

EML 3022: CAD Project

Fall 2023

Acoustic Guitar

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Introduction

I chose to design an acoustic guitar because I enjoy playing this instrument, which I have at home. This project allowed me to combine my passion for music with my desire to learn more about design in SolidWorks. My design application goes beyond personal interest, it serves as a blueprint for developing a prototype, providing detailed dimensions and specifications required for manufacturing. This project was a valuable learning experience in addition to its practical application. It allowed me to delve into various SolidWorks tools and functionalities, improving my CAD design skills. Rather than simply recreating existing drawings, creating this design from scratch required me to use my creativity and problem-solving abilities. In conclusion, this project not only honed my skills but also provided a practical application for my newly acquired knowledge. Designing the acoustic guitar has been a rewarding journey that has greatly aided my growth and proficiency in SolidWorks.

The design

Materials:

The selection of materials for this project was meticulously researched to determine the most suitable options for each component of the acoustic guitar.

Guitar Body: Cedar

String Holes: Cedar

String Part for Body: Cedar

Pin For String: ABS

Nut: Melamine Resin

Arm Part: Maple

Frets: Nickel

Pins for Arm: ABS

Rosette: Maple

Strap Holder Pin: Brass

Pickguard: PVC 0.007 Plasticized

Tuner Holder: Brass

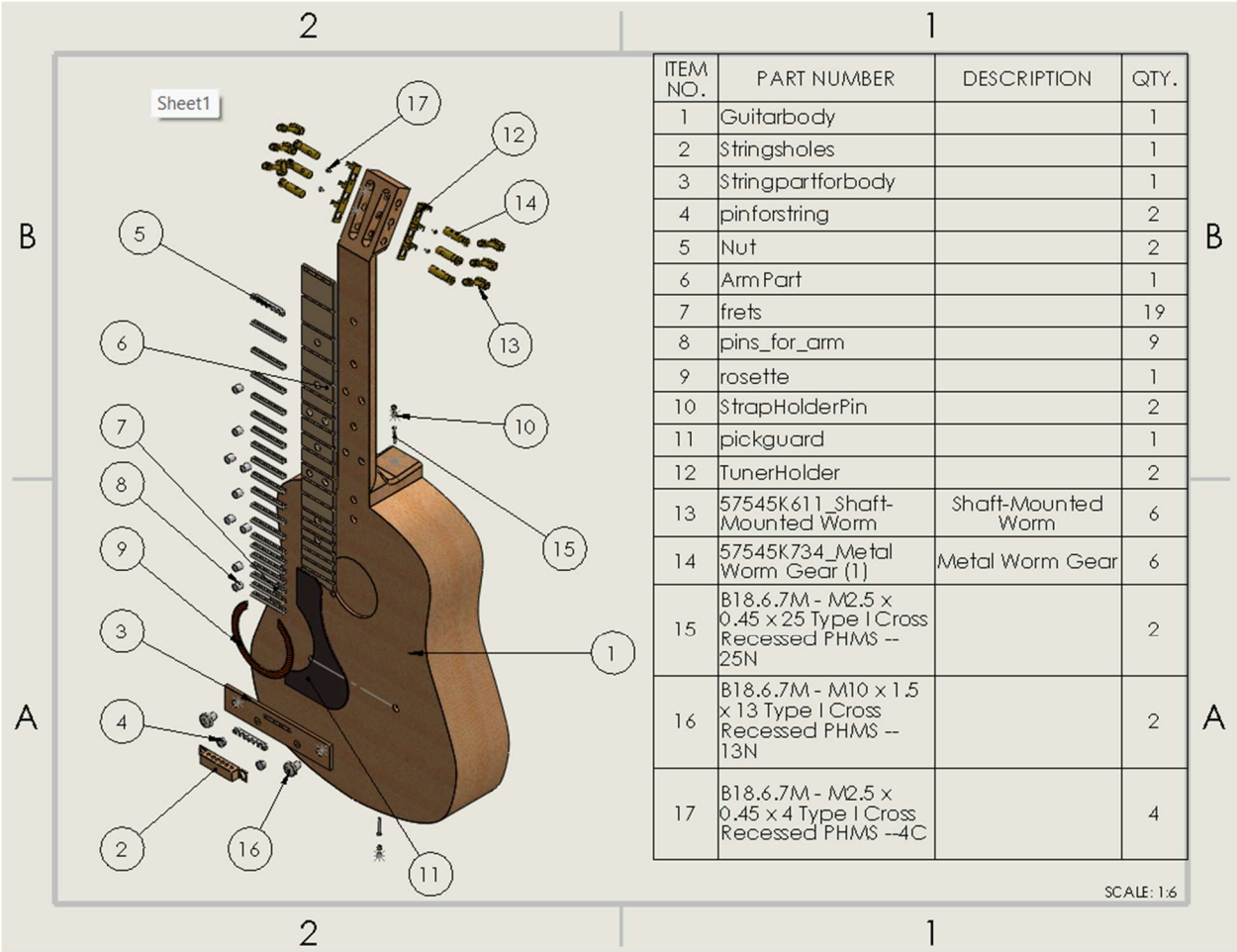
57545k611 Shaft-Mounted Worm: Brass

57535k734 Metal Worm Gear: Brass

Difficulties faced:

The fact that I had little experience starting projects from scratch meant that I ran into many difficulties throughout the design process. To ensure accuracy, precise dimensions, and intricate shapes required a significant investment of time and a learning curve. Furthermore, assembling the complex gearwork was a significant challenge, necessitating additional effort and time to ensure proper functionality. Sourcing appropriate screws for each hole proved difficult as well, necessitating meticulous attention to detail and extensive research to accurately match specifications, adding to the overall complexity. Nonetheless, overcoming these challenges taught me invaluable lessons, improving not only my problem-solving abilities but also my understanding of the complexities involved in designing and assembling intricate mechanisms.

Assembly exploded view



B

B

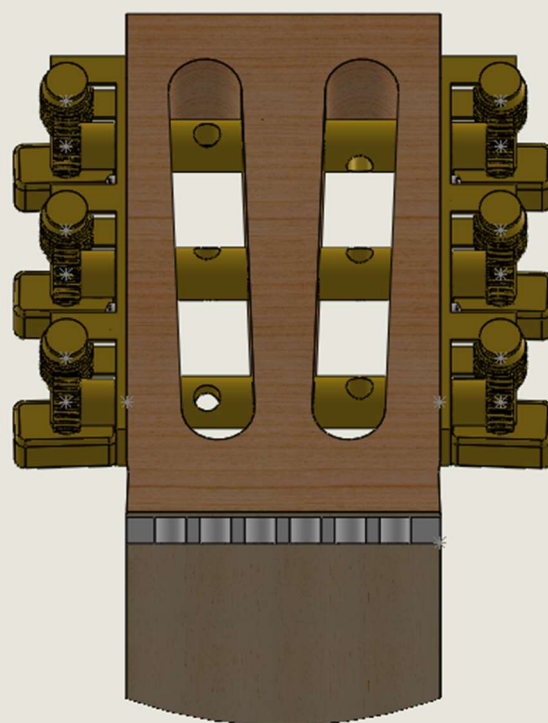
A

A

Assembly alternate position drawings

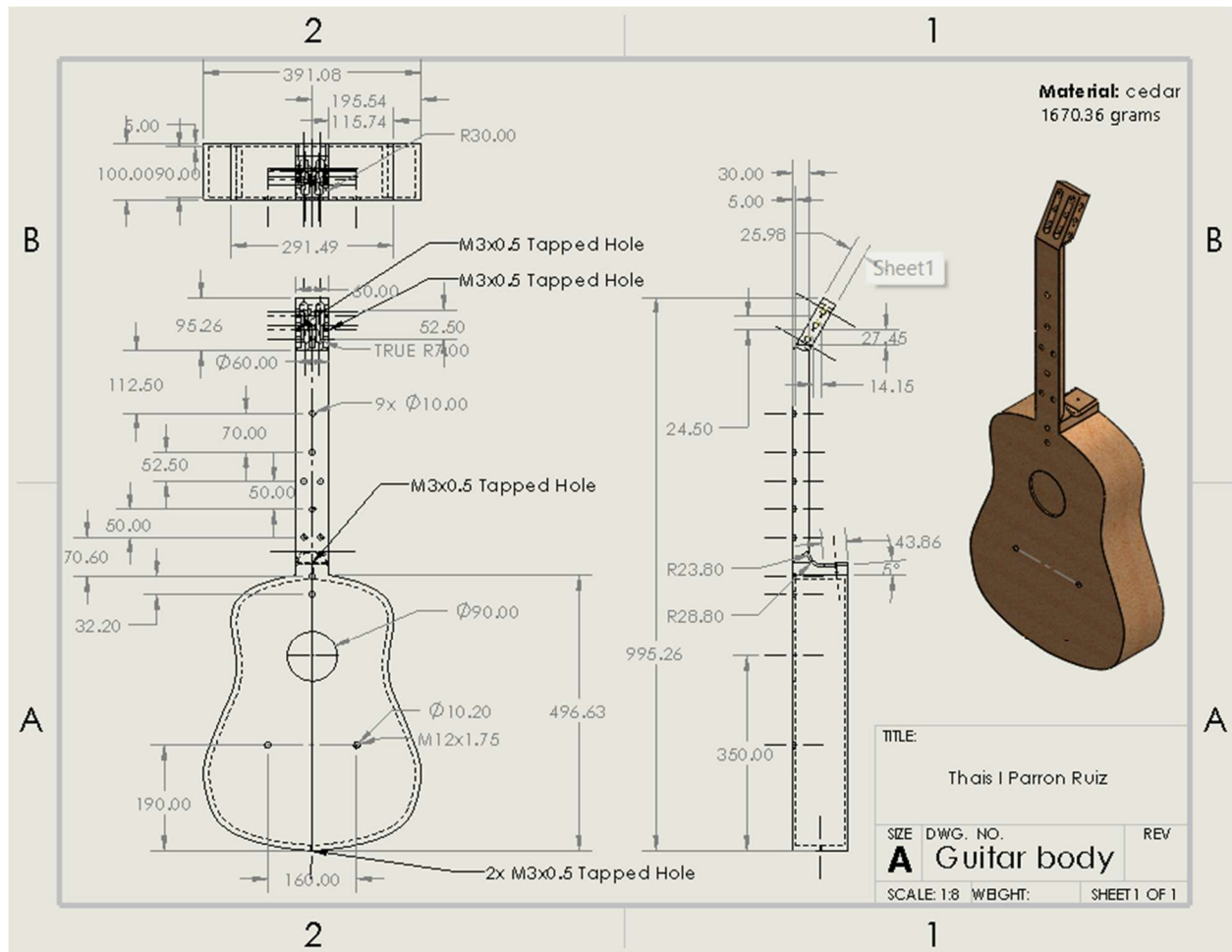


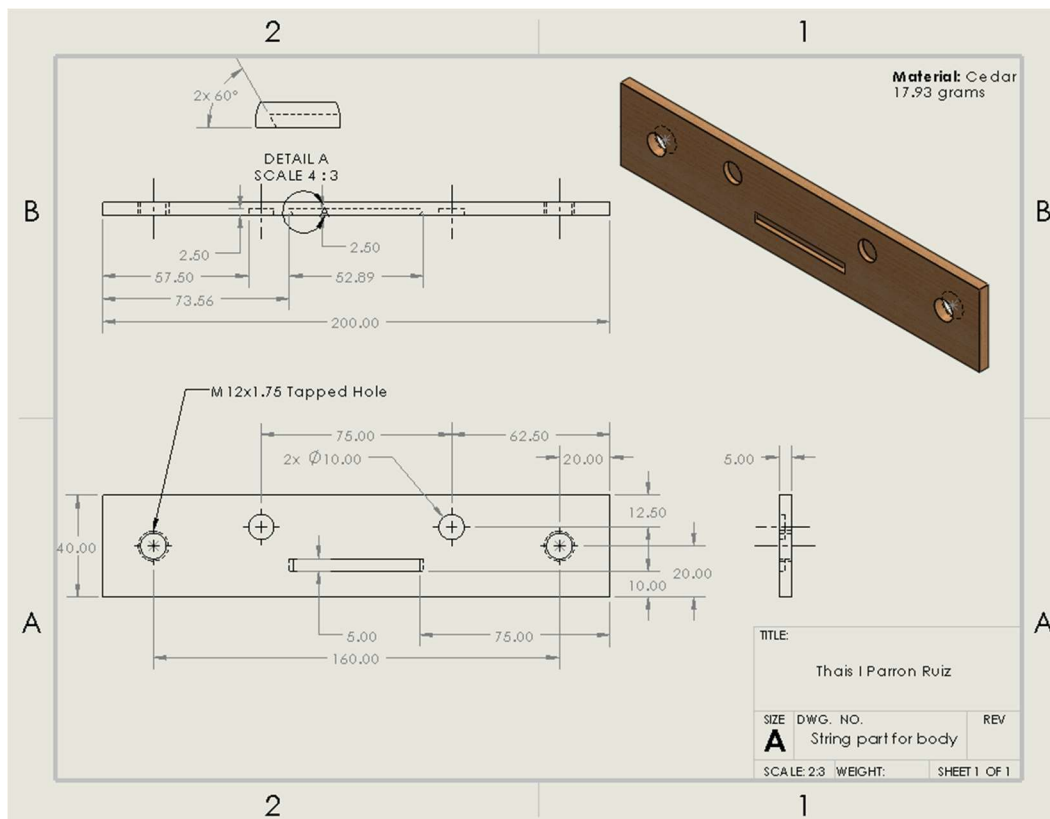
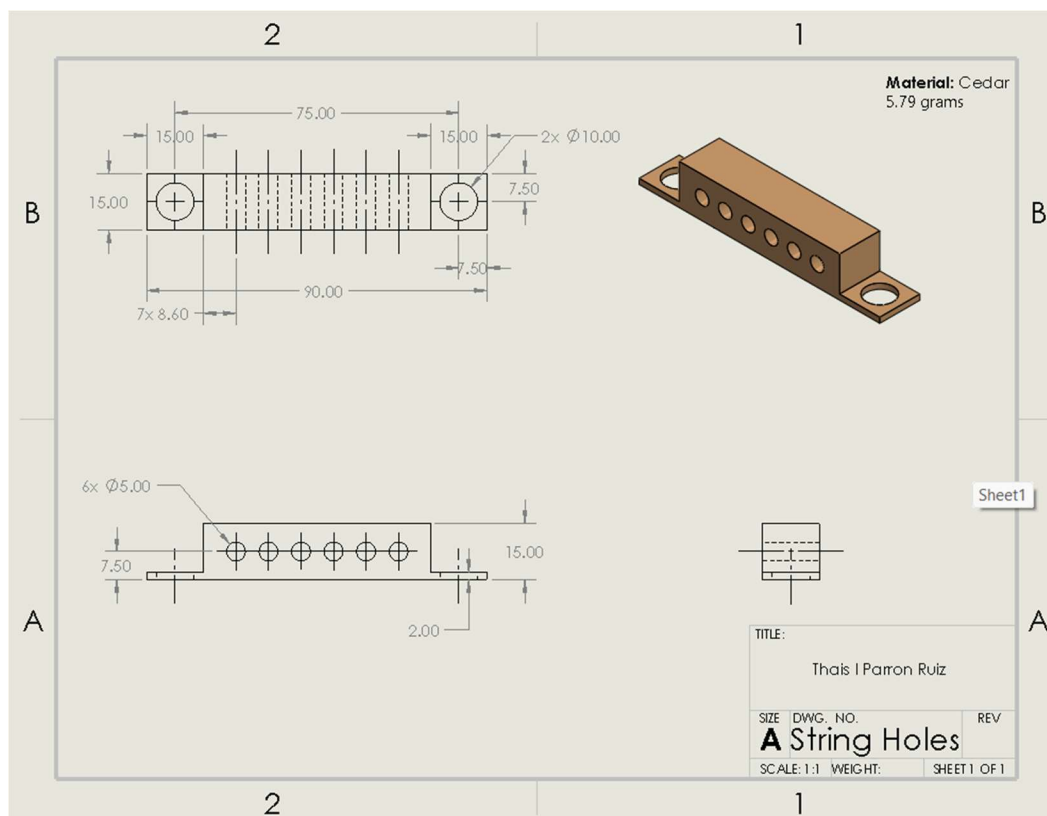
Sheet1

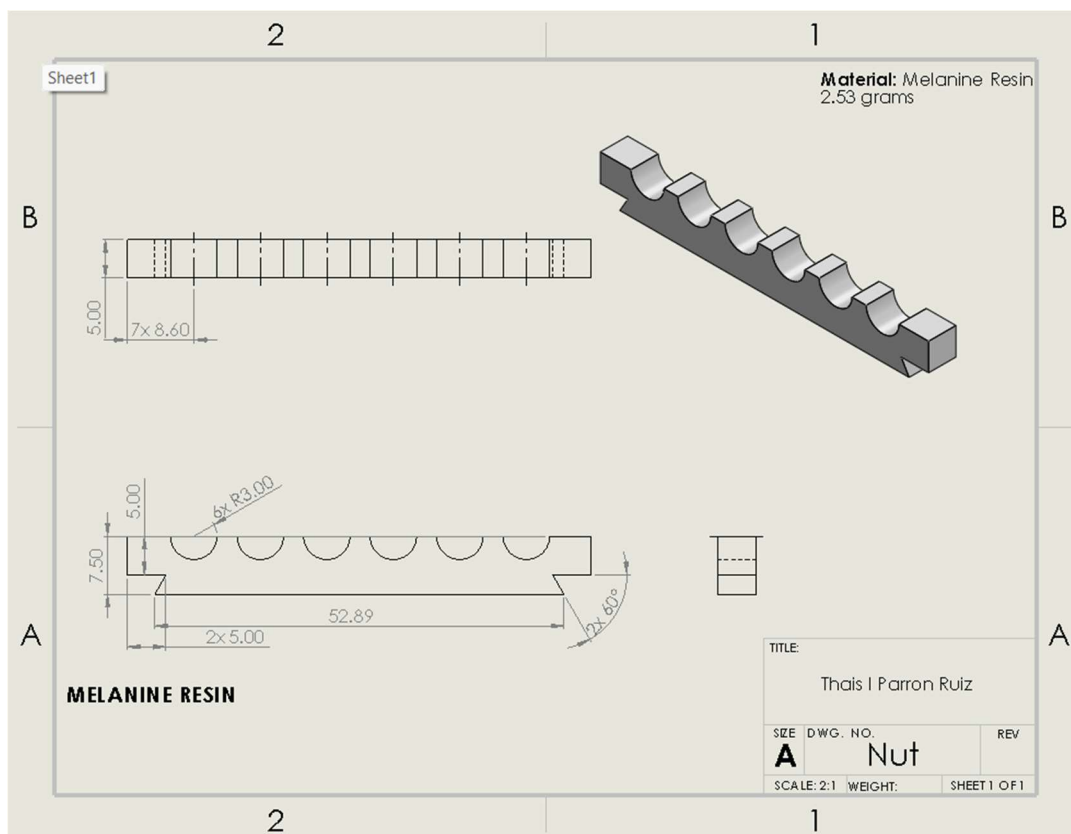
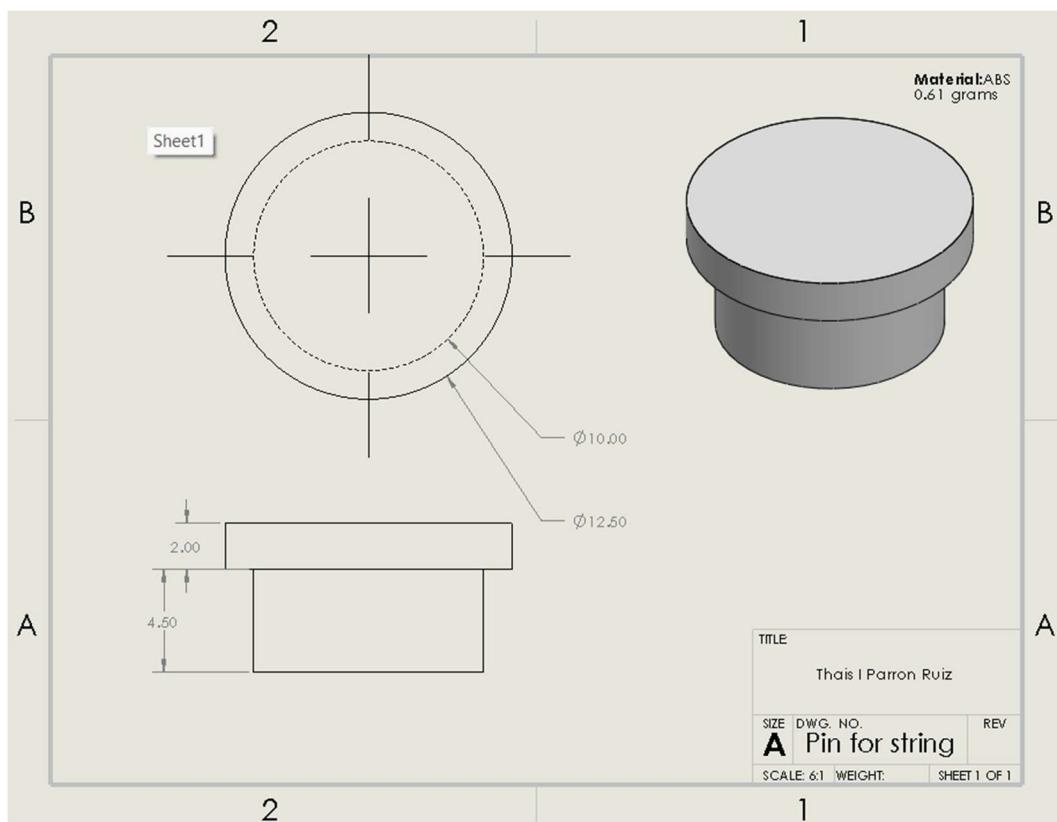


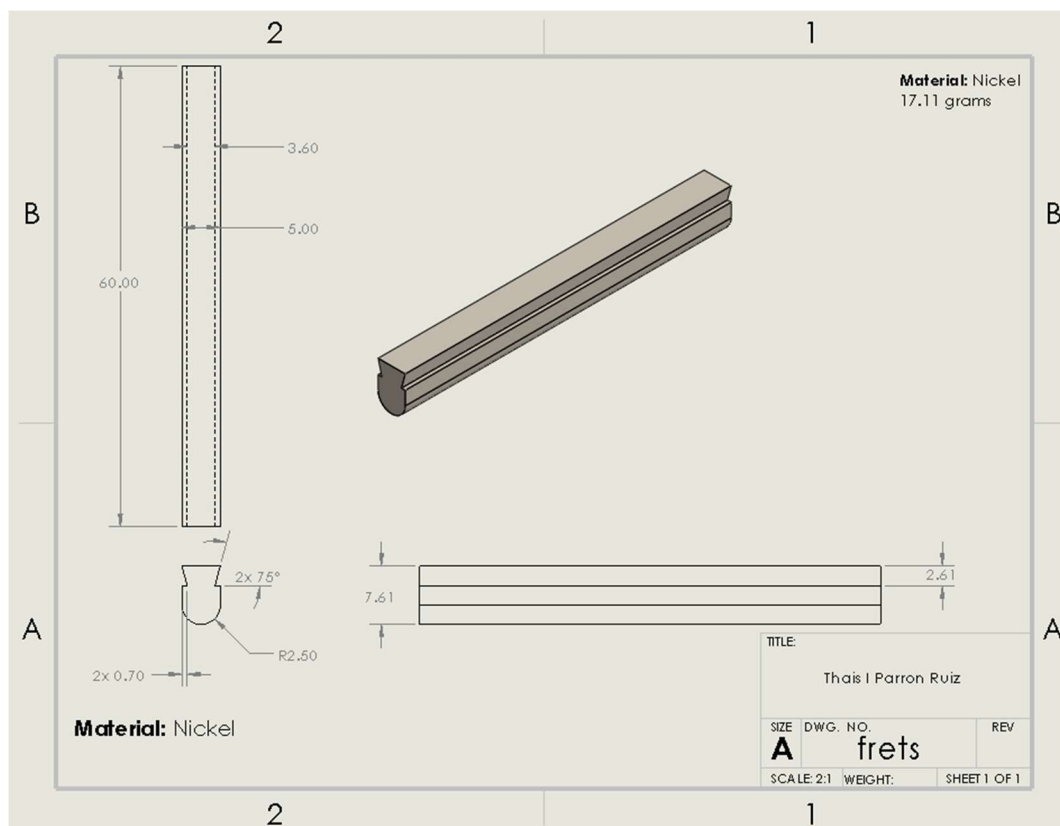
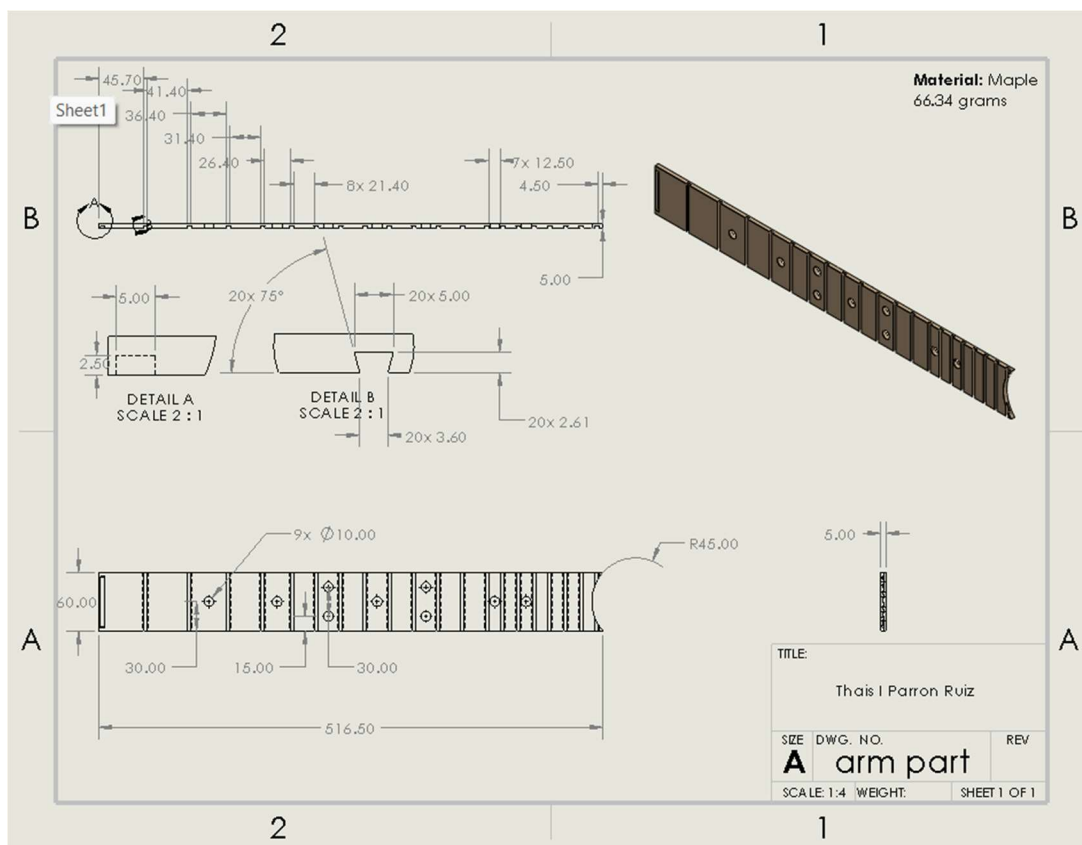
DETAIL A
SCALE 1 : 1

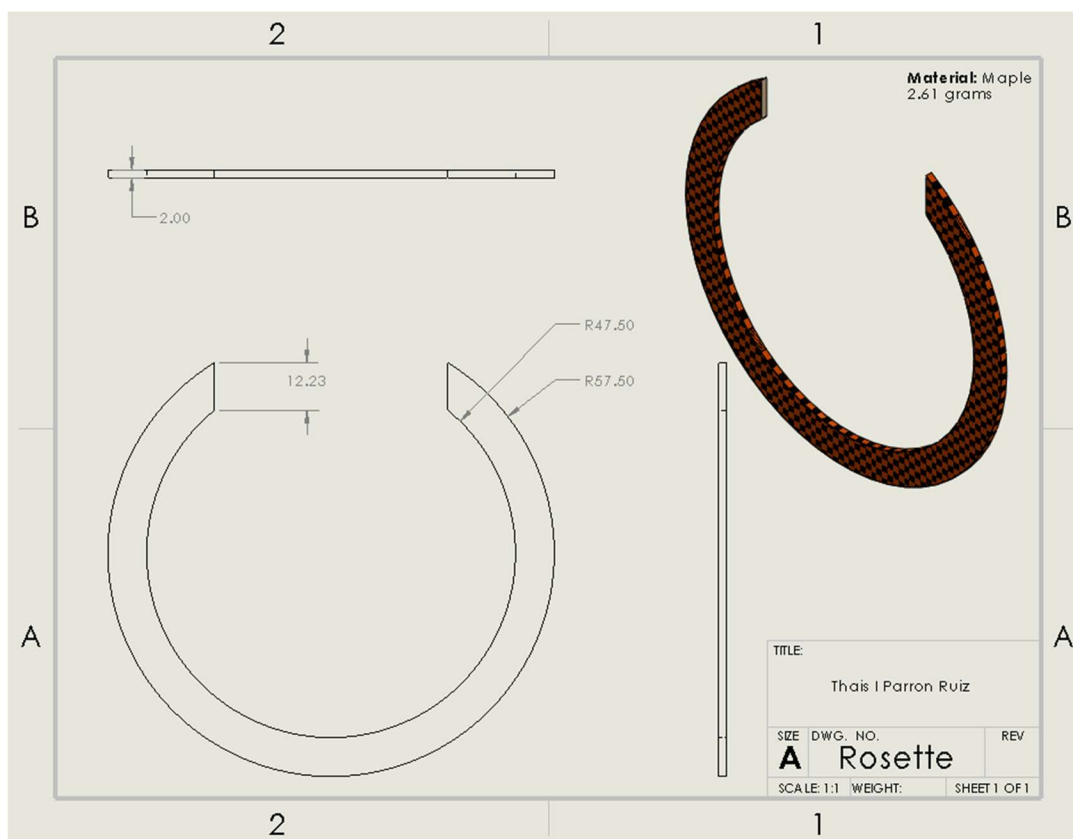
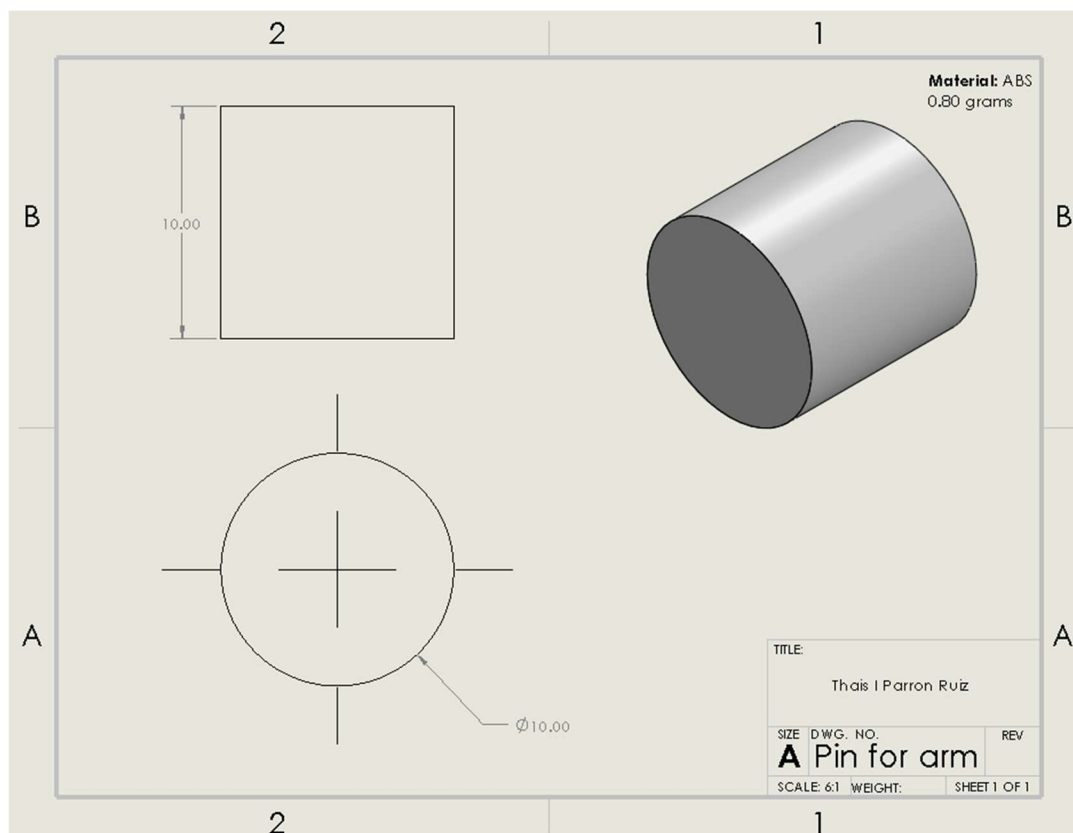
Every part drawing

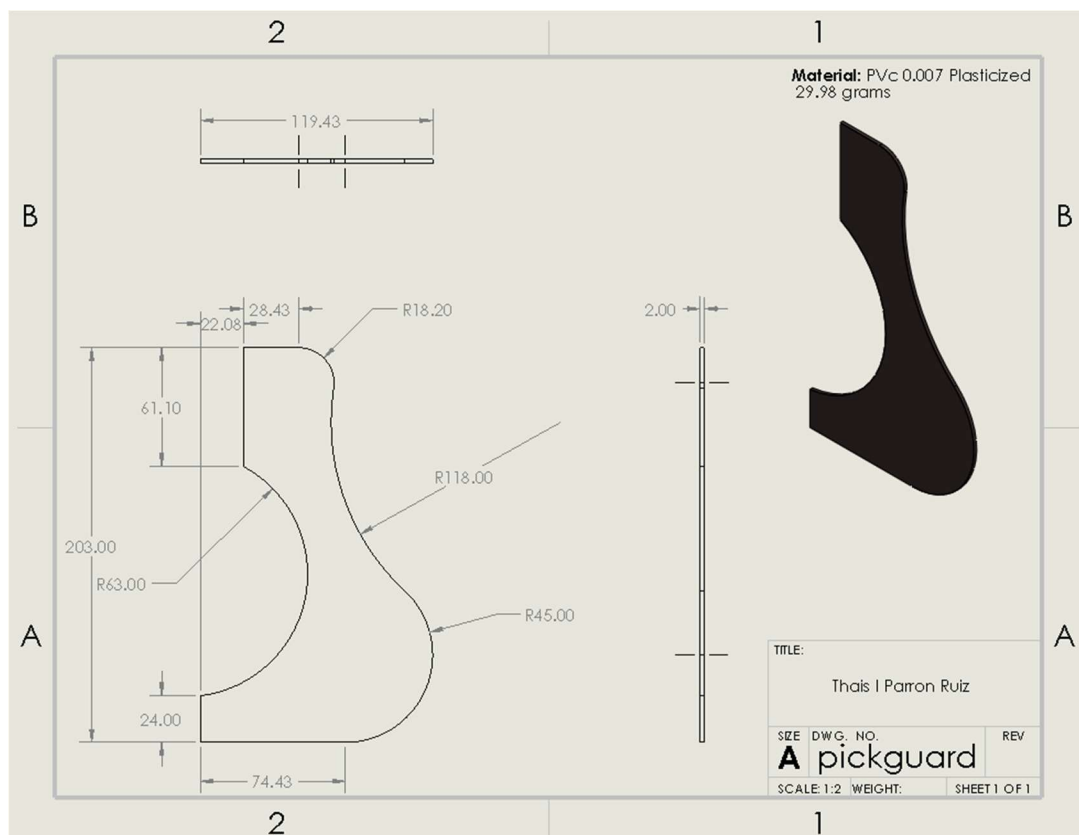
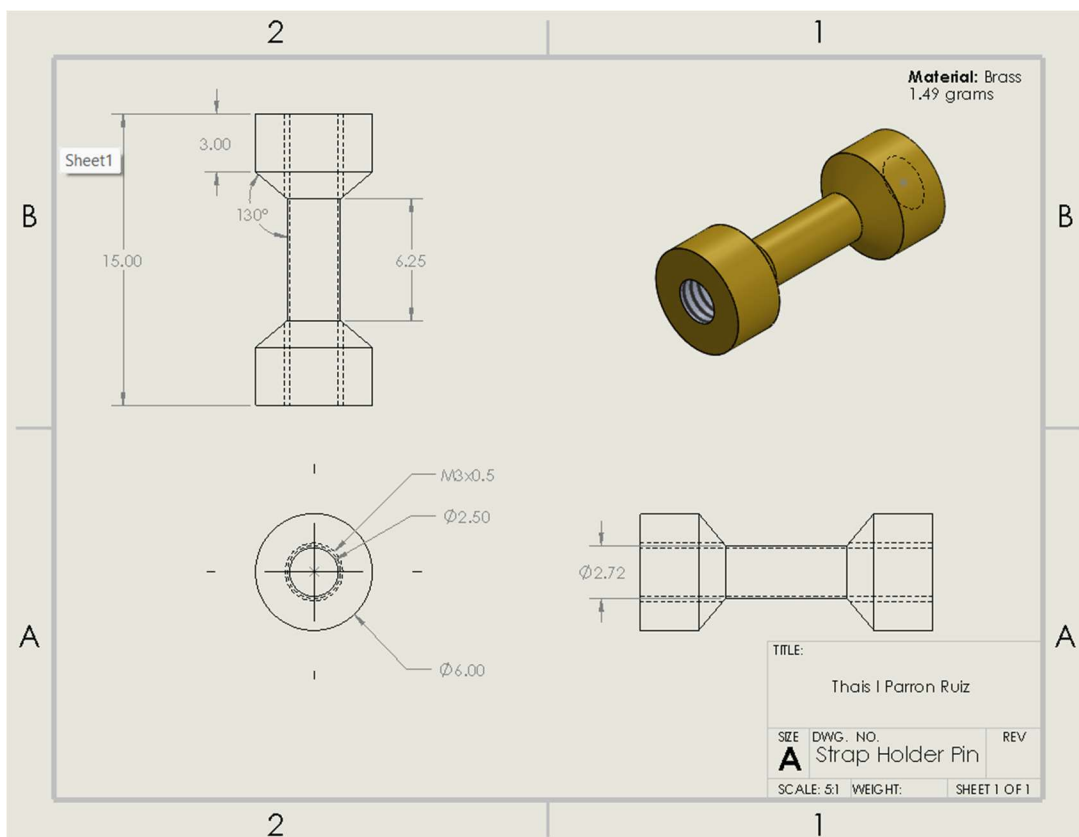


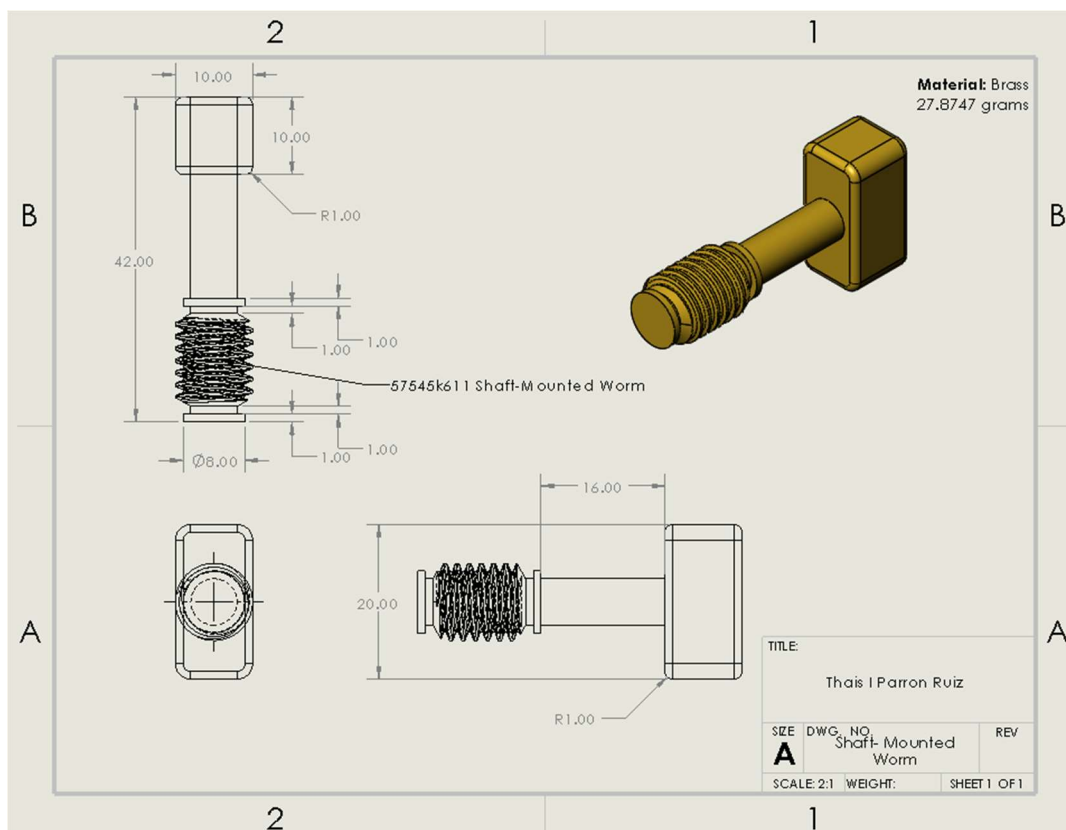
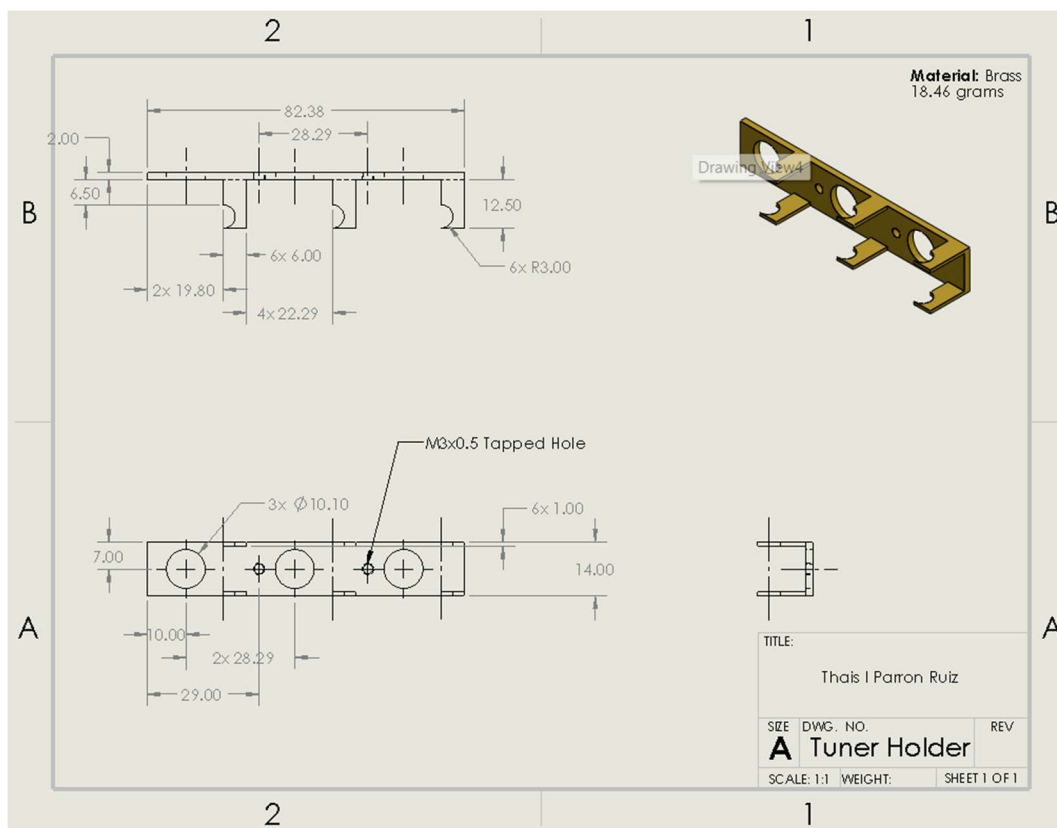


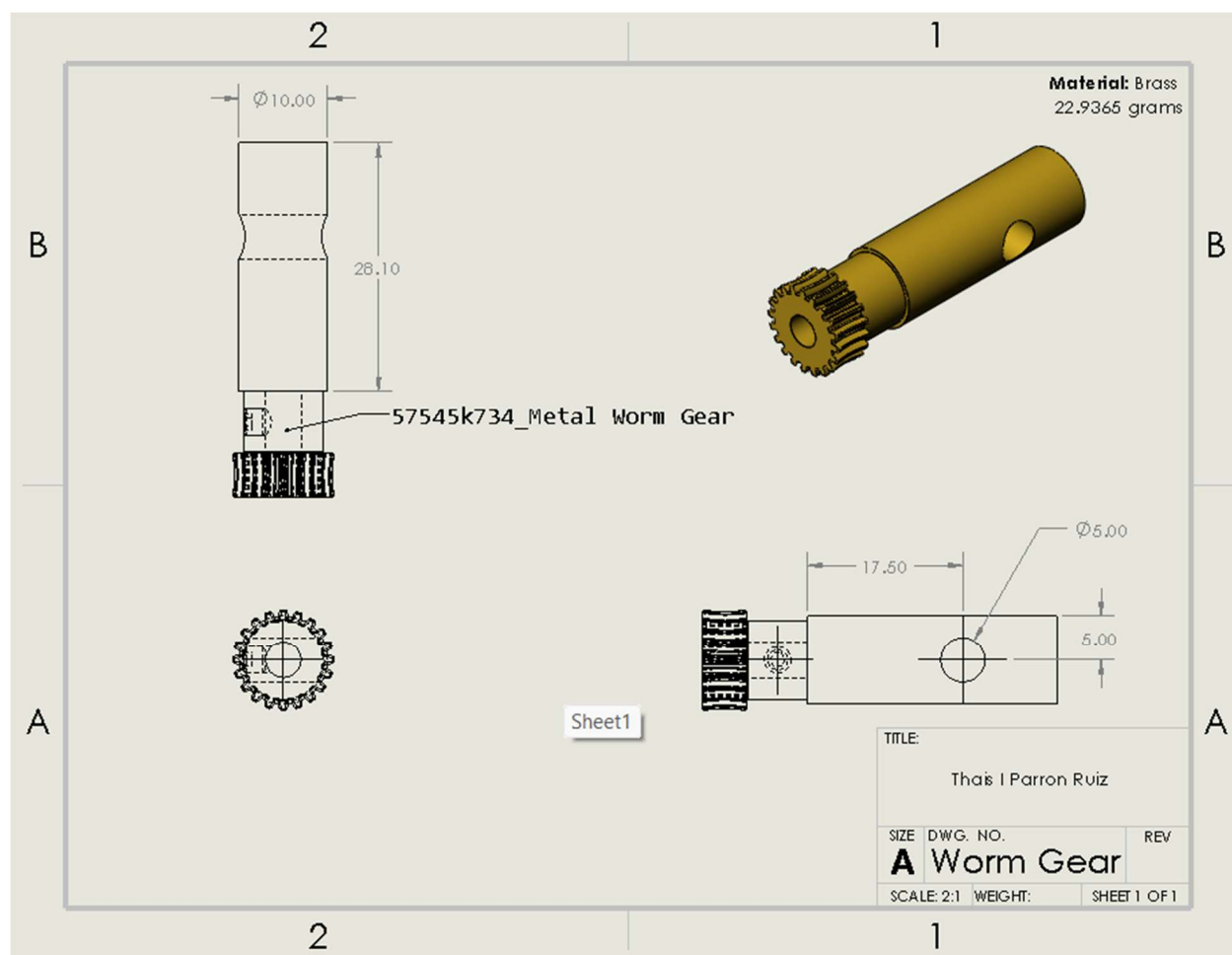












Analysis

The acoustic guitar project I designed functions precisely as envisioned, with its tuning mechanism serving as the instrument's dynamics. When you twist the pin attached to the Shaft-Mounted Worm, it sets off a smooth movement in the worm gear connected to the holes where you are supposed to put the end of the strings. This intricate motion is pivotal, as it pivots the gear in a manner that, contingent upon the direction rotated, delicately adjusts the tension of the strings—either tightening or loosening them with exacting precision. It's this process that lets you dial in the exact tuning you need for your music, making this mechanism the beating heart of the guitar's versatility and playability.

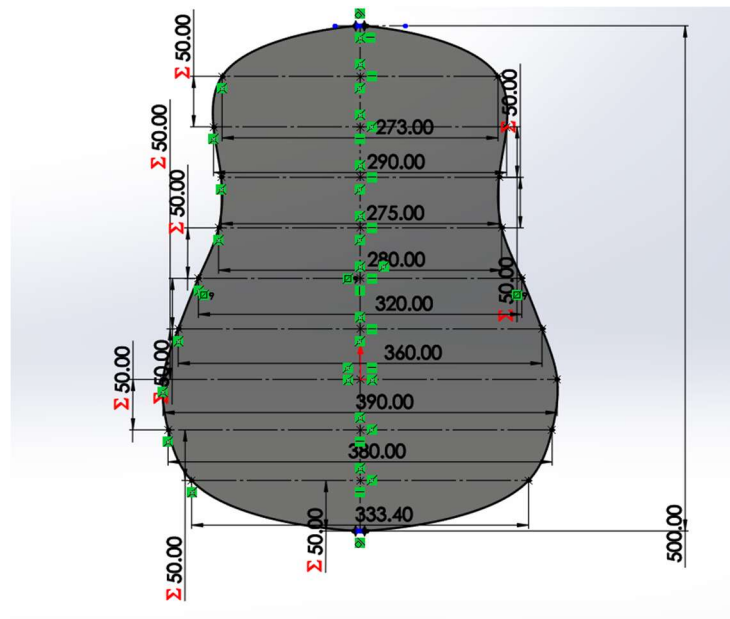
Concluding remarks/Future recommendations

The initial phase of this project involved designing the guitar body by sourcing dimensions from an actual acoustic guitar and selecting optimal materials for its construction. Following this, I crafted the arm section, incorporating connection points for the body, frets, and one of the nuts. Subsequently, I developed the string section, serving as a foundation for the string holes, along with another nut and the design of the "pins for strings" to secure the string holes to their base. Further components, such as the rosette and pickguard, were then created to complete the body. Moving on, I designed the tuner holder, a critical part housing the gears essential for the guitar's tuning mechanism to function effectively. Subsequent steps involved sourcing the worm gear and making necessary extensions for optimal functionality. Finally, I assembled all the components and added the requisite screws for the final assembly. The materials chosen for this acoustic guitar design were meticulously researched to ensure optimal construction.

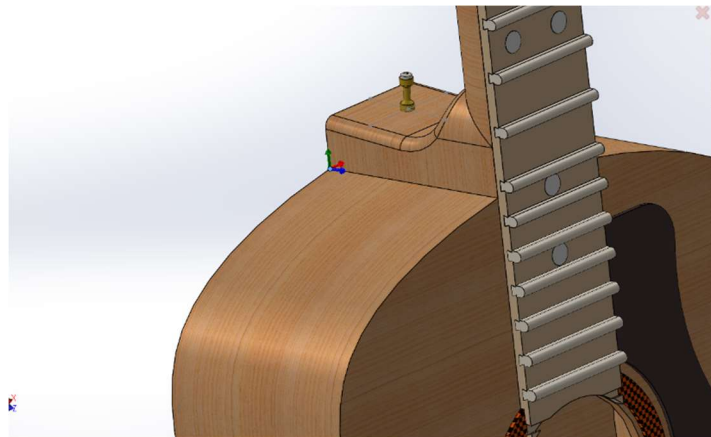
In the future, I recommend doing extensive research on screws before drilling holes and ensuring precise dimensions for each component. Rather than creating all elements beforehand and assembling them later, it is preferable to verify the accuracy of dimensions and test the fit of parts after completing each component. This step-by-step approach allows for adjustments or changes during the design process, resulting in a smoother assembly and minimizing potential fit or alignment issues.

Appendix

Sketch of the body:



Coordinate system1:



Center of mass from the coordinate system 1:

Center of mass: (millimeters)
 X = 30.85
 Y = -35.21
 Z = 63.72

