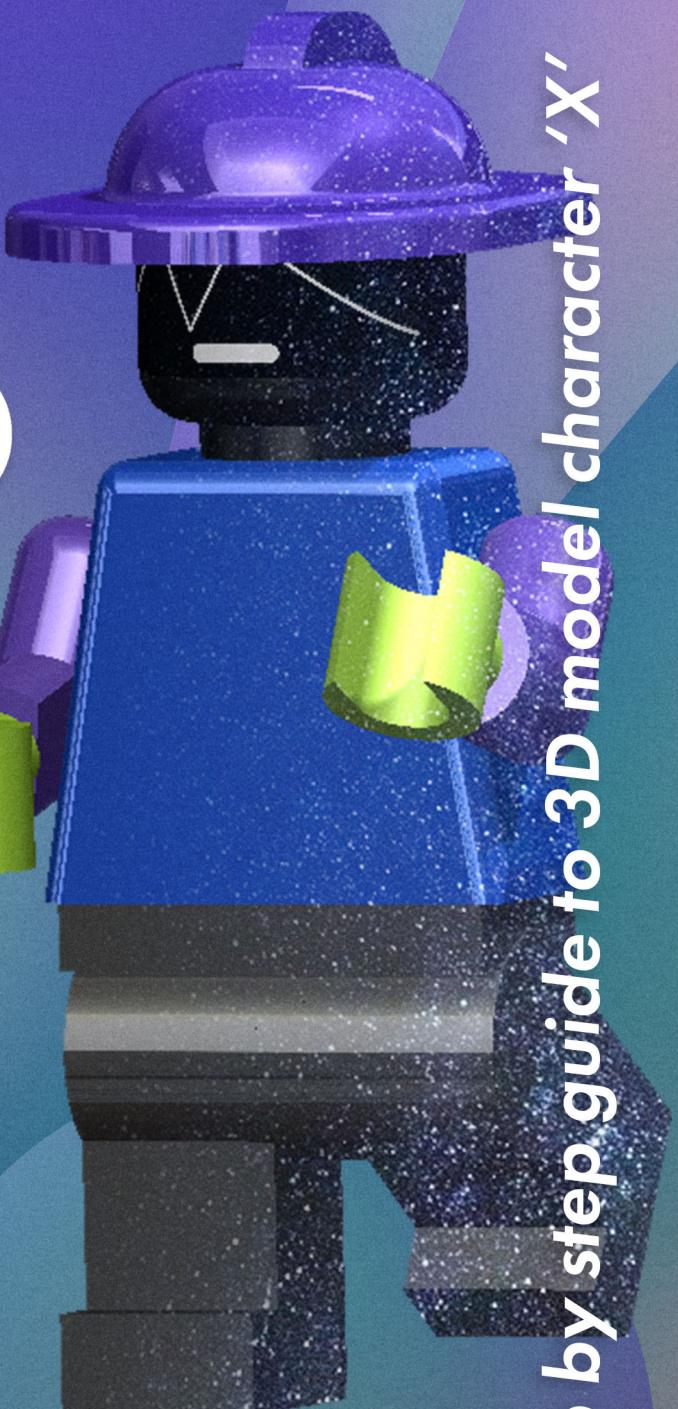


A step by step guide to 3D model character 'X'



TforDesign

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By Tayseer Almattar
Alina Tirdea

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Alina Tirdea



TforDesign

Project X

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By Tayseer Almattar & Alina Tirdea

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About TforDesign

TforDesign is an organization that aims to create exceptional learning experiences by collaborating with other organizations in addition to designing in-house online learning experiences.

About the Authors



Tayseer Almattar

Tayseer is the founder of TforDesign. He is a Design professional and passionate about applying Design Thinking and other design methodologies to add value to different organizations.

He is also the author of the book 'Learn SOLIDWORKS 2020 - a hands-on guide to becoming an accomplished SOLIDWORKS Associate and Professional'.



Alina Tirdea

Alina is a biomedical engineer and proud member of the TforDesign team. She has been writing technical support materials, scientific articles and reports since 2016. Computer Aided Design and 3D modeling are some of the most enjoyable things for her.

Introduction

Learning new skills can be an arduous cycle of going through ups and downs depending on how much we enjoy the process. We enjoy learning first due to the genuineness of the subject. However, we then end up reaching a plateau where learning the same subjects become less exciting.

Back in 2015, we started our journey in design learning and witnessed that observation firsthand. This pushed us to give learning a newer taste and a new outlook to encourage continuity. This booklet supports that objective in learning engineering 3D modeling. So, whether you are a professional, student, or hobbyist learning 3D modeling, Project X is for you.

- Tayseer, Alina and the TforDesign Team

What is Project X?

Welcome to Project X! X is a character of an unknown origin. One day, X was transformed into a virtual being. All friends, family, and tribe were missing. X wants to find them but can do nothing with a virtual body. X needs to be turned back into reality and is looking for new allies to deal with this unknown situation.

X's story is up for you to decide. So, what will it be?

What is this Booklet About?

This booklet takes you through the journey of building your own Project X. Through that journey, you will be using your 3D modeling skills to tackle one part of the project after the other. By the end of it, you will have a version of Project X which you can call your own. In addition, your 3D modeling and presentation skills will grow stronger..that is if you survive though.

This publication is for anyone who wants to learn 3D Modeling. When specific instructions are provided, they are provided according to the design software SOLIDWORKS.

"Through hard work and perseverance, one can go through Project X. Through Project X, one can accomplish 3D modeling enlightenment."

- Unknown

What Skills Will You Utilize to Build Project X?

To pass Project X, you will need to have a variety of 3D modeling skills. Those include:

- Interpreting 2D engineering drawings
- Generating sketches
- Applying basic and complex features
- Applying mates in assemblies
- Generating renders

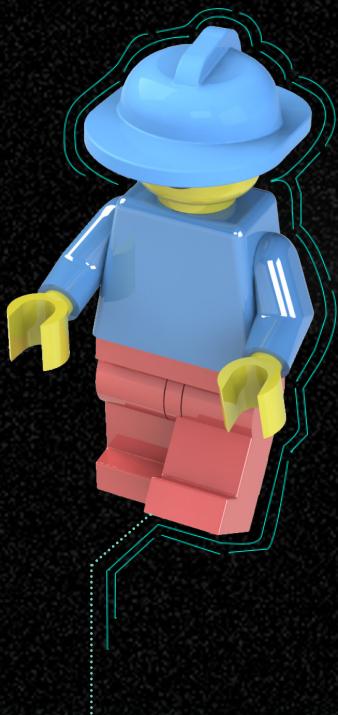
While you are expected to have most of the skills before attempting your own Project X, this guide will provide you with some hints and steps to complete your journey.

How to Navigate Your Way Through this Project X Guide?

This guide will take you through building a set of 3D models to form your version of Project X. It is structured into four different sections as follows:

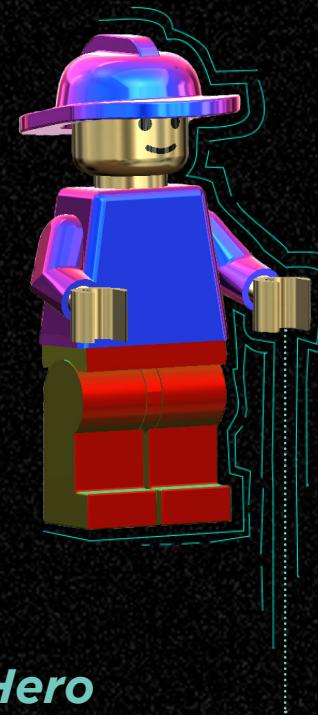
- 1.** Project X parts 2D engineering drawings.
- 2.** Stages and hints for generating each element/part of Project X.
- 3.** Instructions on how to modify appearances and generate renderings using SOLIDWORKS.
- 4.** The Challenge Proposal.

Before moving forward, you can pick your journey according to your 3D modeling level.



Advanced

Only look at the engineering drawings to build all the parts of Project X.



Hero

Only look at the engineering drawings for inspiration, but make your own unique version of Project X.

Moderate

Take a look at the engineering drawings, and utilize the stages and hints provided.

You can also move from different levels by going through the project multiple times.

Here are the design elements to be aware of going through Project X booklet:

- **NOTE**

An extra piece of information that does not relate to everyone, however it is something you might fall for

- **Tip:** extra info that can give a good result.
- **Tasks:** an assignment that you should do to get the most of the experience.
- The text in **bold and italicized Courier New font** refers to screen text from the SOLIDWORKS interface.



Section 1

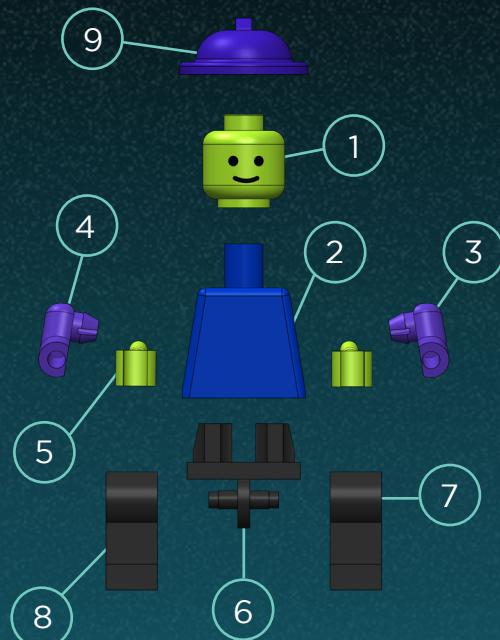
Project X Parts and Engineering Drawings

In this section, we will explore the standard parts for Project X and its specifications. First, we will start with an overview of all the parts in Project X. Then, we will go deeper into presenting the engineering drawing for each part containing their major dimensions. In addition, we will address mirrored derived parts to easily generate the right arm from the left and the right leg from the left.

Project X Parts

Objective

To give you an overview of all the standard parts in Project X.



Project X consists of nine parts that you can model separately as different parts in SOLIDWORKS or any other 3D design software of your choosing. The parts are face, upper body, two arms, hands, hip joint, two legs and a hat. All the parts are highlighted in the exploded view and bill of materials shown in the following figure.

ITEM #	PART	QTY.
1	X's Face	1
2	X's Upper Body	1
3	X's Left Arm	1
4	X's Right Arm	1
5	X's Hand	2
6	X's Hip Joint	1
7	X's Left Leg	1
8	X's Right Leg	1
9	X's Hat	1

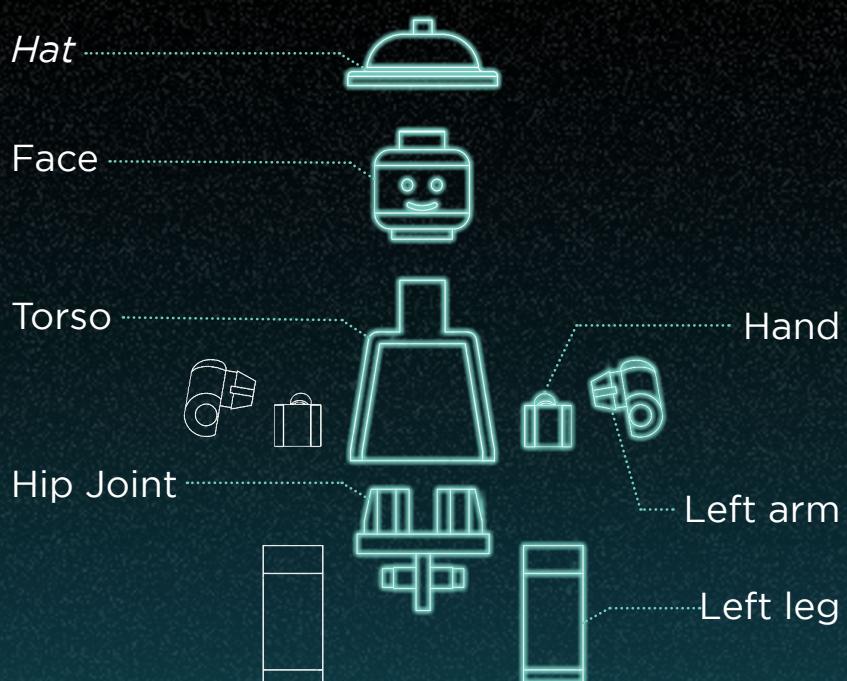
Parts 2D Engineering Drawings

Objective

To provide you with engineering drawings with dimensions that you can use as a base for replicating all the standard parts for Project X. Also, to provide you with hints.

Now it's time to use your imagination! Patience and curiosity will help you a lot on this journey. Here, the drawings for each part and the entire assembly are presented. These drawings should give you enough information to recreate a standard format of all the parts and assembly. However, if you ever feel that you need hints, you can look at the next section of the booklet which will have hints and suggestions to help you in your endeavor.

The drawings are for the following parts:



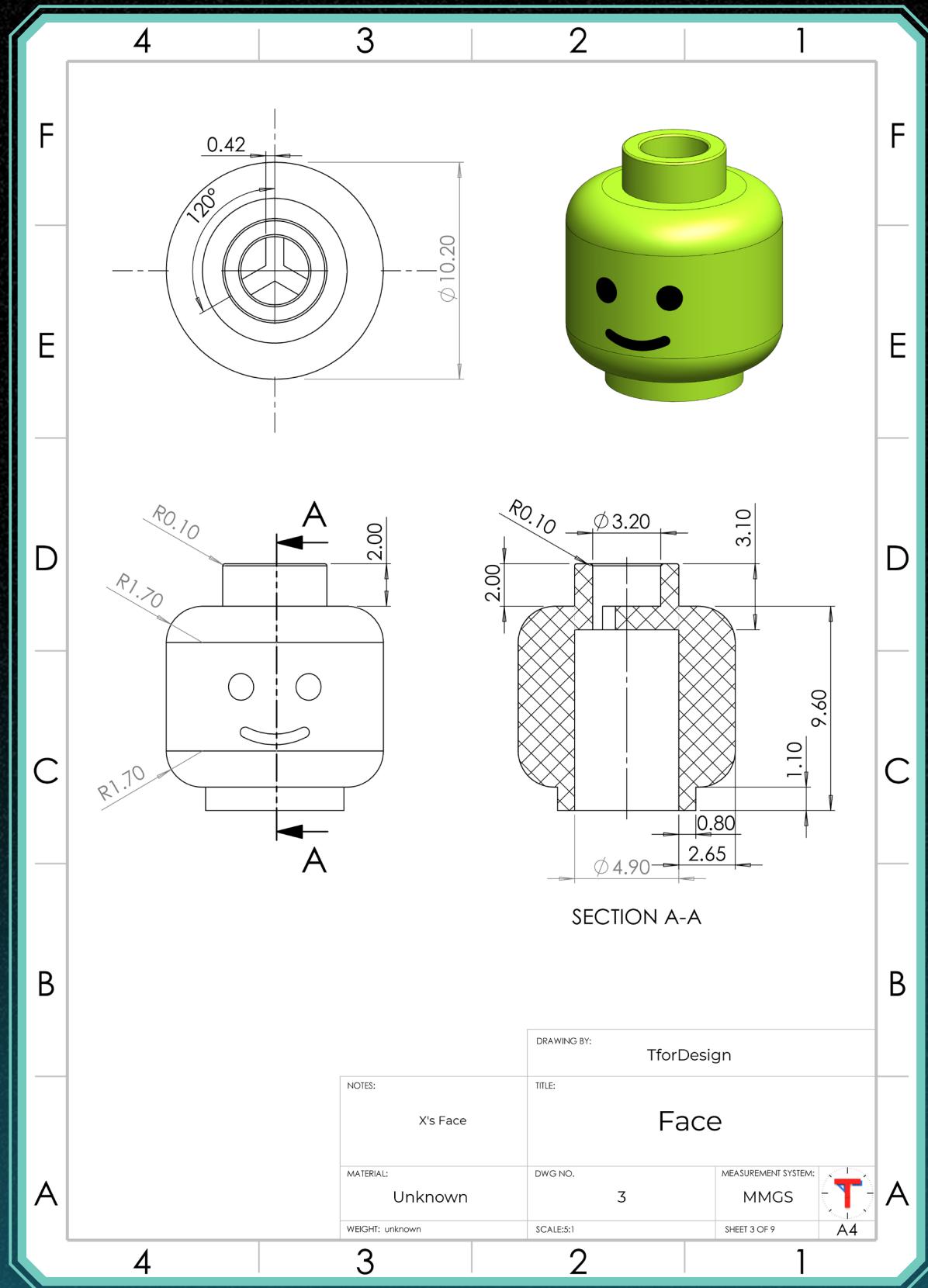
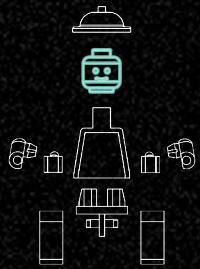
The drawings are also ordered the same way they are listed above. The drawings will provide you with the dimensions you will need to replicate each part. However, you are also free to assume your dimensions and design intent as you see fit.

NOTE

You can always add in your touch to each part.

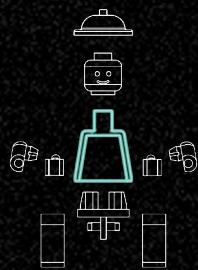
Face Drawing

The following drawing is for a standard version of Project X.

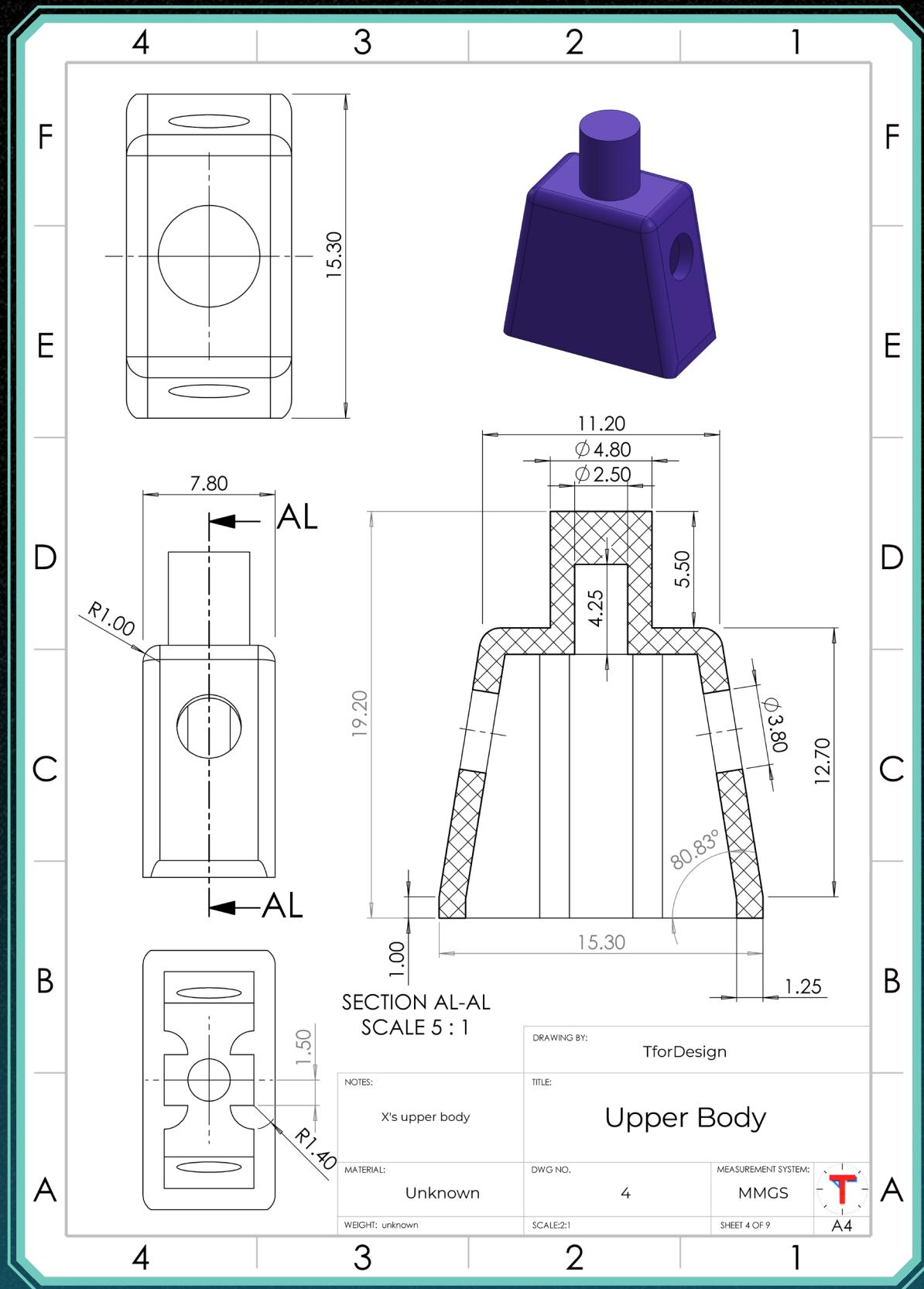


Next we will present the drawing for the upper body.

Upper Body Drawing



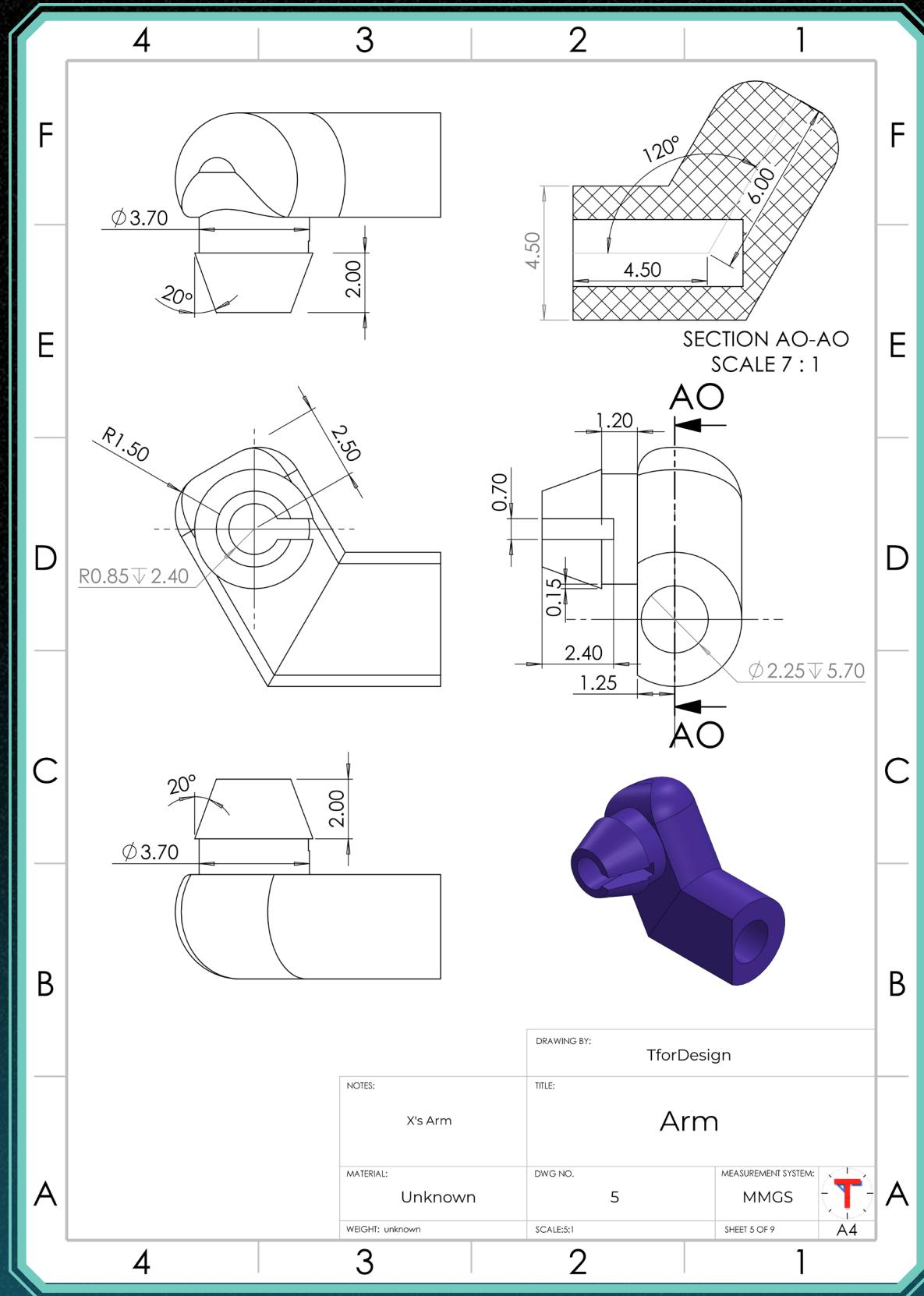
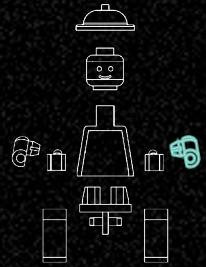
The following drawing is for a standard version of Project X.



Next we will present the drawing for the left arm.

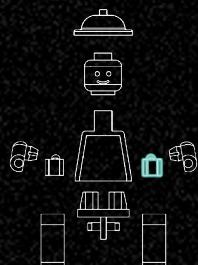
Left Arm Drawing

The following drawing is for a standard version of Project X.

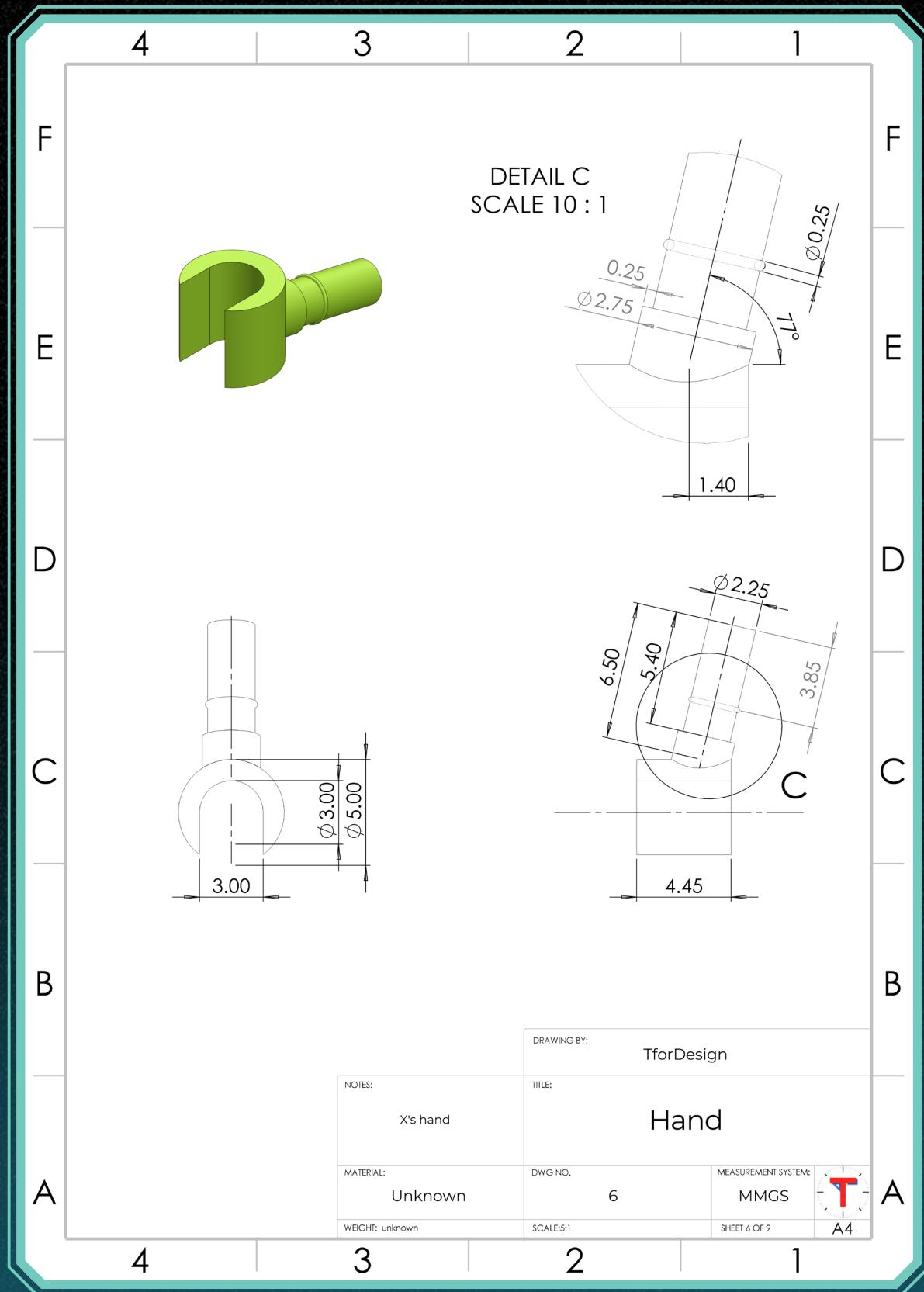


Next we will present the drawing for the hand.

Hand Drawing



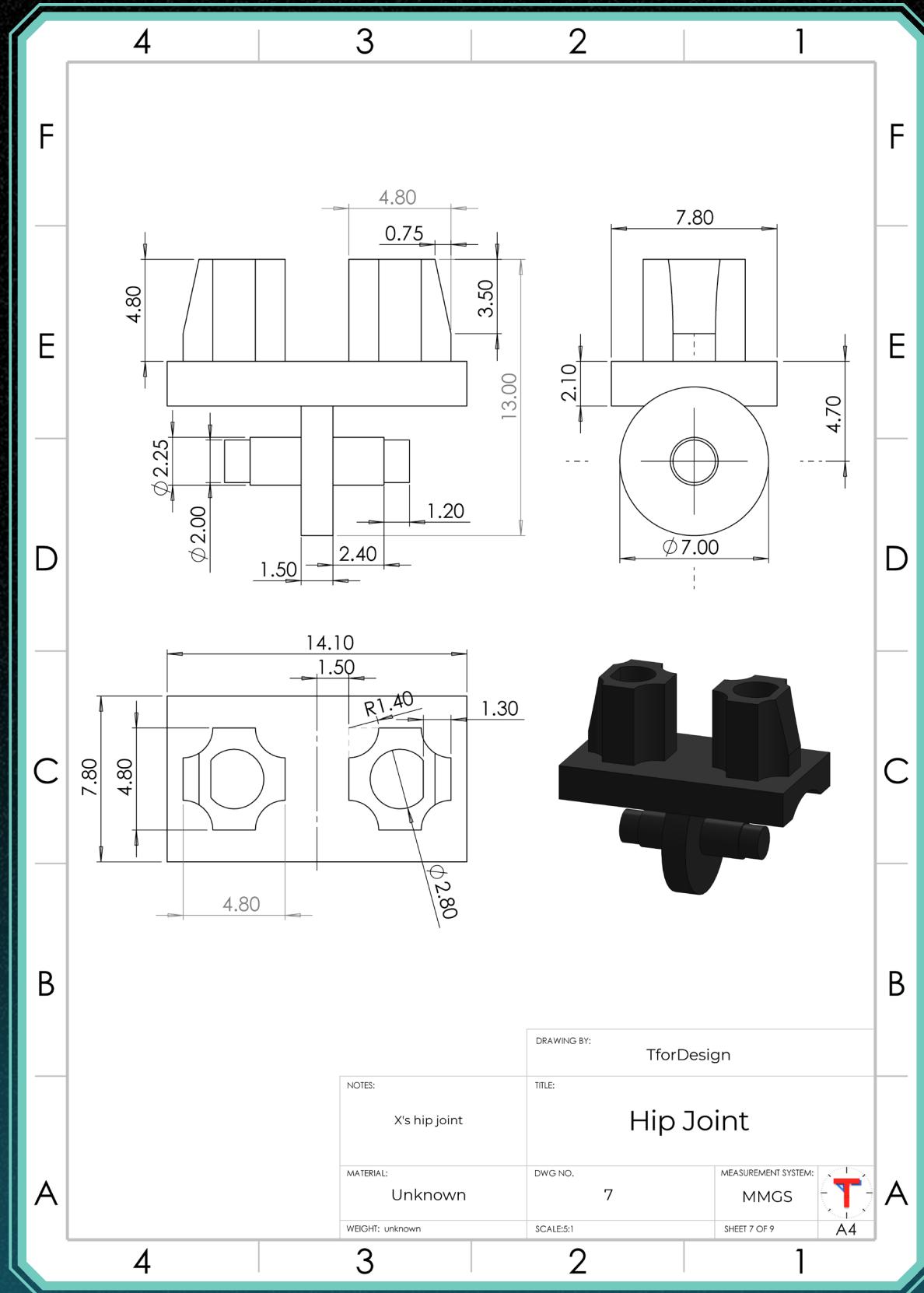
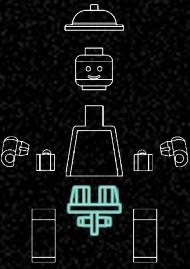
The following drawing is for a standard version of Project X.



Next we will present the drawing for the hip joint.

Hip Joint Drawing

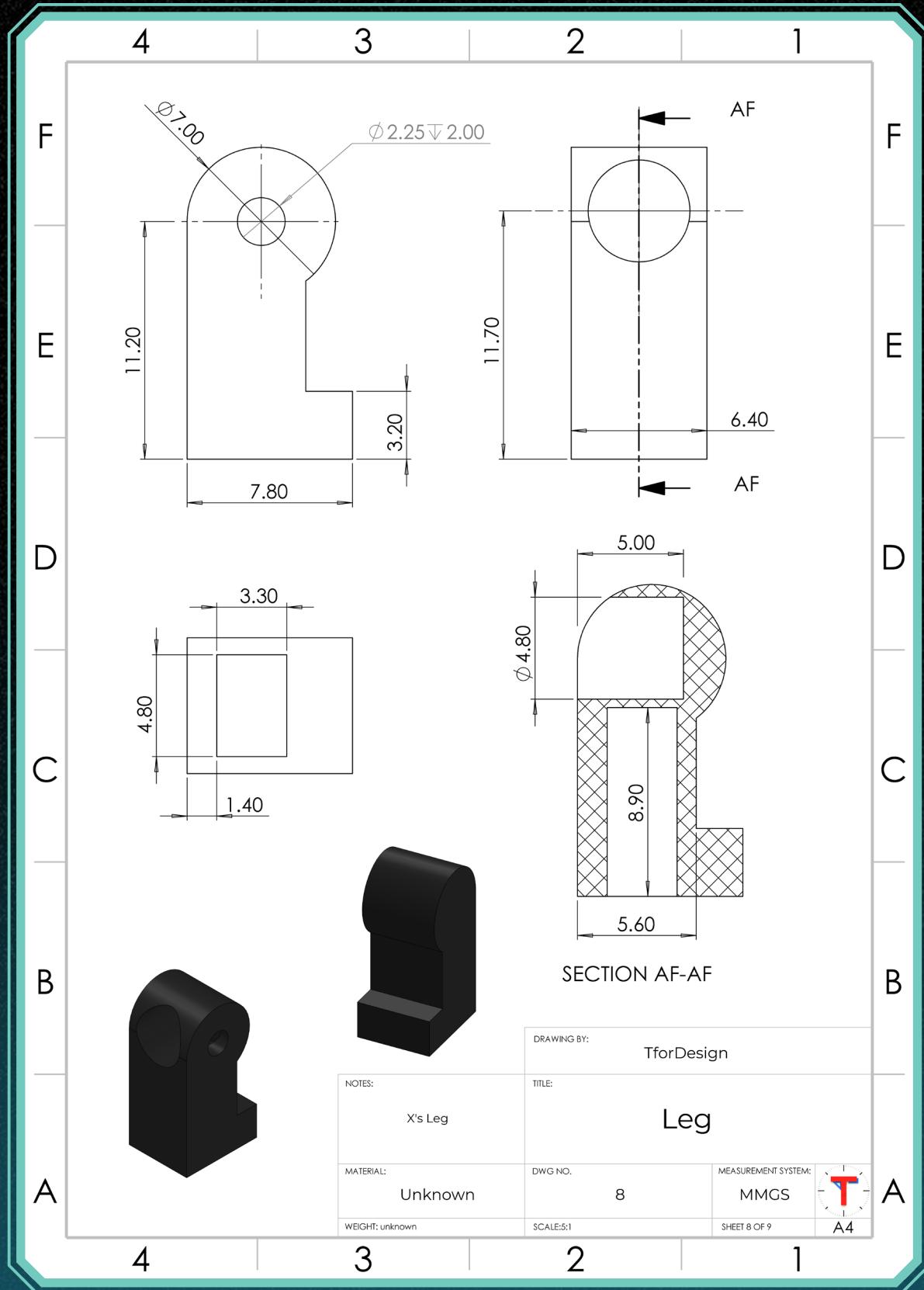
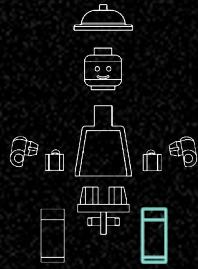
The following drawing is for a standard version of Project X.



Next we will present the drawing for the left leg.

Left Leg Drawing

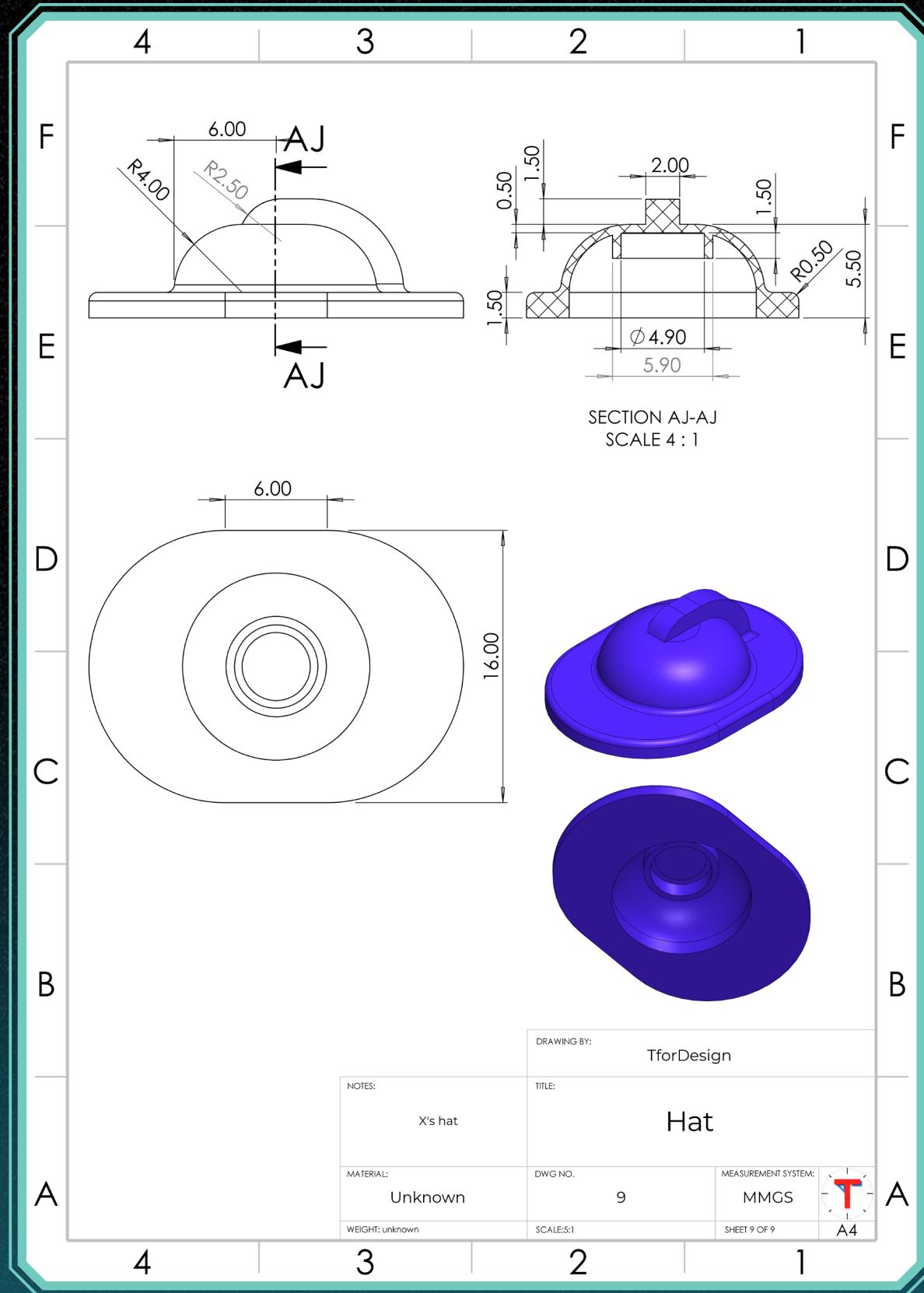
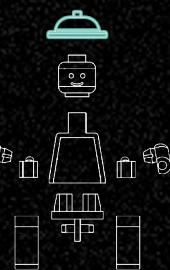
The following drawing is for a standard version of Project X.



Next we will present the drawing for the hat.

Hat Drawing

The following drawing is for a standard version of Project X.



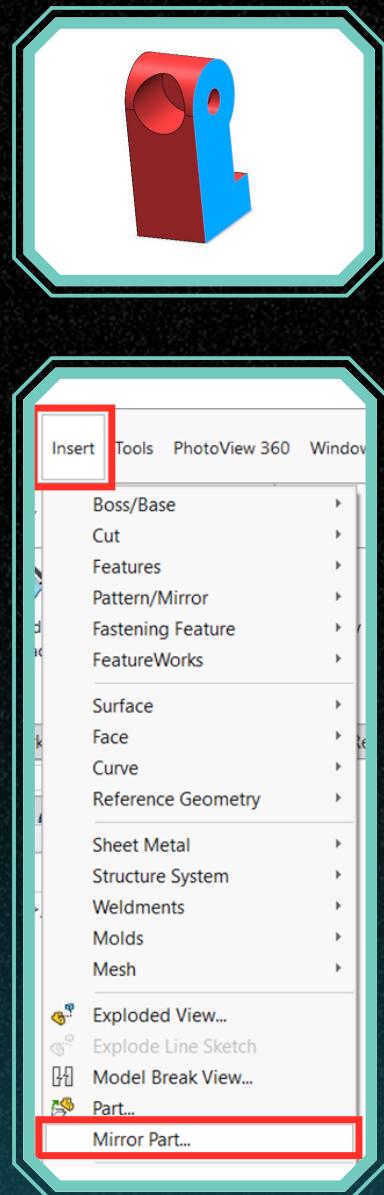
© 2020 TforDesign.

What About the Right Arm and Right Leg?

The right arm and leg are mirrored from the left ones. Thus, you will not need to remake the right and left ones. Instead, you can make a derived mirrored part. To make a mirrored part, you can follow the following steps:

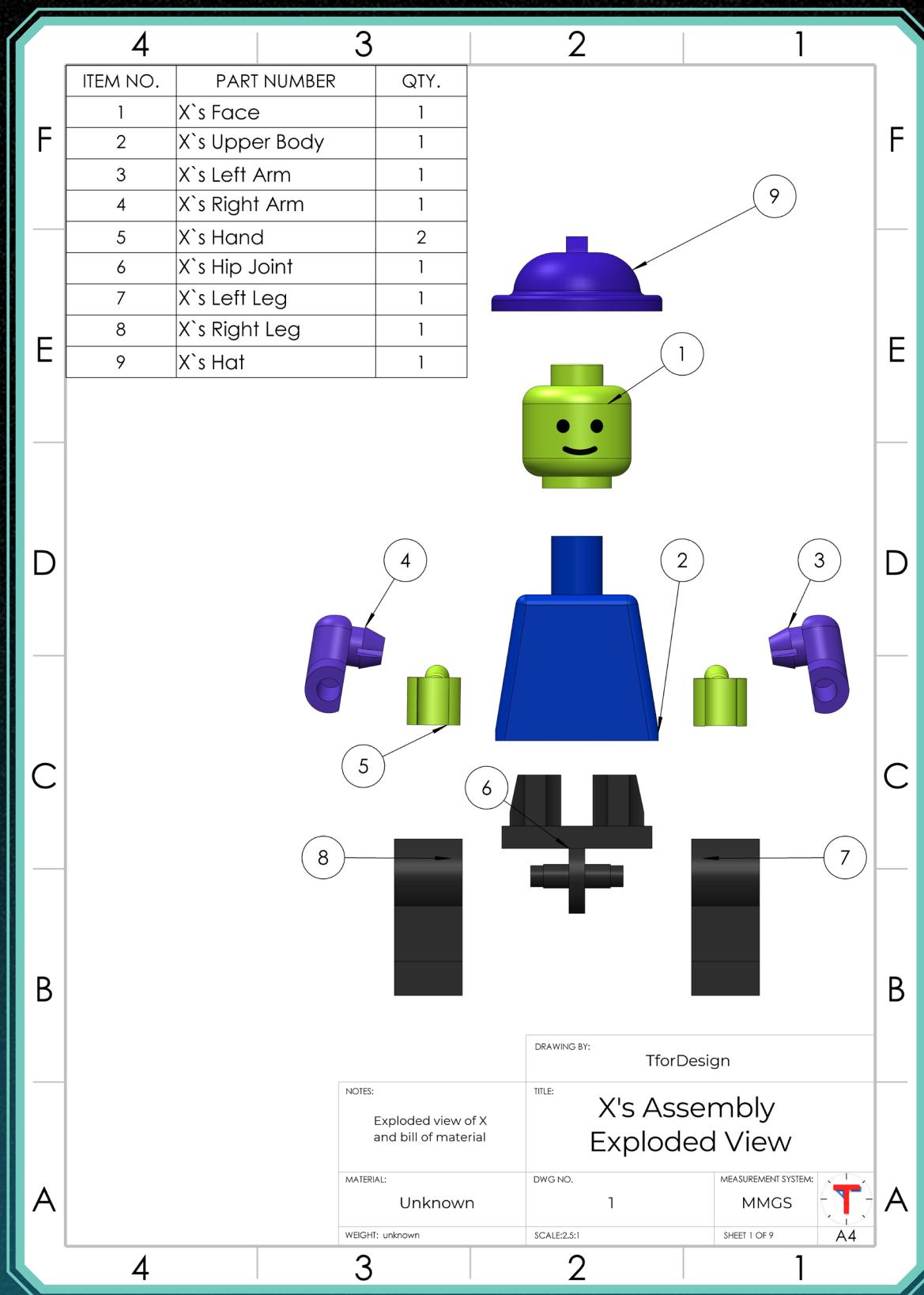
1. Open the original part (e.g. left leg).
2. Select the face you would like to mirror about. The following screenshot shows the mirroring plane for the left leg.
3. While the mirror plane/face is highlighted, go to **Insert** then click on **Mirror Part....** This will automatically create a mirrored part of the original part.
4. Save the new part as a separate file.

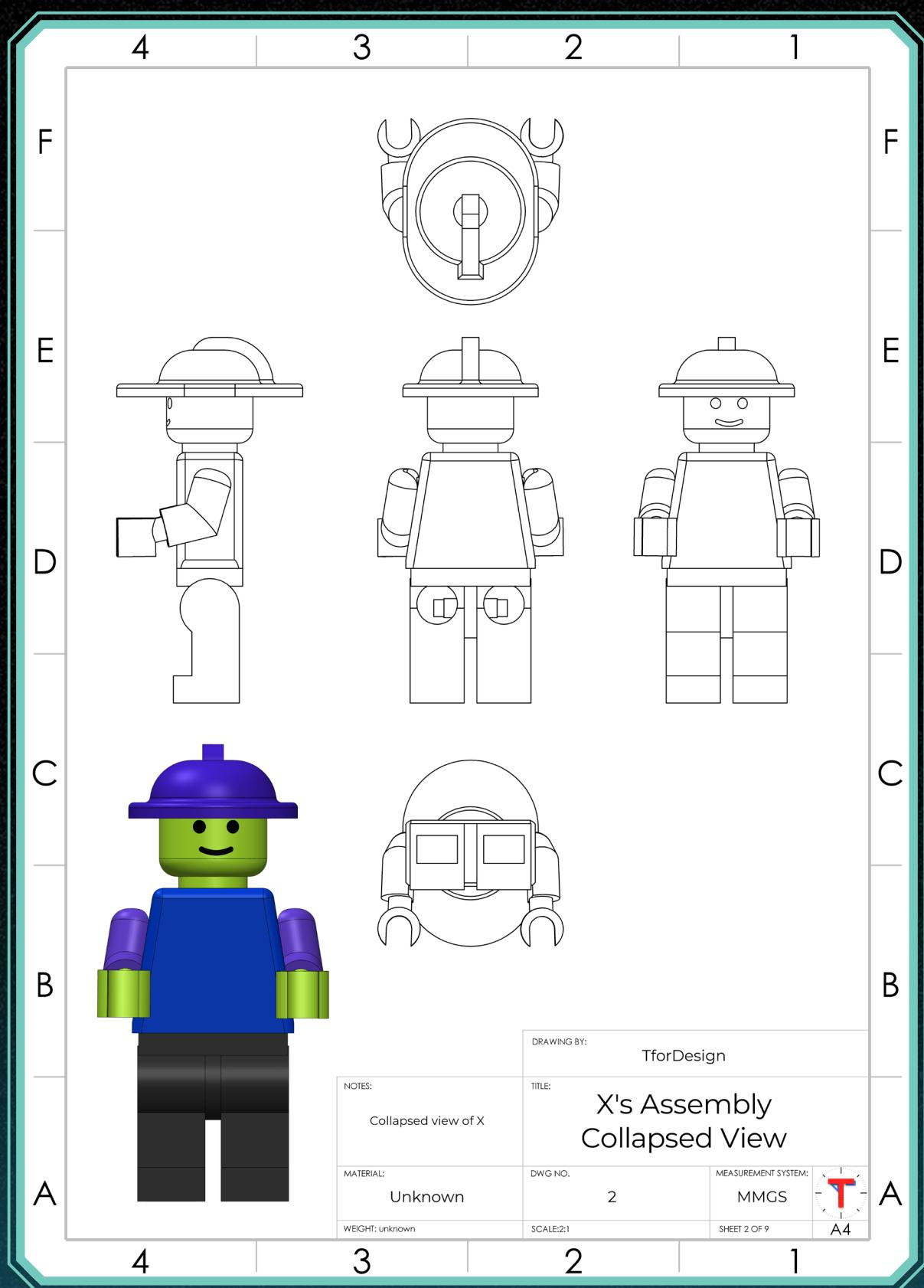
The original and mirrored parts are linked together. Thus, any changes that are applied to the original part, will also be applied to the mirrored part.



Assembling Project X

Now that you have all the parts modeled, you can start putting them together to form an assembly. You can refer to figures below showing the bill of materials and the assembly as a whole.





TASK: Working only from the 2D engineering drawings of the parts and assembly, try to model each of the parts and generate the assembly for your project X.

Next, we will address more hints to model each of the parts.



Section 2

Stages and Hints for Generating Each Element of Project X

Objective

To provide you with more hints and guidance to model each of the parts.

When making a model, we often go through different steps of applying features and to go from an empty canvas to a full 3D model. We will refer to those steps as modeling stages. In this section, we will present with you a sample set of stages for each of the parts. We will also provide extra hints for each stage for more guidance. However, keep in mind that there is no one right or wrong way of generating a 3D model, so it is okay if you are to create the same model using different stages.

The stages are provided for all the parts presented in the drawings. Those include the Face, Upper body, Left arm, Hand, Hip joint, Left leg, and Hat. They are also presented in the same order as mentioned.

NOTE

The shown stages in this section are suggested stages, you can come up with the same model following different steps.

Face Modeling Stages

The face stages of Project X are listed in the following figure.



STAGE 1

Complex Features:
Revolved Boss



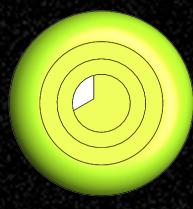
STAGE 2

Complex Features:
Wrap (make a unique face expression for your Project X)



STAGE 3

Basic Features:
Cut Extrude



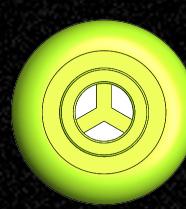
STAGE 4

Sketching Basics:
Selecting an existing body to sketch on



STAGE 5

Sketching Basics:
Patterns



STAGE 6

Basic Features:
Fillet

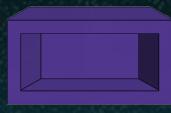
Next, we will go through the stages for modeling the upper body.

Upper Body Modeling Stages

The upper body stages of Project X are listed in the following figure.



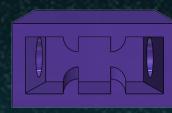
STAGE 1
Basic Features:
Boss Extrude



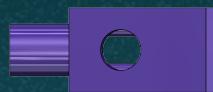
STAGE 2
Shell Feature



STAGE 3
Basic Features: Cut Extrude and Sketching Basics: Mirror



STAGE 4
Basic Features: Boss Extrude and Sketching Basics: Mirror



STAGE 5
Basic Features:
Boss Extrude



STAGE 6
Basic Features:
Cut Extrude

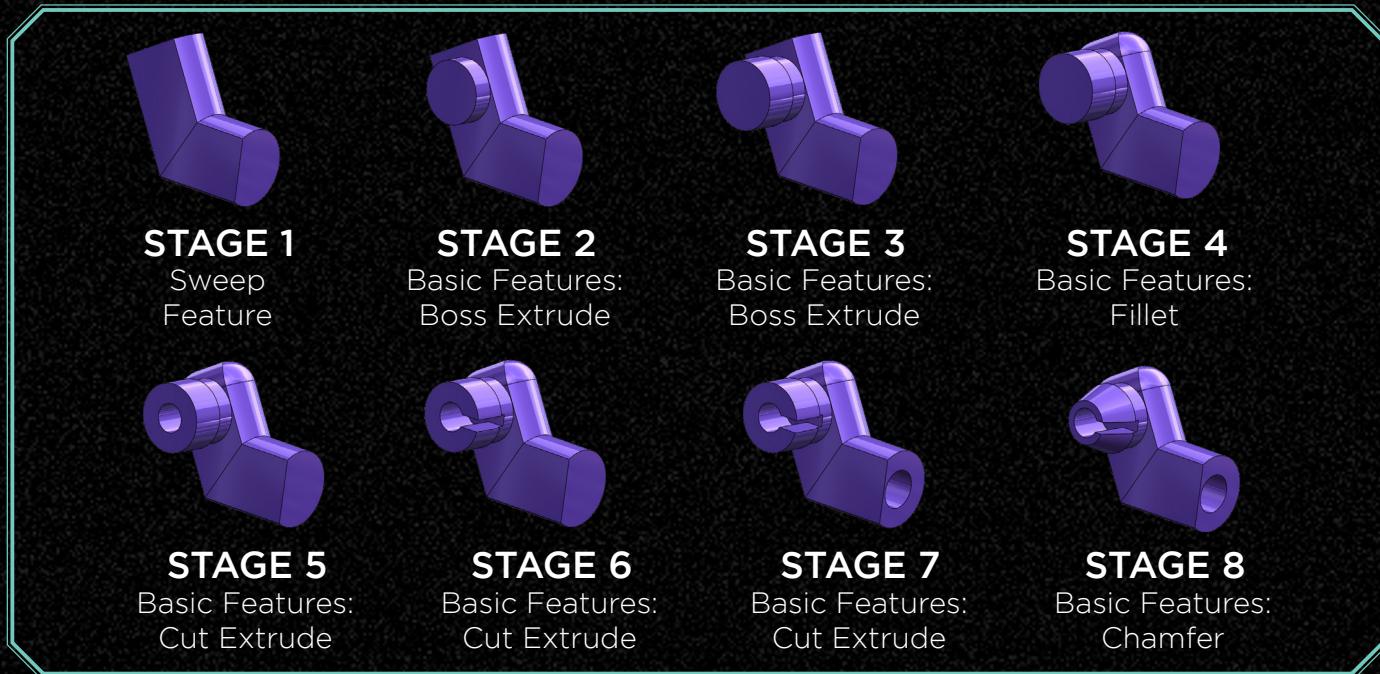


STAGE 7
Basic Features: Fillet

Next, we will go through the stages for modeling the left arm.

Left Arm Modeling Stages

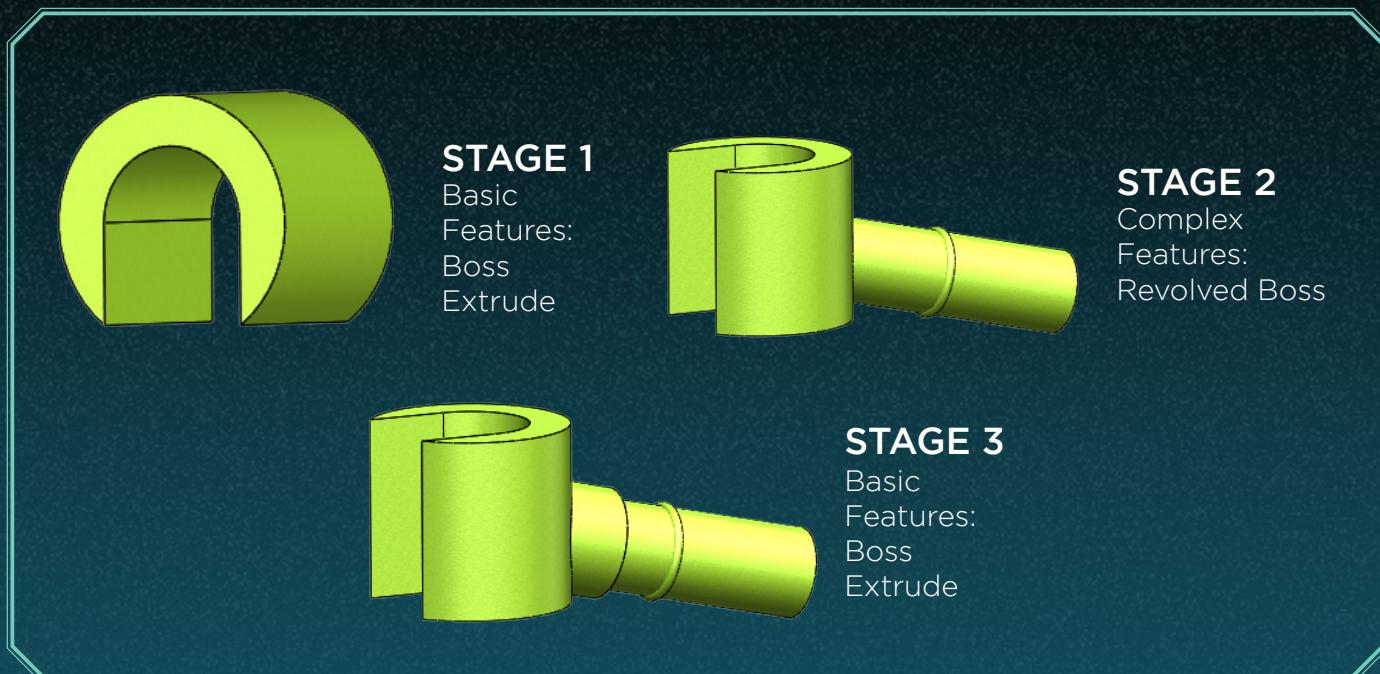
The arm stages of Project X are listed in the following figure.



Next, we will go through the stages for modeling the hand.

Hand Modeling Stages

The hand stages of Project X are listed in the following figure.



Next, we will go through the stages for modeling the hip joint.

Hip Joint Modeling Stages

The hip joint stages of Project X are listed in the following figure.



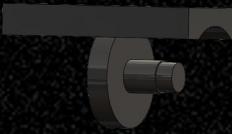
STAGE 1

Basic Features: Boss
Extrude



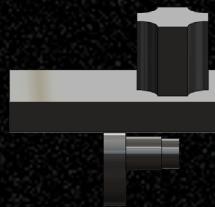
STAGE 2

Basic Features: Boss
Extrude



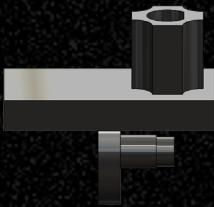
STAGE 3

Basic Features: Boss
Extrude



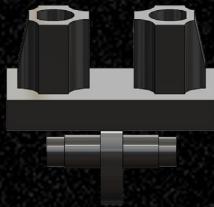
STAGE 4

Basic Features: Boss
Extrude



STAGE 5

Basic Features: Cut
Extrude



STAGE 6

Basic Features: Cut Extrude
& Sketching Basics: Mirror

Next, we will go through the stages for modeling the left leg.

Left Leg Modeling Stages

The leg stages of Project X are listed in the following figure.



STAGE 1

Basic
Features:
Boss
Extrude



STAGE 2

Basic
Features:
Cut
Extrude



STAGE 3

Basic
Features:
Cut
Extrude



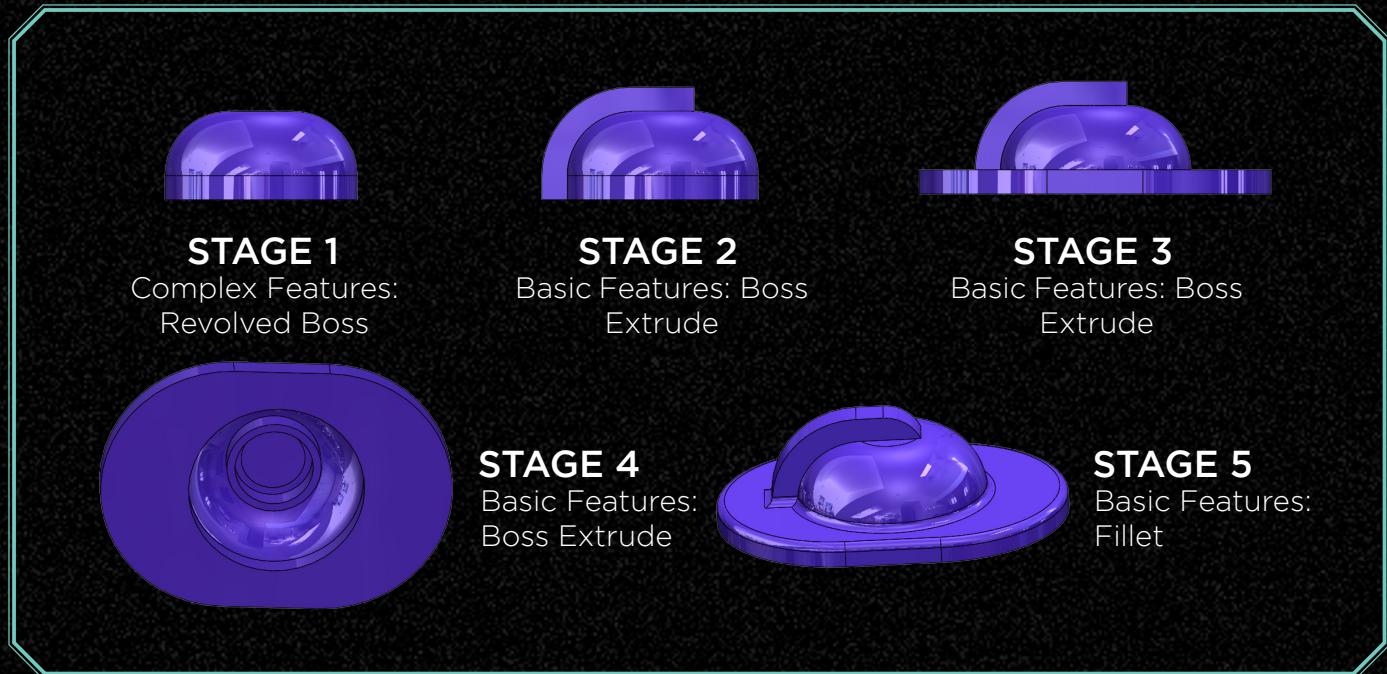
STAGE 4

Basic
Features:
Cut
Extrude

Next, we will go through the stages for modeling the hat.

Hat Modeling Stages

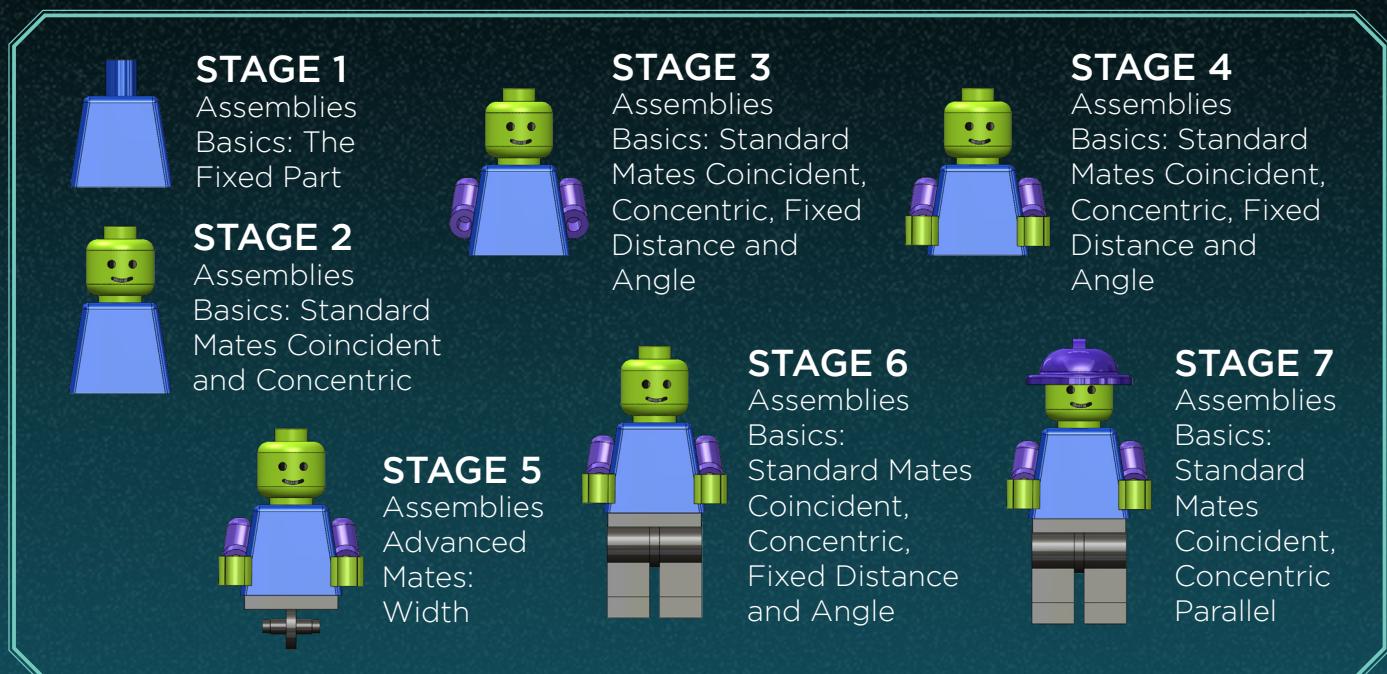
The hat stages of Project X are listed in the following figure.



Next, we will explore the stages for making the assembly.

Assembly Stages

The assembly stages of Project X are listed in the following figure.



At this point, you should be done with modeling all the parts as well as the assembly for your project X. The next section is a bonus guide toward applying unique appearances to your parts. Also, we will have some guidance for generating renders for your model of Project X.



Section 3

Appearance and Renderings

In this section, we will cover appearances and renderings. In appearances, you will learn how to give unique textures and colors to each part in your project X. In renderings, you will learn how to make more realistic images for your model by generating renderings using the Photo View 360 add-in. Instructions for both appearances and renderings are covered for software SOLIDWORKS.

Adjusting the Appearance of Our Models

Objective

To provide you with guidance to apply textures and colors on your 3D models using SOLIDWORKS.

Now that you have made your models, we can start giving them colors and textures to have your Project X look more unique. Here, we will be discussing:

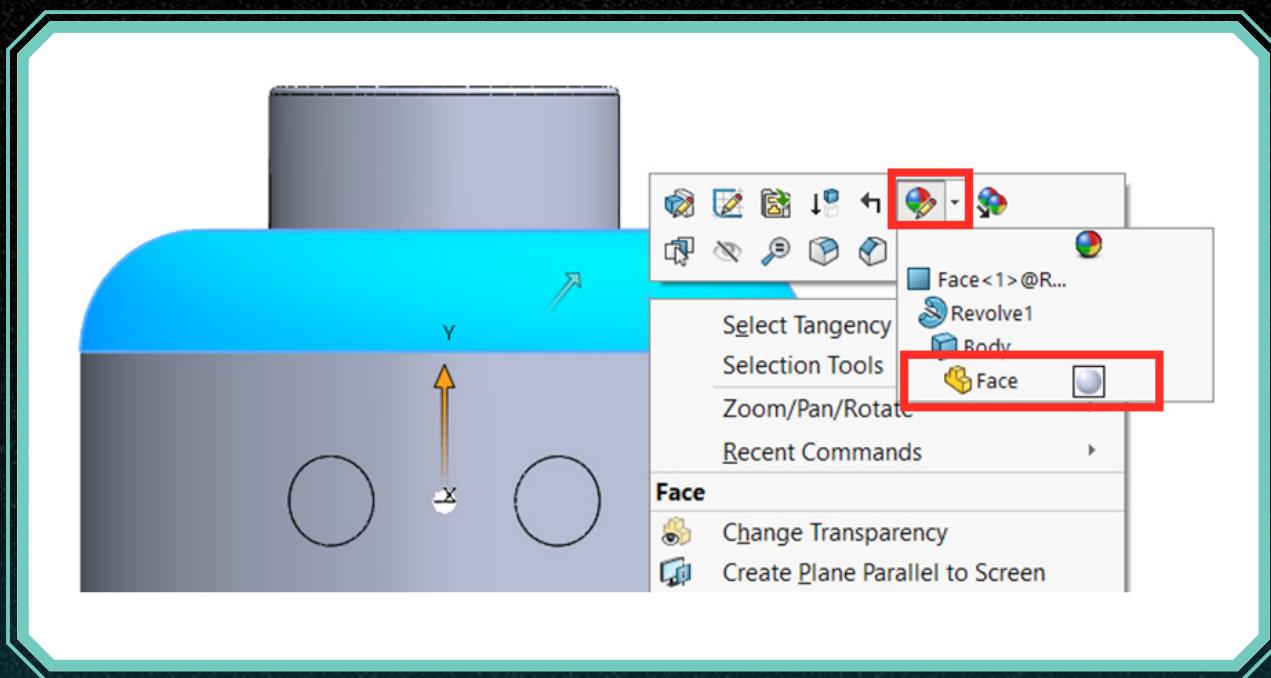
- Applying appearances
- Deleting appearances of materials shown in the following figure.

Editing Appearances

An appearance refers to how a part or a surface looks in our SOLIDWORKS interface and renderings. For example, we can have a part/surface to look like wood, gold, silver, etc. Assuming we want our part to look like Oakwood, the next question would be what color we want our wood to be. Would you like it to be red, white, purple, etc.

For the appearance, we can determine the texture, as well as the color. Let us address both elements by demonstrating on the Face part. We can edit appearance following the following steps:

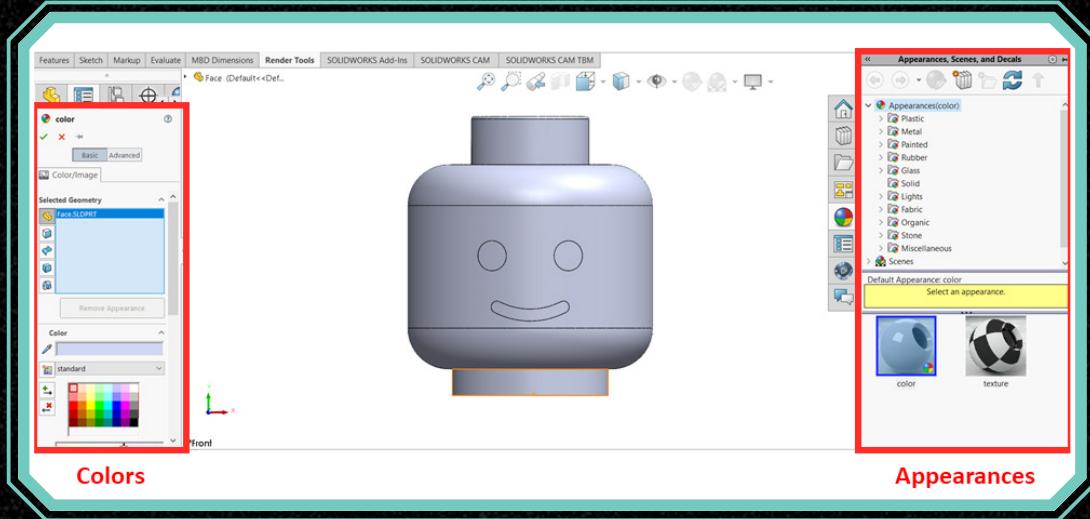
1. Right-click on any surface of the part, then click on the drop-down menu on **appearance** as shown in the following screenshot. For this demo, we will pick Part.



NOTE

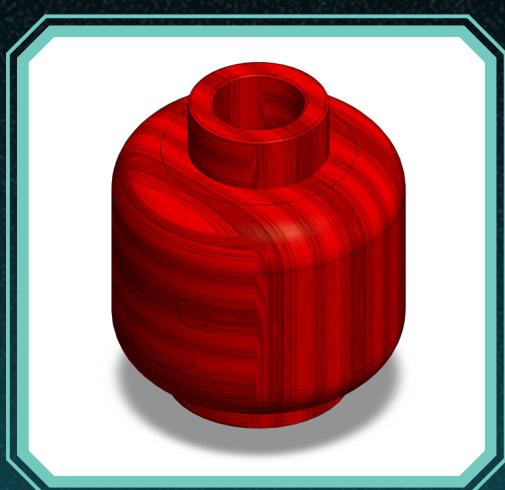
You can pick which part relating to the selected surface you would like to adjust. The options available are the face highlighted by the click, the feature indicated by the click, the body selected (in case the part is a multi-body part), and the whole part.

2. Once you do that, you will get two new panels, the Color PropertyManager on the left and the Appearance on the right as shown in the following screenshot:

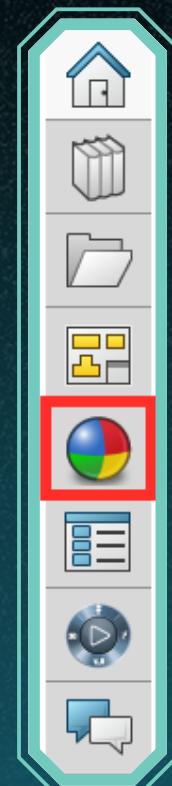


- From the appearance side, you can pick how your model would appear. For example, you can choose to make it look like Polished Rosewood (located at **Appearance > Organic > Wood > Rosewood > polished rosewood**). This will apply the texture as well as the natural color of that material.
- From the color PropertyManager on the left, you can then adjust the color as if you are painting your part. So, you can make your polished rosewood look red.

After applying the appearance and coloring adjustments to red polished rosewood, our model will look as shown in the following figure as shown in the canvas.



TIP: you can apply another appearance on top of the one that is already applied. For example, even though the part already has the appearance red rosewood, you can still change the appearance any surface to any other appearance you which by following the same procedure without effect the rest of the part.



NOTE

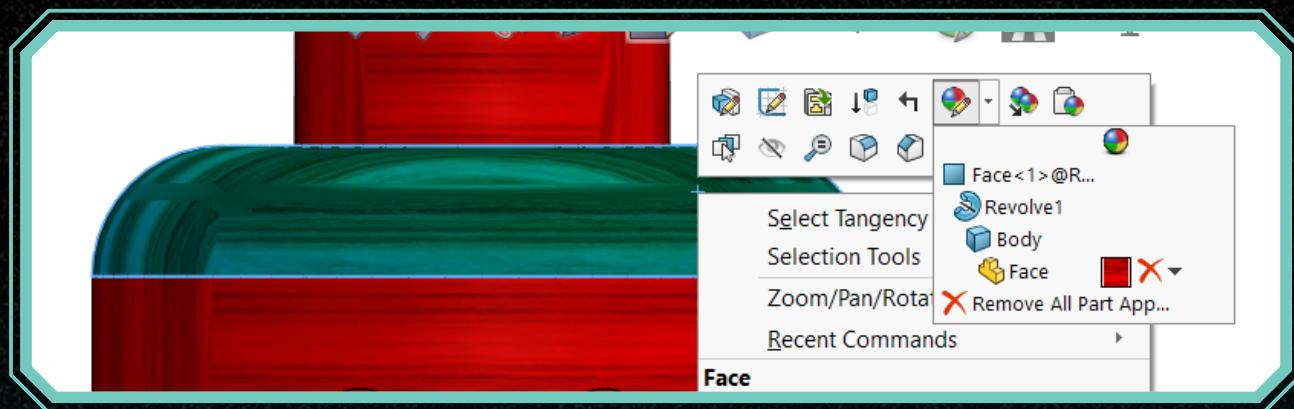
The appearance menu can get minimized by default, if that happens, you can expand it by clicking on the appearance sign on the shortcut pane commonly appearing on the right as shown in the figure.

Next, we will learn how to delete one appearance which we applied already.

TASK: follow the procedure highlighted to apply color to all the parts. Feel free to get creative with the different appearances to produce your unique model with its own character.

Deleting Appearances

To delete an appearance, can right-click on any surface, then open the drop-down menu for appearance. There, you will find a shortcut to delete the appearances you have already applied as shown in the following screenshot.



At this point, you should have applied unique appearances to all your parts using different textures and colors. Next, we will learn how to generate beautiful renders using the Photo View 360 add-in in SOLIDWORKS.

Creating Renders Using Photo View 360

Objective

To enable you to make renderings of your Project X using Photo View 360.

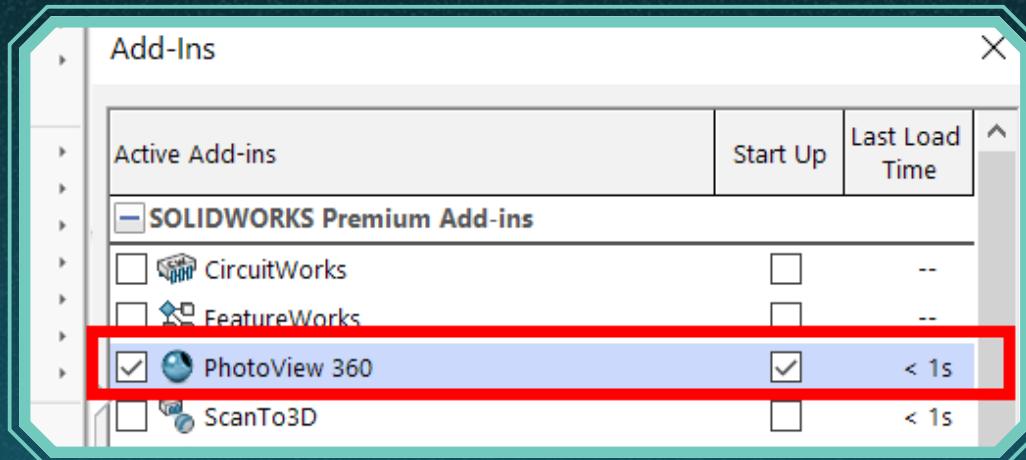
Now that you have all your parts colored, it is time to create beautiful renders using Photo View 360 add-on in SOLIDWORKS. Photo View 360 is one of the add-on tools available in SOLIDWORKS that can be used to make more realistic renders of how our models would look like with the appearance applied. Here, we will address:

- How to toggle-on the Photo View 360 function.
- How to adjust the size and quality of our render.
- How to generate the rendering.
- How to save our render as JPEG, PNG and the advantages of each.

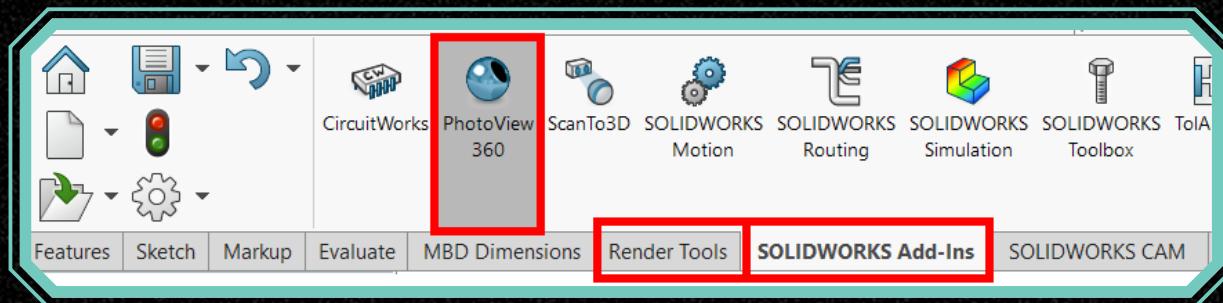
How to Toggle on Photo View 360

To use Photo View 360, you will first need to turn it on. To turn on the Photo View 360 add-on, you can follow the following steps:

1. Go to **Tools > Add-ins**
2. Check the **Photo View 360** option then click **OK** as heightened in the following figure.



3. Go to the SOLIDWORKS Add-Ins tab and make sure Photo View 360 is clicked. You will then find a new tab appearing called Render Tools which will give us access to the tools needed to generate renderings. All the tabs and command are highlighted in the following figure.



NOTE

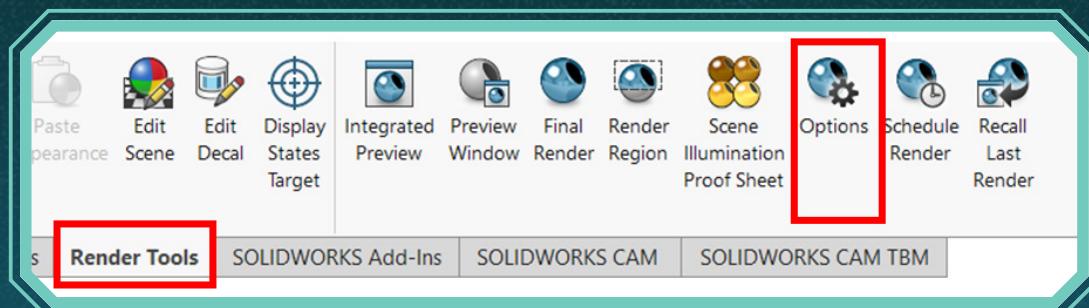
Photo View 360 is only available for SOLIDWORKS Professional and Premium Versions. This includes student versions as well. It is not available if you have a SOLIDWORKS Standard version.

Now that we have access to the rendering tools, we will start learning how to adjust the size and positioning of our renders before generating them.

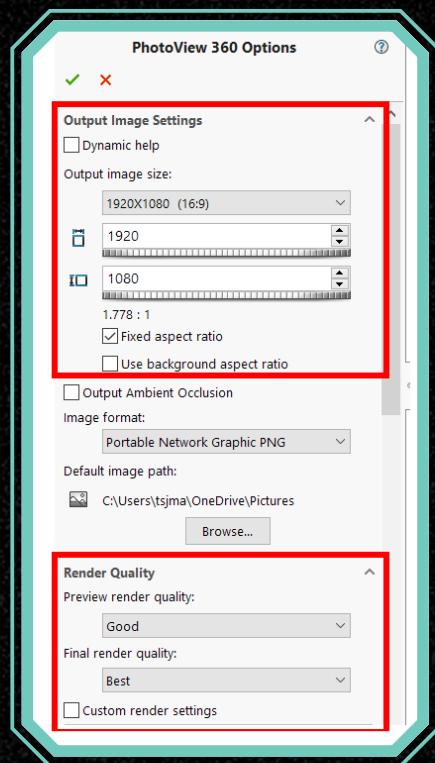
How to Adjust the Size and Quality of Our Renders

Before making a render, it is important to determine the output criteria of our rendering before generating it. Here, we will only look at the output size and render quality. To access those options, you can follow the following steps:

1. On the **Render Tools** tab, click on **Options** as shown in the figure.



2. You will get a new PropertyManager appearing on the left with many different options about your render as shown in the figure. The two we will be addressing here are:



- Output image size:** in this, you can determine how big you would like your final output to be. There are different options in the dropdown menu for common sizes. If you are looking for something bigger, you can input large values manually. As a starter, we recommend using 1920 x 1080.
- Final render quality:** this allows us to determine the render quality in terms of details. The option available is Good, Better, Best, and Maximum. A render quality of Better or Best would work well in most cases.

NOTE

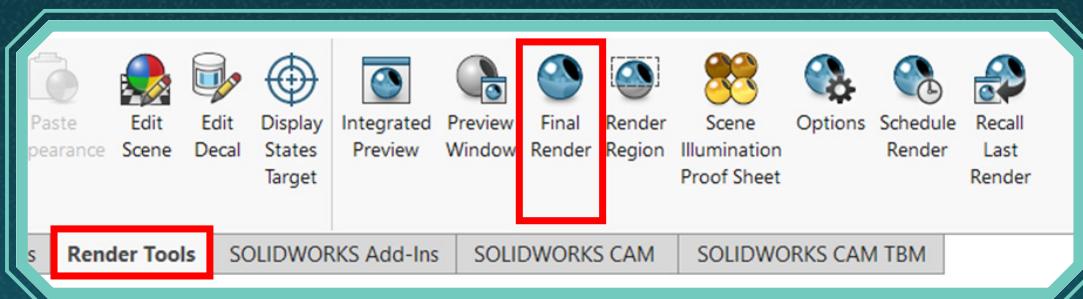
The higher the image size, and the final render quality, the longer it will take for the render to generate.

At this point, we have our Photo View 360 enabled. We have also set-up the size and quality of our renders. Next, we will go ahead and start generating our final render.

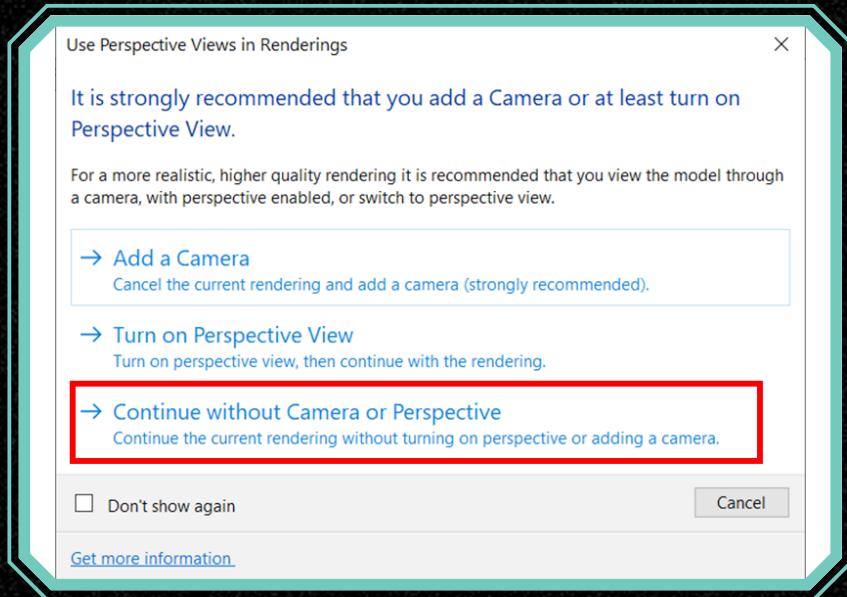
How to Generate a Render

At this point, we already have our rendering set up. To start generating our render, we can follow the following steps:

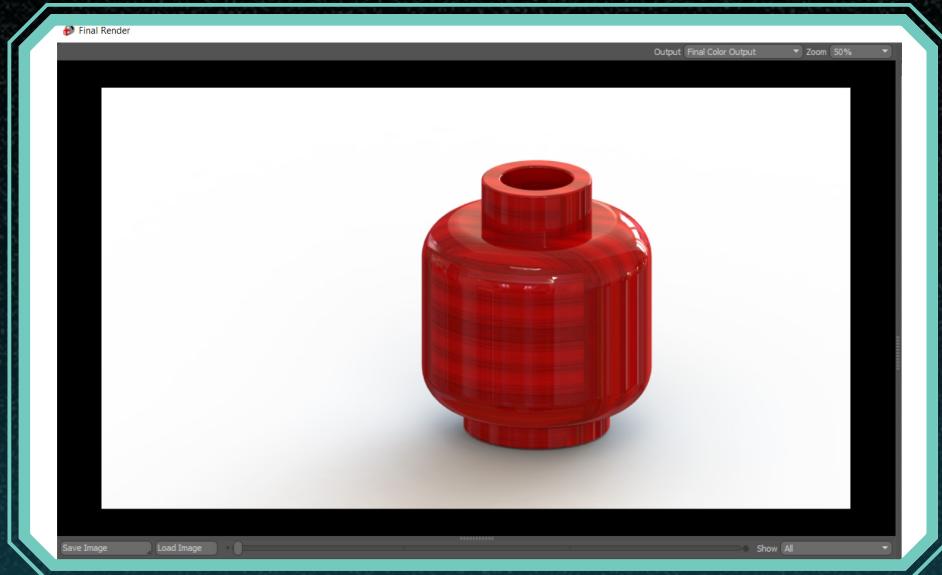
1. Click on the **Final Render** button on the command bar as shown.



2. You might get a window like the one shown. You can click on ***Continue without Camera or Perspective***.



3. You will get a new window that shows the processing of your render as shown. Generating the render will take time depending on your rendering settings, your computer hardware, and the complexity of the model complexions.



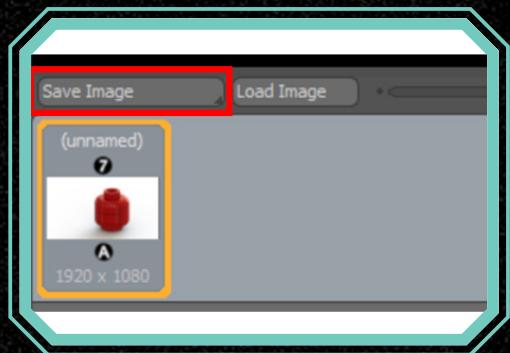
NOTE

The positioning of the model in the canvas is also the positioning of the generated render's view. To change the view, you can simply adjust it in the canvas by rotating the model or zooming in & out.

Now that we have generated the render for our model, we can save our render in a format that we can use for display or show off. We will discuss saving our render next.

Save Your Rendering as JPEG or PNG

Once your rendering is done, you can save the result for your creative usage or sharing. You can save the rendering by clicking on the button highlighted in the screenshot.



Two common saving options are to save your rendering as a JPEG or PNG. The major difference between the two is that a PNG will give you a transparent background image while a JPEG will use the background in your SOLIDWORKS canvas. The following render is the result of rendering the face parts as a red polished rosewood.

TIP: Saving your render as PNG (without a background) makes it easy to place your render in front of different backgrounds to have more creative outcomes.

TASK: Follow the procedure highlighted above to generate a rendering for your Project X Assembly.

Now you are already equipped with all the knowledge needed to fully tackle your own Project X. So, get ready to take the challenge.



Section 4

The Challenge Proposal

This Project X booklet is an open challenge aiming for challengers to practice their 3D modeling skills. However it is also an open competition for creatives. With that in mind, your challenge is to make the most unique Project X out there.

TIP: Feel free to get creative, design new parts, props, or environments that goes with your Project X.

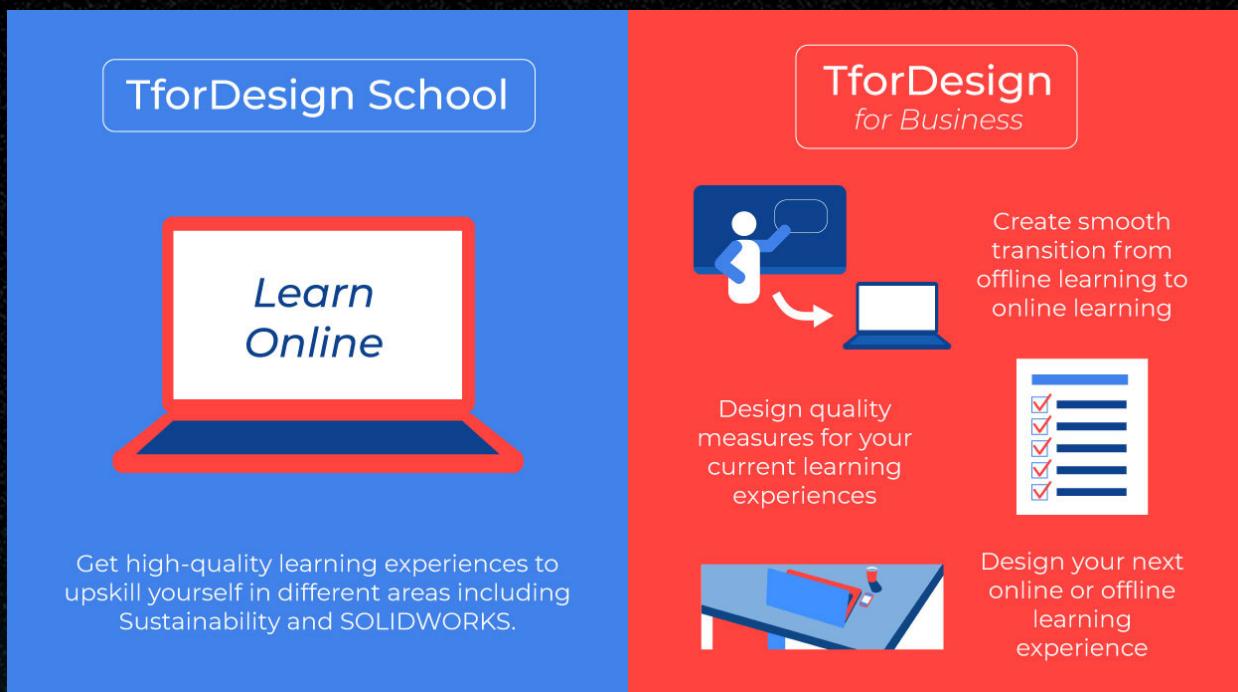
After making your final models and renders, make sure to share them in social media using these hashtags! **#TforDesign #ProjectX** and **#MakeItReal2020**

This will enable everyone to find your creation, and will also enable you to find everyone else's.

“May the odds be ever in your favor.”

Other TforDesign Services and Offers

TforDesign is an organization dedicated to designing exceptional learning experiences. It has two branches, an independent online school and learning design services for businesses as highlighted in the following figure.



Some of the online courses offered at TforDesign School include:

- SOLIDWORKS Associate Level Training (CSWA).
- SOLIDWORKS Professional Level Training (CSWP).
- SOLIDWORKS Drawings Professional - Advanced Training (CSWPA-DT)
- Introduction to Climate Change
- The Complete Work Portfolio Building Course

For more information, visit TforDesign.com

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