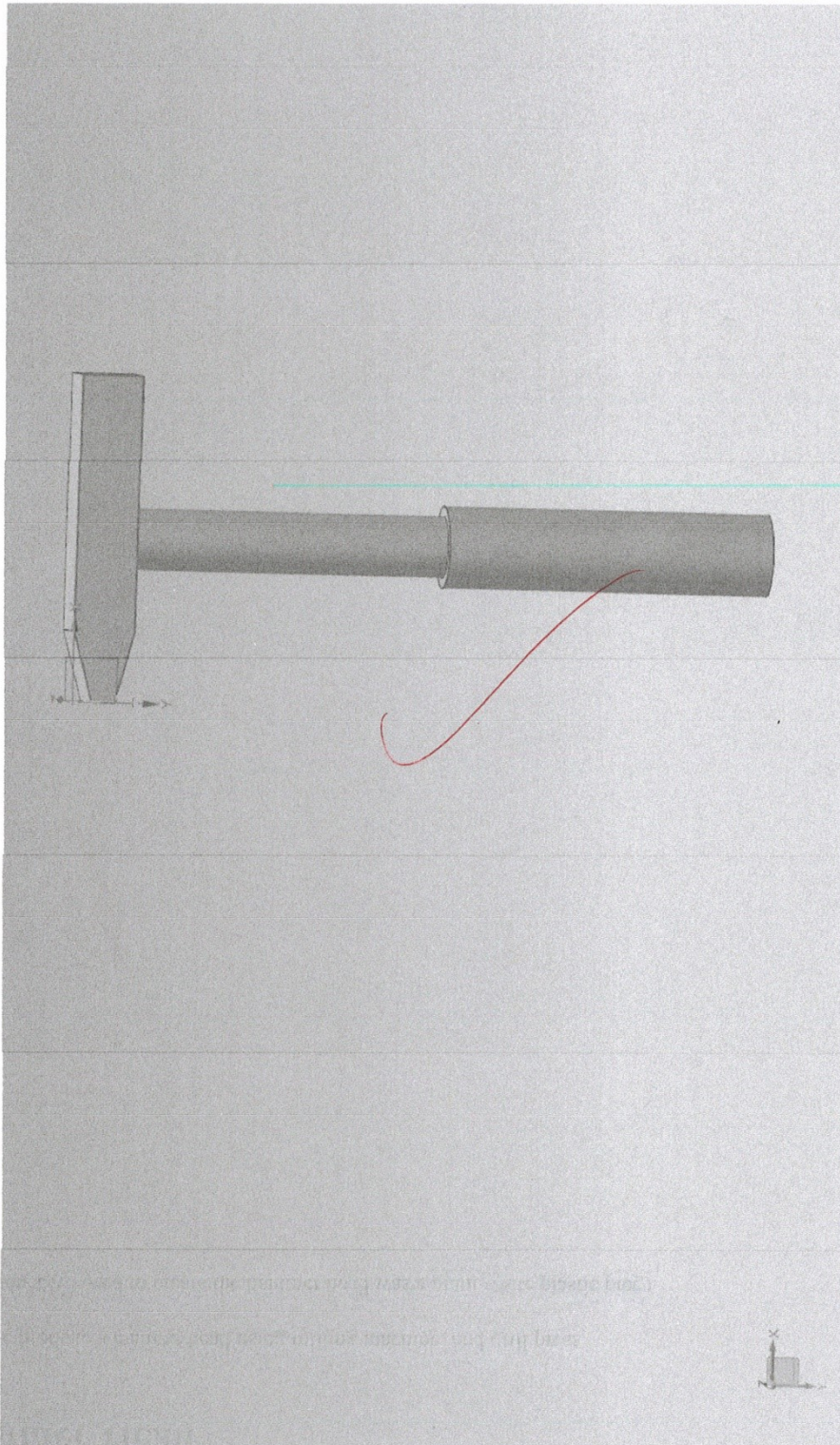


46





• Missing the drawing of the hammer handle. +0.



o missing the drawing of the hammer assembly. +0

**MANUFACTURING PROCESSES LABORATORY
FALL 2021**

PROJECT REPORT # 2

CNC MILLING PROJECT

TOPICS COVERED IN PROJRCT

- 1. Learn to take precise measurements.**
- 2. Learn to understand and create CNC program**
- 3. Provide hands on experiences on operating CNC machine following instructions and safety guidelines**
- 4. Strengthen summarizing and writing skills.**
- 5. Assess awareness of the impact of engineering solutions in a global and societal context.**

Print Name: _____

Lab Section #: _____

Grade: _____

CNC Milling Project (To be completed individually)

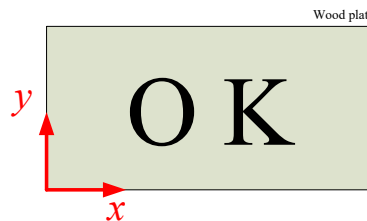
Report Due: Nov 23th, 2021 by 5 pm

PROJECT DETAILS

Use the CNC technology to engrave your name initials on a wooden plate using the HAAS CNC milling machine in the manufacturing lab. The procedures are summarized as follows:

- 1) Design your name initials on a piece of engineering paper with grids;
- 2) Mark the machining sequence of all critical points and their coordinates of your design;
- 3) Write an NC program that can engrave your name initials based on the coordinates of critical points you found;
- 4) Import your program to the CNC milling machine and perform the machining.

One example is shown here:



REPORT REQUIREMENTS

Your final report should be a **Word file** and contains the following topics:

1. Use this handout as the cover page of your report with your name and section number (5%).
2. A project summary of at least 500 words, in which the following contents must be discussed based on this project (20%):
 - Your recognition of ethical and professional responsibilities in engineering situations involving global, and societal contexts
 - Your increased ability in making informed judgments on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in global, economic, environmental, and societal contexts
3. The design of your name initials on the original engineering paper, with machining sequence numbers and coordinates for all critical points (20%).
4. The NC codes you wrote with a description of the function of each line of codes (20%).
5. A photo of your manufactured name initials plate (5%).
6. Describe the detailed operating procedures in using the CNC milling machine to make your name initials plate. You should specify the following topics: hand operations to load the work part, turn on the CNC machine, change the tool, set up the coordinate system, import the program, simulate and debug the program, dry runs, and finally engrave the wood plate, etc. (20%)
7. **Submit a hard copy to your instructor and upload the soft copy to Taskstream (Outcome – 4) (10%)**

**ABOVE AVERAGE
PROJECT REPORT**

Print Name: Joshua Guyton Lab Section #: P02 Grade: 94

CNC Milling Project (To be completed individually)

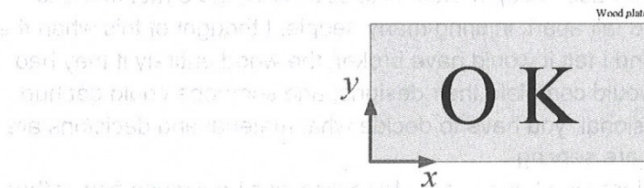
Report Due: Nov 23th, 2021 by 5 pm

PROJECT DETAILS

Use the CNC technology to engrave your name initials on a wooden plate using the HAAS CNC milling machine in the manufacturing lab. The procedures are summarized as follows:

- 1) Design your name initials on a piece of engineering paper with grids;
- 2) Mark the machining sequence of all critical points and their coordinates of your design;
- 3) Write an NC program that can engrave your name initials based on the coordinates of critical points you found;
- 4) Import your program to the CNC milling machine and perform the machining.

One example is shown here:



REPORT REQUIREMENTS

Your final report should be a **Word file** and contains the following topics:

- 1) Use this handout as the cover page of your report with your name and section number (5%). **+5**
- 2) A project summary of at least 500 words, in which the following contents must be discussed based on this project (20%): **+20**
 - Your recognition of ethical and professional responsibilities in engineering situations involving global, and societal contexts
 - Your increased ability in making informed judgments on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in global, economic, environmental, and societal contexts
- 3) The design of your name initials on the original engineering paper, with machining sequence numbers and coordinates for all critical points (20%). **+16**
- 4) The NC codes you wrote with a description of the function of each line of codes (20%). **+19**
- 5) A photo of your manufactured name initials plate (5%). **+5**
- 6) Describe the detailed operating procedures in using the CNC milling machine to make your name initials plate. You should specify the following topics: hand operations to load the work part, turn on the CNC machine, change the tool, set up the coordinate system, import the program, debug the program, dry runs, and finally engrave the wood plate, etc. (20%) **+18**
- 7) **Submit a hard copy to your instructor and upload the soft copy to Taskstream (Outcome - 4) (10%)** **+5**

88

project summary

The goal of this project was to learn the basics of CNC code and use it to program the CNC mill. We used the CNC mill to mill a piece of wood with the design of our choosing. Throughout this project, I have gained recognition for the ethical and professional responsibilities that engineering situations require. The effect that engineering has involves the entire globe and affects society as a whole. I have also gained an increased ability to make informed judgments on ethical and professional responsibilities in engineering. In addition, I have also started to consider the impact that engineering solutions have around the globe on the economy, environment, and social aspects of life.

Throughout this project, one thing I came to realize was how much power that engineering holds in society. Engineers are responsible for building the foundation for many different builds and vehicles. They also play a significant role in many household appliances. When making these various structures and machines, a lot of ethical responsibilities must go into it. I realized this when watching the CNC mill engrave my design into the wood. Engineers would be in charge of choosing the material as well as creating the CNC code. If they take unethical shortcuts, not only could this put people in harm's way they would also be taking advantage of their consumers. If they use cheap materials to save cost, the structures and vehicles they build would break and fall apart, injuring many people. I thought of this when the wood carving starters splintered, and I felt it would have broken the wood entirely if they had used thinner wood. Then no one would complete their designs, and someone could get hurt from the wood pieces. As a professional, you have to decide what material and decisions are best for you and the audience you are serving.

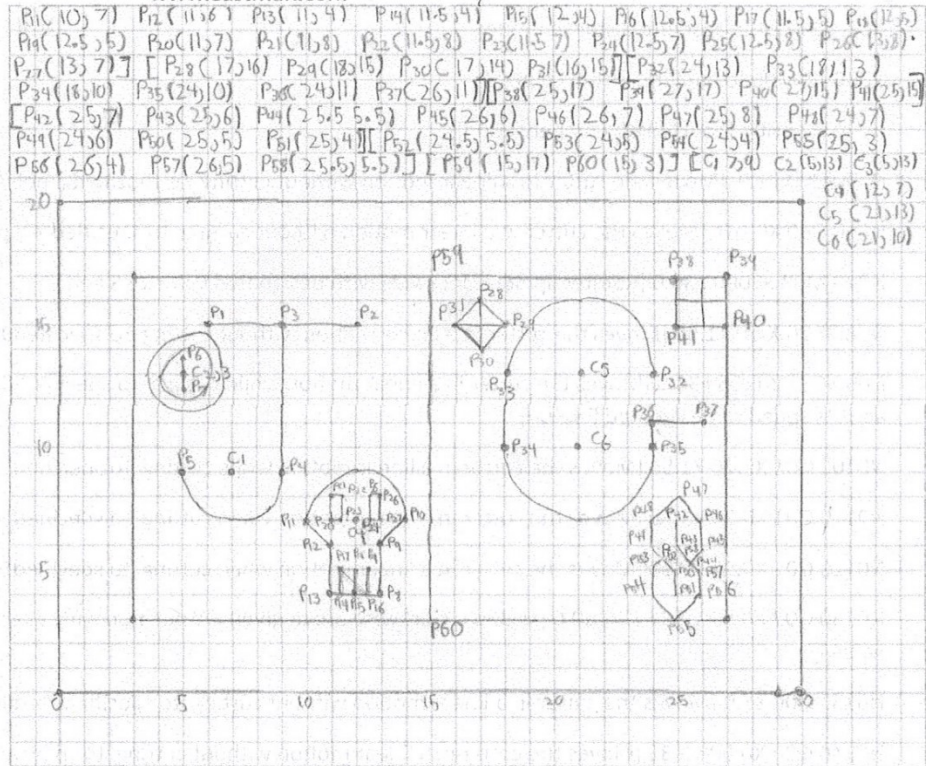
Throughout this project, one thing I came to realize was how much power that engineering holds in society. Engineers are responsible for building the foundation for many different builds and vehicles. This project has also gotten me to start thinking of ethical engineering decisions and how they will affect the economy, environment, and social aspects of life around the globe. Engineering has made many technological advances possible, but at the same time, it has taken a toll on our environment. With all of the factories and vehicles that engineering has made, we must consider the carbon emitted and affect our ozone layer. There is also the fact that due to human error and other factors, many natural resources are used and wasted. When I saw that some students had to redo the wood carving, which wastes some material, this came to my mind. These are all environmental factors that should be considered when making decisions in engineering. I also realized how engineering affects our social and economic life. Like we made the design for this project, many things can be created simply for pleasure. Engineers have to choose to sell the items, which helps increase money flow in the economy. Technologies are also built for people to enjoy, such as different pieces of art. The designs we made in class were simple, but the CNC mill could create beautiful works of art that bring people together. This project has gotten me to consider the ethical and professional responsibilities of engineering. It has also increased my ability to make informed judgments on ethical and professional responsibilities in engineering and consider the impact engineering solutions have on global, economic, environmental, and societal contexts.

+ 20

design

$[P_1(6,15) P_2(12,15) P_3(9,16) P_4(9,16) P_5(5,9)] [P_6(5,13.5) P_7(5,12.5)] [P_8(13,4) P_9(13,6) P_{10}(14,7)]$

www.eastman.com



• Not the original design paper - 2

18 - 2

+1.6

CNC milling code

O8913 (Guyton.txt) [File name]

N010 G54 [sets work coordinates system offset]

N020 G90 [Sets absolute distance mode]

N030 T1 M06 [completes a tool change]

N040 G43 H01 [Tool length compensation]

N050 G00 Z2.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N060 G00 X0. Y0. [Moves the cutter in a linear motion without cutting to specified X Y point]

N070 M03 S2000 F30.0 [Rotates spindle clockwise with designated value of S and F]

N080 G00 X.60 Y1.50 [Moves the cutter in a linear motion without cutting to specified X Y point]

N090 G01 Z-0.05 ~~F30.0~~ [Moves the cutter in a linear motion while cutting to specified Z point and adjusts speed to designated F value]

N0100 G01 X1.20 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0110 G01 X0.90 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0120 G01 X0.90 Y0.90 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0130 G02 X0.50 Y.90 I-0.20 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0131 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0140 G00 X0.50 Y1.35 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0141 G01 Z-0.05 [Moves the cutter in a linear motion without cutting to specified Z point]

N0150 G01 X0.50 Y1.25 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0151 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0160 G00 X0.40 Y1.30 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0161 G01 Z-0.05 [Moves the cutter in a linear motion without cutting to specified Z point]

N0170 G02 X0.4 Y1.30 I0.1 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0171 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0180 G00 X0.35 Y1.30 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0181 G01 Z-0.05 [Moves the cutter in a linear motion without cutting to specified Z point]

N0190 G02 X0.35 Y1.30 I0.15 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0191 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0200 G00 X1.30 Y0.40 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0201 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0210 G01 X1.30 Y0.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0220 G01 X1.40 Y0.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0230 G03 X1.0 Y0.70 I-0.20 J0.0 [Makes a counter clockwise arc to given X Y position with a radius of specified value I]

N0240 G01 X1.10 Y0.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0250 G01 X1.10 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0260 G01 X1.15 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0270 G01 X1.15 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0271 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0280 G00 X1.15 Y0.40 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0281 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0290 G01 X1.20 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0300 G01 X1.20 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0301 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0310 G00 X1.20 Y0.40 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0311 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0320 G01 X1.25 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0330 G01 X1.25 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0331 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0340 G00 X1.25 Y0.40 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0341 G01 Z-0.05 [Moves the cutter in a linear motion without cutting to specified Z point]

N0350 G01 X1.30 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0351 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0360 G00 X1.10 Y0.70 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0361 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0370 G01 X1.10 Y0.80 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0380 G02 X1.15 Y0.80 I0.025 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0390 G01 X1.15 Y0.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0400 G02 X1.10 Y0.70 I-0.025 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0401 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0410 G00 X1.25 Y0.70 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0411 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0420 G01 X1.25 Y0.80 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0430 G02 X1.30 Y0.80 I0.025 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0440 G01 X1.30 Y0.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0450 G02 X1.25 Y0.70 I-0.025 J0.0 [Makes a clockwise arc to given X Y position with a radius of specified value I]

N0451 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0460 G00 X1.70 Y1.60 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0461 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0470 G01 X1.80 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0480 G01 X1.70 Y1.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0490 G01 X1.60 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0500 G01 X1.70 Y1.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0510 G01 X1.70 Y1.40 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0511 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0520 G00 X1.60 Y1.50 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0521 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0530 G01 X1.80 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0531 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0540 G00 X2.40 Y1.30 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0541 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0550 G03 X1.80 Y1.30 I-0.30 J0.0

N0560 G01 X1.80 Y1.0 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0570 G03 X2.40 Y1.0 I0.30 J0.0 [Makes a counter clockwise arc to given X Y position with a radius of specified value I]

N0580 G01 X2.40 Y1.10 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0590 G01 X2.60 Y1.10 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0591 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0600 G00 X2.50 Y1.70 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0601 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0610 G01 X2.70 Y1.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0620 G01 X2.70 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0630 G01 X2.50 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0640 G01 X2.50 Y1.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0641 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0650 G00 X2.60 Y1.70 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0651 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0660 G01 X2.60 Y1.50 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0661 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0670 G00 X2.50 Y1.60 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0671 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0680 G01 X2.70 Y1.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0681 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]

N0690 G00 X2.50 Y0.70 [Moves the cutter in a linear motion without cutting to specified X Y point]

N0691 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]

N0700 G01 X2.50 Y0.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0710 G01 X2.55 Y0.55 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0720 G01 X2.60 Y0.60 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0730 G01 X2.60 Y0.70 [Moves the cutter in a linear motion while cutting to specified X Y point]

N0740 G01 X2.50 Y0.80 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0750 G01 X2.40 Y0.70 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0760 G01 X2.40 Y0.60 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0770 G01 X2.50 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0780 G01 X2.50 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0781 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]
N0790 G00 X2.45 Y0.55 [Moves the cutter in a linear motion without cutting to specified X Y point]
N0791 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]
N0800 G01 X2.40 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0810 G01 X2.40 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0820 G01 X2.50 Y0.30 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0830 G01 X2.60 Y0.40 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0840 G01 X2.60 Y0.50 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0850 G01 X2.55 Y0.55 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0851 G00 Z1.0 [Moves the cutter in a linear motion without cutting to specified Z point]
N0860 G00 X1.50 Y1.70 [Moves the cutter in a linear motion without cutting to specified X Y point]
N0861 G01 Z-0.05 [Moves the cutter in a linear motion while cutting to specified Z point]
N0870 G01 X1.50 Y0.30 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0880 G01 X2.70 Y0.30 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0890 G01 X2.70 Y1.70 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0900 G01 X0.30 Y1.70 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0910 G01 X0.30 Y0.30 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0920 G01 X1.50 Y0.30 [Moves the cutter in a linear motion while cutting to specified X Y point]
N0930 G00 Z2.0 [Moves the cutter in a linear motion without cutting to specified Z point]
N0940 G00 X0.0 Y0.0 [Moves the cutter in a linear motion without cutting to specified X Y point]
N0950 M05 [Stops the spindle rotation]
N0960 M30 [Ends the program and rewind]

+19.

Finished plate



+5

CNC milling procedures

1. Loading the work part
 - A. First we clear off the workspace and make sure no debris is on the vice
 - B. Put the parallels on both sides of the vice to help mount our stock
 - C. Place our stock into the vice in between the parallels
 - D. Tighten the vice
2. Turn on the CNC machine
3. Tool change
 - A. Close the machine door
 - B. Use the motor menu and press the MDI DNC
 - C. Type in T4 to select the fourth tool on motor menu
 - D. Press ATC FWD on motor menu
4. Setting up coordinate system
 - A. Press the offset button motor menu
 - B. Move the cursor to highlight Y axis in G54
 - C. Press the Part zero set button ←
 - D. Bring the tool up in the Z direction
 - E. Move the tool for 0.1 in in the positive Y direction
 - F. Highlight the Y axis in G54
 - G. Press the Part zero set
 - H. Repeat these steps for the X direction
5. Setting up Z coordinates
 - A. Press the MDI DNC button
 - B. Press T1
 - C. Press the ATC FWD button
 - D. Move your tool 1 to right above the work part
 - E. Use paper to feel the drag ← *Highlight Tool 1.*
 - F. Press the tool offset measure button
 - G. Repeat the process for every tool to be used
- 7-10. Import the program, debug the program, dry run and engrave the wood plate
 - A. Press the list program button to bring up files
 - B. Use the cursor to select of specific file from the flash drive
 - C. Press select program button
 - D. Press the setting graphic button twice
 - E. Press the green circle start button several times
 - F. Press the offset button
 - G. Manual input 6.0
 - H. Press enter
 - I. Press the memory button
 - J. Press the cycle start button
 - K. Cancel all offsets in Z direction
 - L. Press the memory button **X2**
 - M. Press the green circle start button
 - N. hold the feed hold button in case any errors occur

+18

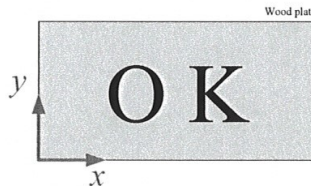
**AVERAGE
PROJECT REPORT**

Print Name: Austin SmithLab Section #: P02Grade: 80**CNC Milling Project** (To be completed individually)**Report Due: Nov 23th, 2021 by 5 pm****PROJECT DETAILS**

Use the CNC technology to engrave your name initials on a wooden plate using the HAAS CNC milling machine in the manufacturing lab. The procedures are summarized as follows:

- 1) Design your name initials on a piece of engineering paper with grids;
- 2) Mark the machining sequence of all critical points and their coordinates of your design;
- 3) Write an NC program that can engrave your name initials based on the coordinates of critical points you found;
- 4) Import your program to the CNC milling machine and perform the machining.

One example is shown here:

**REPORT REQUIREMENTS**

Your final report should be a **Word file** and contains the following topics:

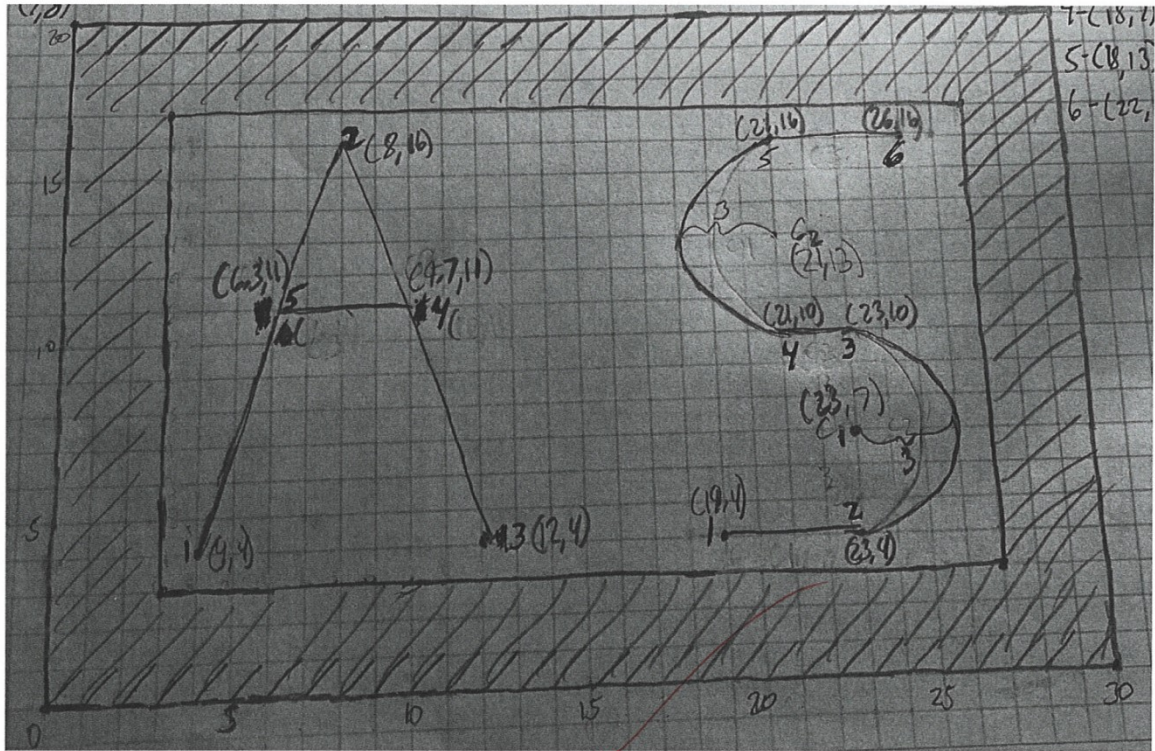
- 1) Use this handout as the cover page of your report with your name and section number (5%). **+5**
- 2) A project summary of at least 500 words, in which the following contents must be discussed based on this project (20%): **+0**
 - Your recognition of ethical and professional responsibilities in engineering situations involving global, and societal contexts
 - Your increased ability in making informed judgments on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in global, economic, environmental, and societal contexts
- 3) The design of your name initials on the original engineering paper, with machining sequence numbers and coordinates for all critical points (20%). **+13**
- 4) The NC codes you wrote with a description of the function of each line of codes (20%). **+17**
- 5) A photo of your manufactured name initials plate (5%). **+5**
- 6) Describe the detailed operating procedures in using the CNC milling machine to make your name initials plate. You should specify the following topics: hand operations to load the work part, turn on the CNC machine, change the tool, set up the coordinate system, import the program, debug the program, dry runs, and finally engrave the wood plate, etc. (20%) **+19**
- 7) **Submit a hard copy to your instructor and upload the soft copy to Taskstream (Outcome - 4) (10%)** **+5**

64

Summary

0

Initial Design



Not the original design paper - 2

15-2

+ 13

NC Code

%
O1779(Smith.txt)
N010 G54 – Work coordinate system offset (X and Y)
N020 G90 – Absolute distance mode
N030 T1 M06 – Change to tool 1
N040 G43 H01- Tool length offset at 01
N050 G00 Z2.0 – Rapid position tool 2 inches above wood
N060 G00 X0.0 Y0.0 – Rapid position tool to (0,0)
N070 M03 S2000 F30.0- Rotate spindle clockwise at speed 2000 at feed rate of 30
N080 G00 X0.4 Y0.4 – Rapid position at (4,4)
N090 G01 Z-0.050 – Move tool down 0.050
N100 G01 X0.8 Y1.6 – Rapid position tool to (8,16) 1st line
N110 G01 X1.2 Y0.4 – Rapid position tool to (12,4) 2nd line
N120 G01 X0.97 Y1.1- Rapid position tool (9.7,11)
N130 G01 X0.63 Y1.1 – Rapid position tool (6.3,11) 3rd line
N140 G00 Z1.0 – Raise tool to 1
N150 G00 X1.9 Y0.4 – Rapid position to (19,4)
N160 G01 Z-0.05 – Move tool down to 0.05
N170 G01 X2.3 Y0.4 – Rapid position to (23,4) 1st line
N180 G03 X2.3 Y1.0 R0.3 – Counter clock wise circle to (23, 10) Radius 3
N190 G01 X2.1 Y1.0 – Rapid position to (21,10) 3rd line
N200 G02 X2.1 Y1.6 R0.3 – Clock wise circle to (21,16) Radius 3
N210 G01 X2.6 Y1.6 – Rapid position to (26, 16) 5th line
N220 G00 Z2.0 – Move tool to 2
N230 G00 X0.0 Y0.0 – Rapid position back to (0,0)
N240 M05 – Stop spindle
N250 M30 – Program end
%

o No IJK method use for cutting curves. -2

+17

Manufactured name initials plate



Detailed operating procedures

Step 1: Clean the vice grip CNC machine

Step 2: Place parallels on both ends of vice

Step 3: Place wood piece into vice grip between parallels lining the origin up at the front left corner

Step 4: Use tool to tighten the vice grip. Check if parallels are moving. If they are use a rubber mallet to hammer until it's aligned.

Step 5: Go to section 4 on the display and press the MDI/DNC button in order to do a tool change to #4. Press T and 4. Then press ATC/FWD.

Step 6: Press the Handle/Jog button in order move tool to the front left edge of the part. Press .01 then press the -Z button also using X and Y button to line the tool at front left edge with the dial. Following that press 7 5 0. Then press CW to start spindle. Press .001. Using the dial to align the tool. When aligned press STOP spindle button.

Step 7: Press the offset button. Move the cursor to highlight the Y axis in G54. Press Part Zero set button. Bring the tool up in Z direction. Move tool for 0.1 in in the Y direction. Press part zero set button. Do the same for the X direction.

Step 8: Press MDI/DNC button. Press the T1 button. Press the ATC/FWD button. Move T1 to the right above the work part. Use paper to feel the drag. Press the Tool offset measurement button.

Step 9: Place the USB into the Machine. Press the List Program button. Use the cursor to select the right file from flash drive. Press Select Program Button.

Step 10: Do a dry run by pressing Offset button and manually putting in 6.0 then press ENTER. Press the Memory button. Press the Cycle start button. When dry run is done Cancel all offsets in the Z direction

Step 11: Press the Setting Graphic twice then press the Cycle start button. Press the Memory button. Press the Cycle start button while also keeping your finger on the FEED hold button.

Step 11: When program is done take a brush to clean part. Then remove part from vice.

+ 19

BELOW AVERAGE
PROJECT REPORT

Print Name: Priscille Djomo

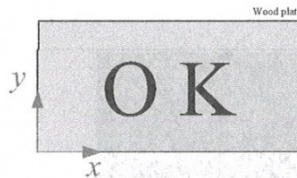
Lab Section #: P02

Grade: 48**CNC Milling Project** (To be completed individually)**Report Due: Nov 23rd, 2021 by 5 pm****PROJECT DETAILS**

Use the CNC technology to engrave your name initials on a wooden plate using the HAAS CNC milling machine in the manufacturing lab. The procedures are summarized as follows:

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- 4) Import your program to the CNC milling machine and perform the machining.

One example is shown here:

**REPORT REQUIREMENTS**

Your final report should be a **Word file** and contains the following topics:

- 1) Use this handout as the cover page of your report with your name and section number (5%). +5
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 - Your recognition of ethical and professional responsibilities in engineering situations involving global, and societal contexts
 - Your increased ability in making informed judgments on ethical and professional responsibilities in engineering while considering the impact of engineering solutions in global, economic, environmental, and societal contexts
- 3) The design of your name initials on the original engineering paper, with machining sequence numbers and coordinates for all critical points (20%). +13
- 4) The NC codes you wrote with a description of the function of each line of codes (20%). +0
- 5) A photo of your manufactured name initials plate (5%). +0
- 6) Describe the detailed operating procedures in using the CNC milling machine to make your name initials plate. You should specify the following topics: hand operations to load the work part, turn on the CNC machine, change the tool, set up the coordinate system, import the program, debug the program, dry runs, and finally engrave the wood plate, etc. (20%) +0
- 7) **Submit a hard copy to your instructor and upload the soft copy to Taskstream (Outcome - 4) (10%)** +5

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Engraving name CNC milling code:

These codes are generated through Mach3 and Lazy cam software

First in wizard we open and run text engraving

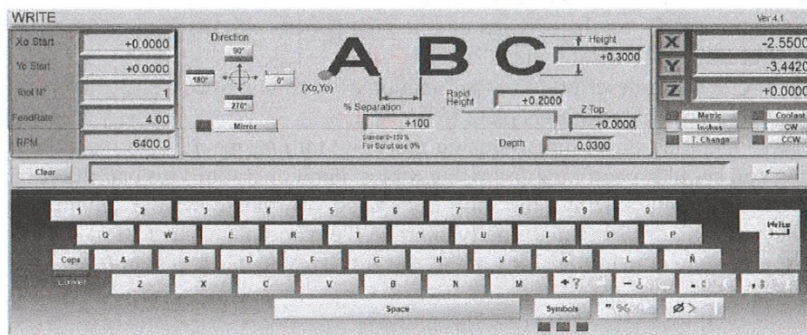
Then we put our text

After that an RPM is given to it and also feed rate is giving to it.

Then direction is selected from where engraving will be started.

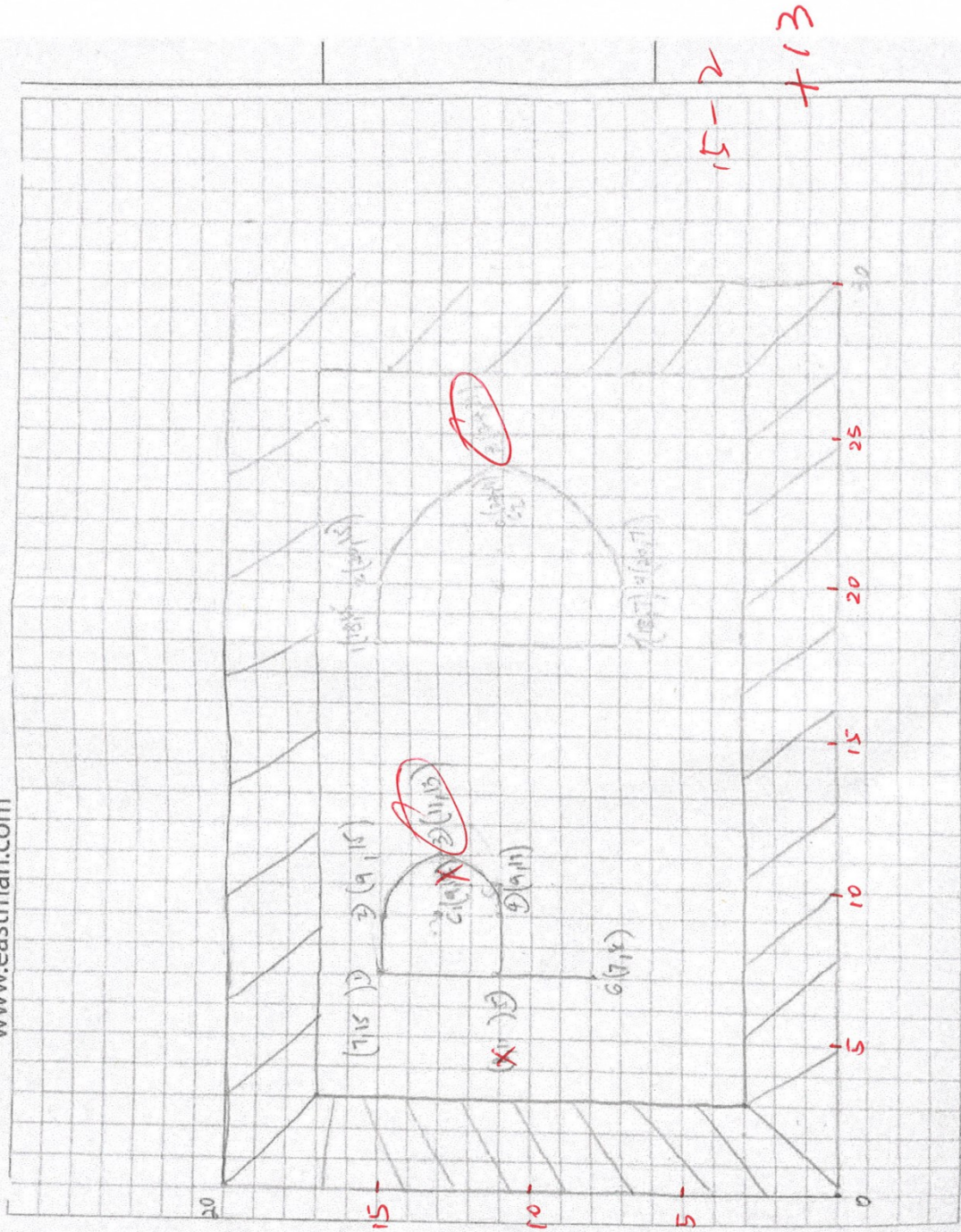
Then depth is given into it

Also font style is selected in it



EASTMAN

www.eastman.com



Code:

G00 G49 G40 G17 G80 G50 G90

G20

M03 S7500

G00 Z0.1

G00 G90 X0Y0

F5

G00 X0 Y0

G00 Z0

G00 Z-0.02

G01 X0.09435 Y0

G03 X0.129725 Y0.003225 I0.09545 J0.183775

G03 X0.19765 Y0.0487 I0.1144 J0.09955

G03 X0.2128 Y0.10705 I0.092975 J0.10705

G03 X0.20425 Y0.151525 I0.092975 J0.10705

G03 X0.15145 Y0.202875 I0.121625 J0.119375

G03 X0.1082 Y0.210425 I0.10195 J0.047

G03 X0 Y0.2111 I0.04665 J-0.9911

G01 X0 Y0.205475

G02 X0.01345 Y0.20505 I0.003925 J0.11795

G02 X0.024175 Y0.200225 I0.010475 J0.184075

G02 X0.027675 Y0.195175 I0.01705 J0.191575

G02 X0.029825 Y0.182775 I-0.0162 J0.18115
G02 X0.031075 Y0.10505 I-2.407975 J0.10505
G02 X0.029875 Y0.02915 I-2.407975 J0.10505
G02 X0.0282 Y0.017575 I-0.0216 J0.0308
G02 X0.02345 Y0.01045 I0.0146 J0.021475
G02 X0.011075 Y0.00575 I0.01025 J0.02655
G02 X0 Y0.005625 I0.003925 J0.137525
G01 X0 Y0
G00 Z0.1
G00 X0.0598 Y0.0156
G00 Z0
G01 Z-0.02
G03 X0.1019 Y0.011625 I0.0929 J0.141675
G03 X0.1755 Y0.084775 I0.0937 J0.093475
G03 X0.17725 Y0.1054 I0.0557 J0.1054
G03 X0.16765 Y0.15275 I0.0557 J0.1054
G03 X0.091775 Y0.19945 I0.09465 J0.11915
G03 X0.0598 Y0.19495 I0.09555 J0.05705
G01 X0.0598 Y0.0156
G00 Z0.1
G00 X0.2945 Y0
G00 Z0

G00 Z-0.02

G01 X0.38885 Y0

G03 X0.424225 Y0.003225 I0.38995 J0.183775

G03 X0.49215 Y0.0487 I0.4089 J0.09955

G03 X0.5073 Y0.10705 I0.387475 J0.10705

G03 X0.49875 Y0.151525 I0.387475 J0.10705

G03 X0.44595 Y0.202875 I0.416125 J0.119375

G03 X0.4027 Y0.210425 I0.39645 J0.047

G03 X0.2945 Y0.2111 I0.34115 J-0.9911

G01 X0.2945 Y0.205475

G02 X0.30795 Y0.20505 I0.298425 J0.11795

G02 X0.318675 Y0.200225 I0.304975 J0.184075

G02 X0.322175 Y0.195175 I0.31155 J0.191575

G02 X0.324325 Y0.182775 I0.2783 J0.18115

G02 X0.325575 Y0.10505 I-2.113475 J0.10505

G02 X0.324375 Y0.02915 I-2.113475 J0.10505

G02 X0.3227 Y0.017575 I0.2729 J0.0308

G02 X0.31795 Y0.01045 I0.3091 J0.021475

G02 X0.305575 Y0.00575 I0.30475 J0.02655

G02 X0.2945 Y0.005625 I0.298425 J0.137525

G01 X0.2945 Y0

G00 Z0.1

G00 X0.3543 Y0.0156

G00 Z0

G01 Z-0.02

G03 X0.3964 Y0.011625 I0.3874 J0.141675

G03 X0.47 Y0.084775 I0.3882 J0.093475

G03 X0.47175 Y0.1054 I0.3502 J0.1054

G03 X0.46215 Y0.15275 I0.3502 J0.1054

G03 X0.386275 Y0.19945 I0.38915 J0.11915

G03 X0.3543 Y0.19495 I0.39005 J0.05705

G01 X0.3543 Y0.0156

G00 Z0.1

G00 X0.589 Y0

G00 Z0

G00 Z-0.02

G01 X0.589 Y0.005625

G03 X0.600125 Y0.00575 I0.59295 J0.136675

G03 X0.61265 Y0.01055 I0.599225 J0.026875

G03 X0.616 Y0.014375 I0.60085 J0.024225

G03 X0.618325 Y0.022525 I0.5971 J0.024175

G03 X0.6191 Y0.0359 I0.504675 J0.0359

G03 X0.6191 Y0.037325 I0.504675 J0.0359

G01 X0.6191 Y0.173775

G03 X0.6191 Y0.175375 I0.518025 J0.175375

G03 X0.61805 Y0.189975 I0.518025 J0.175375

G01 X0.61675 Y0.19525

G03 X0.6133 Y0.200225 I0.606525 J0.191875

G03 X0.602525 Y0.20505 I0.599525 J0.183925

G03 X0.589 Y0.205475 I0.59295 J0.117075

G01 X0.589 Y0.2111

G02 X0.679625 Y0.210725 I0.627625 J-1.455925

G02 X0.706575 Y0.20665 I0.676075 J0.0968

G02 X0.74515 Y0.174525 I0.69065 J0.14825

G02 X0.749625 Y0.15215 I0.6914 J0.15215

G02 X0.732475 Y0.110875 I0.6914 J0.15215

G02 X0.698975 Y0.095725 I0.69145 J0.157025

G02 X0.6488 Y0.099025 I0.683725 J0.2466

G01 X0.6488 Y0.037325

G03 X0.648775 Y0.035725 I0.746825 J0.035725

G03 X0.649875 Y0.021125 I0.746825 J0.035725

G01 X0.651225 Y0.01585

G03 X0.654675 Y0.010875 I0.662375 J0.0199

G03 X0.6653 Y0.00605 I0.6682 J0.026525

G03 X0.6789 Y0.005625 I0.674875 J0.0939

G01 X0.6789 Y0

G01 X0.589 Y0

G00 Z0.1

G00 X0.6488 Y0.107875

G00 Z0

G01 Z-0.02

G03 X0.67425 Y0.10475 I0.6767 J0.230175

G03 X0.707225 Y0.124025 I0.6736 J0.1437

G03 X0.7139 Y0.150475 I0.658175 J0.150475

G03 X0.710675 Y0.169225 I0.658175 J0.150475

G03 X0.675475 Y0.1983 I0.671775 J0.157975

G03 X0.6488 Y0.1957 I0.6697 J0.1192

G01 X0.6488 Y0.107875

G00 Z0.1

G00 X0.831325 Y0

M30

No explanation of codes.

+ 0