

Munera

Board Game Design

Team ID: 2046-1

Denver CO, 2021



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Main Game Overview

Although the true beginning of gladiatorial combat is lost to history, most modern historians believe gladiatorial combat began with the funeral of Emperor Brutus Pera in the 3rd-century Carthan war. Regardless of when it started, by the 1st-century bc, gladiatorial combat was a mainstay of Roman culture. The State sponsored events in which gladiators, each specialized in a specific set of weapons, were matched up in one on one combat. Then, there were Munera. A Munera was a gladiatorial event put on by a wealthy patron independent of the State. They were for the entertainment of the public and, of course, the status of the patron. In a Munera, State rules didn't apply. Dirty fighting and group battles thrilled the audience. Anything could happen in a Munera.

The game Munera recreates the strategic thinking of a gladiator team competing in a group arena battle. Throughout the game, players compete for control over areas in the arena, with the end goal of eliminating all opposing gladiators, and obtaining all of the glory that comes with victory.

Munera has 15 unique arena layouts, each requiring different strategies. Munera also includes blank arena layouts for players to create their own unique arena designs.

After an arena is selected, each player uses their 20 gladiators to attempt to converge on and eliminate the opposing players team. Every turn, a player rolls the dice to determine how many "steps" they have to work with. From there, they may release a new gladiator into the arena, and use their "steps" to reposition their gladiators.

What makes Munera unique is the "stacking" mechanic, in which up to four gladiators may position themselves on the same space. This mimics the formations used by gladiators to gain an advantage in an actual Munera battles. Because it takes one gladiator per enemy gladiator to capture a space, stacking gladiators makes them much more difficult to capture. The downside? It takes one step per gladiator in the stack to move one space. It's up to the player to decide how much mobility they are willing to give up for a greater defense.

Munera's "stacking" mechanics, gradual increase in the number of gladiators in the arena, and variety of arenas leads to a game of territory control, trickery, and risk management. Will you seize the bridge? Flank your enemy? Control a choke point? Anything can happen in a Munera.

Expansion Overviews

Medusa's Mischief: Medusa has slithered her way into the arena, and she is looking to expand her statue collection. This expansion for Munera introduces a new game piece, Medusa, who is placed randomly (determined by dice rolls) in the arena. Medusa can look in any of the four cardinal directions, and any gladiator who crosses her gaze is eliminated from the arena. Any time a player rolls a 1, Medusa rotates 90 degrees. If a player rolls snake eyes, they get to choose the direction of Medusa's gaze. This expansion also comes with Medusa themed pillars for the arena, and green dice.

Taurus' Terror: Taurus has stormed into the arena, and he's ready to run down some gladiators! This expansion for Munera introduces a new game piece, Taurus, who is placed randomly (determined by dice rolls) in the arena. Any time a player rolls doubles, they must move Taurus in any direction (except diagonally) until he hits either a pillar, or the edge of the arena. Any gladiator who gets in his way is eliminated. This expansion also includes Taurus themed double pillars for the arena, and red dice.

Traps And Treachery: Things are about to get a little more dangerous. Each player is given three floor traps and a booby trapped pillar to place in the arena. Any time a gladiator passes over a floor trap, or by a booby trapped pillar, they must roll the dice. If they roll doubles, the gladiator is eliminated. These traps can activate on any gladiator, regardless of what player placed them, so choose your placement wisely, it may come back to bite you. Along with the trap pieces, this expansion also comes with blue dice.

Intended Audience

Munera is intended for players from 12 years of age and up. Munera, and its expansions (Medusa's Mischief, Taurus' Terror, etc), are heavily themed around Greco-Roman lore. This was done deliberately to leverage off of the popularity of Roman and Greek themed books and movies that resonate with audiences around the age of 12. Rick Riordan, the author of the Percy Jackson series, which has sold 110 million books, even stated in an interview that his Greco-Roman stories are "designed... for the middle grades, roughly ages 9-14". With this massive popularity, one would expect game stores to be overflowing with Greco-Roman themed games. And yet, when inspecting the shelves at our local toy stores, we noticed a severe lack of board games reflecting this popular theme. We decided to fill the void, and give kids the chance to get hands on with their Roman heroes; when they play Munera!

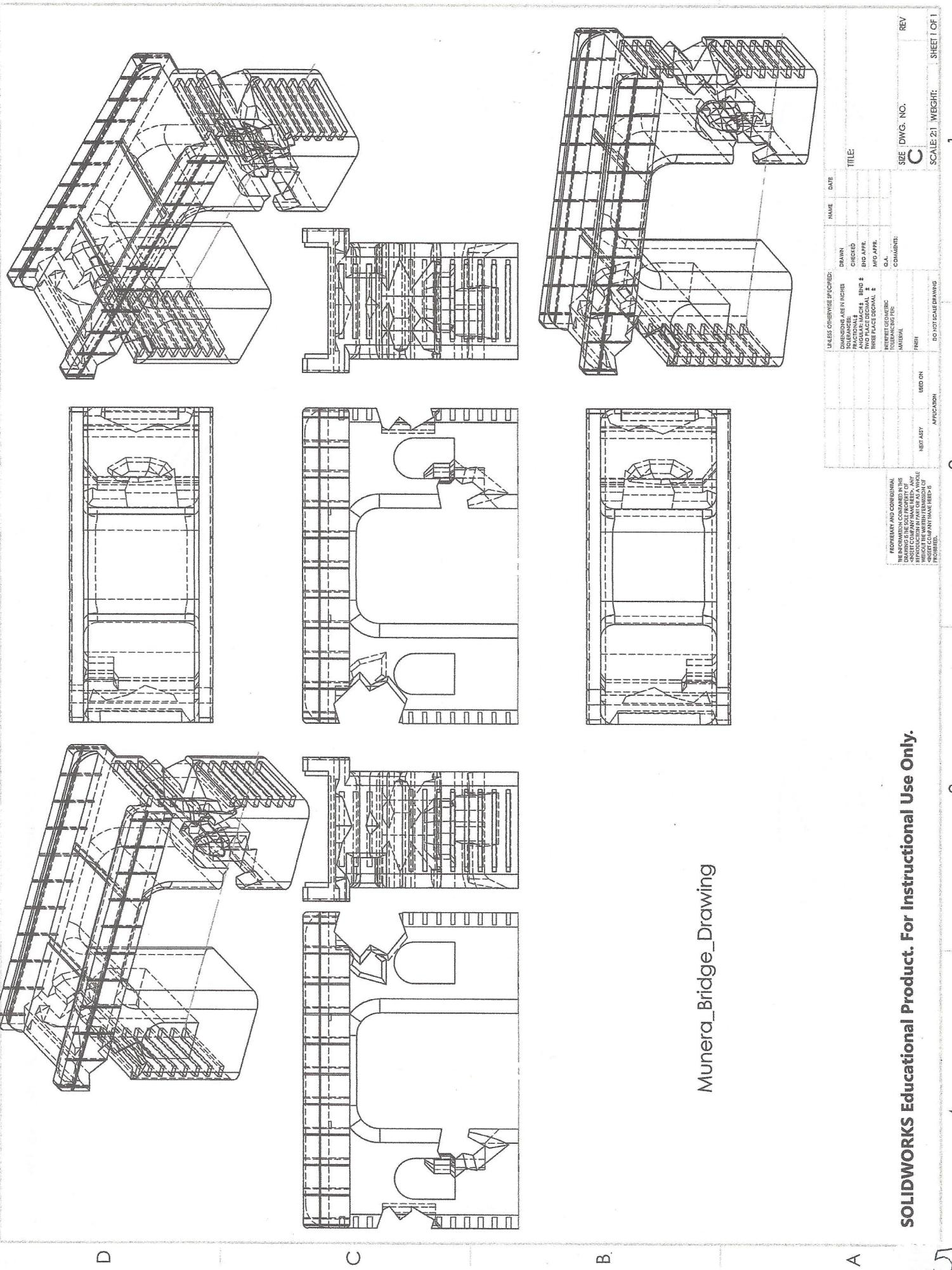
The primary reason we chose 12 as the baseline minimum age for Munera is the gameplay itself, and how the game grows in complexity with the player. We believe that the challenge of a board game should not be in understanding the rules, but in having the rules provide a platform for players to challenge one another. The rules of Munera are straightforward enough: you position your gladiators in the arena and attempt to eliminate all of the opposing gladiators. The complexity of the game emerges when players start understanding the theory behind effectively controlling the game board, and the nuances of each individual arena. A 12 year old player can quickly pick up the rules to Munera and play it with friends. Over time, players develop strategies and become a greater challenge to one another. This aspect of the game also makes Munera accessible to older players, as, like chess, the game is truly as challenging as the opponent.

The Munera expansions also allow the game to grow with the player. A new 12 year old player can master Munera Classic with ease. From there, they learn the strategies involved in each expansion, and how the strategy changes when you combine expansions. This format also allows players to customize their own play experience by including the expansions they enjoy most, or none at all, making Munera fun for a variety of player types!

Another reason why we decided on 12 as the introductory age for Munera is the heavy emphasis on tactile learning in those formative years, and the opportunity that provides us to create pieces that are not just functional on the game board, but intricate toys in their own right. Each of the fourteen unique pieces presented in the base kit and expansion packs was 3D designed and printed to look and feel like an artifact of Greco-Roman history. We vetoed and redesigned a piece if it was not visually or tactilely appealing after 3D printing. Some of our rejected designs can be found in the engineering drawings section of the manual. Additionally, before gameplay begins, the players must assemble one of the 15 unique arena layouts, or create one of their own. This gives players the chance to get hands-on with creating the arena itself, adding another layer of cognitive challenge to Munera.

With its heavy theming, and its "minutes to learn, lifetime to master" gameplay, Munera is a game kids and parents alike can enjoy playing together.

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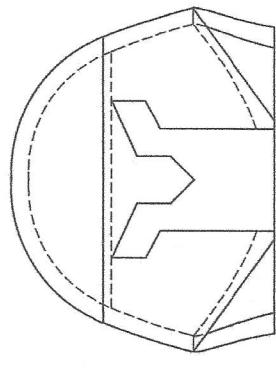
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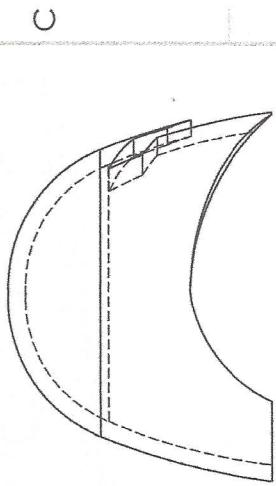
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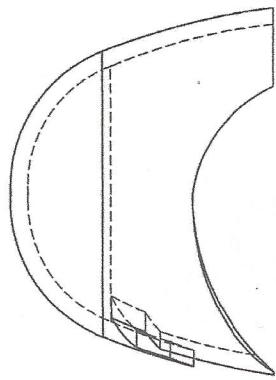
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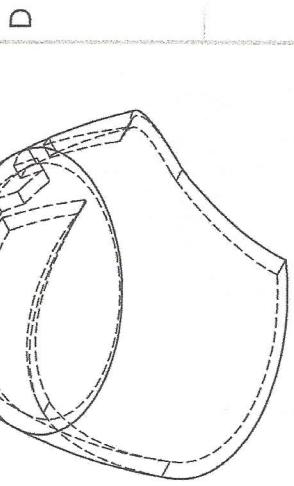
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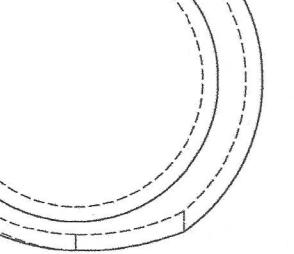


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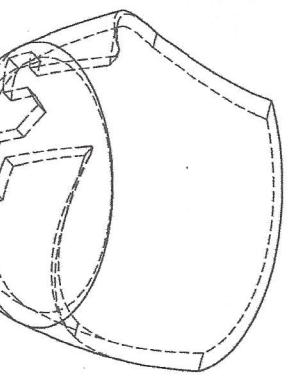


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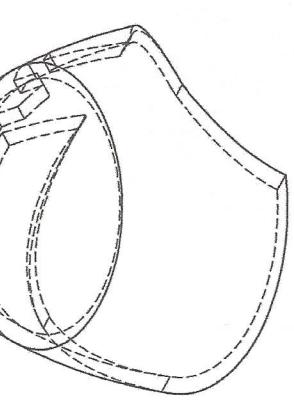
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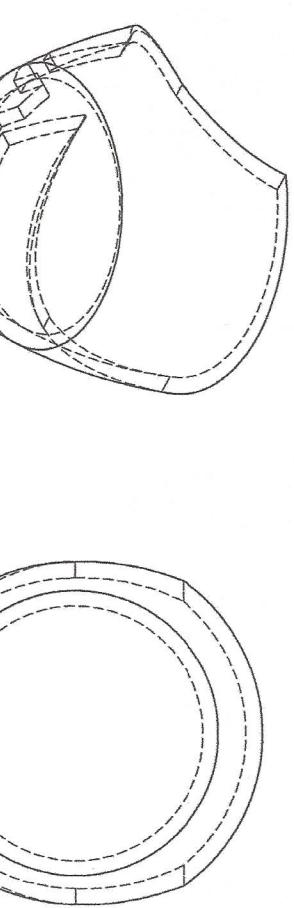
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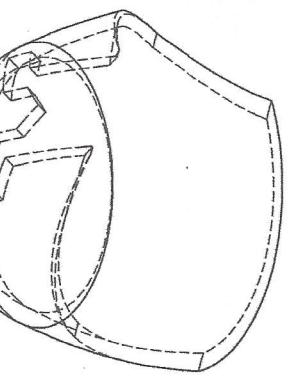
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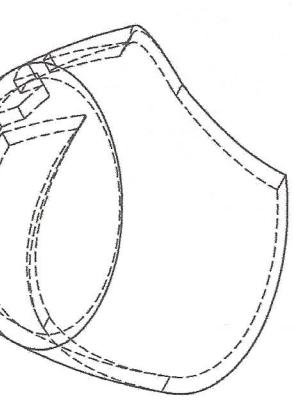
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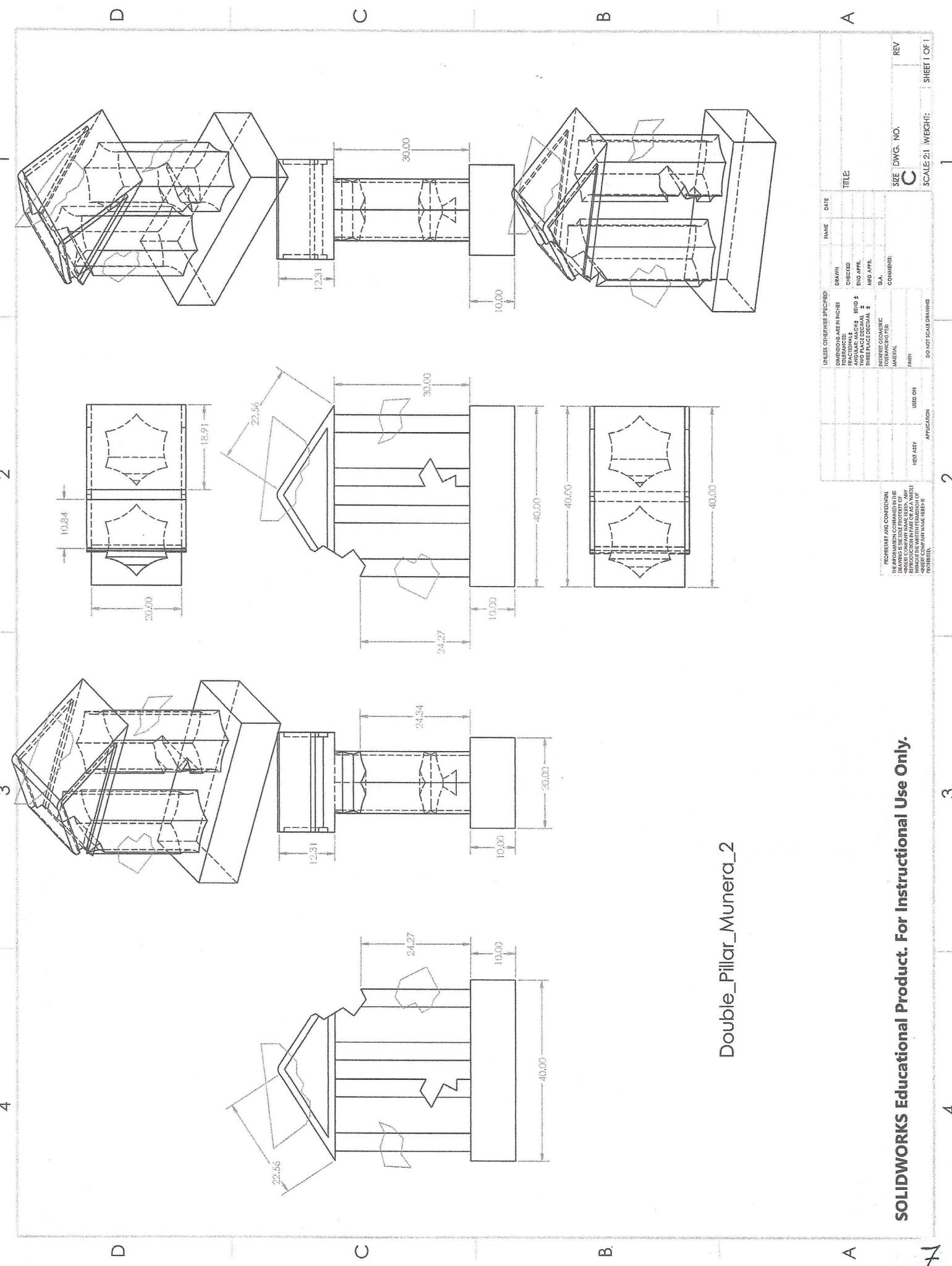


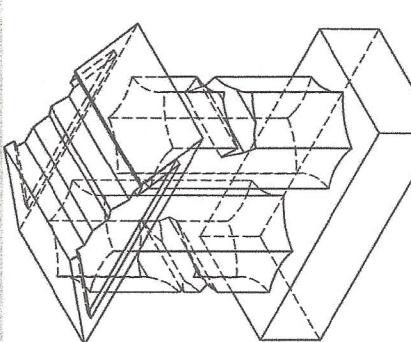
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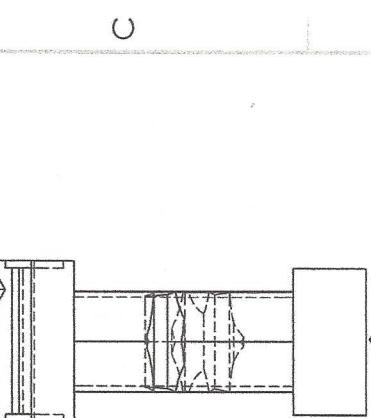
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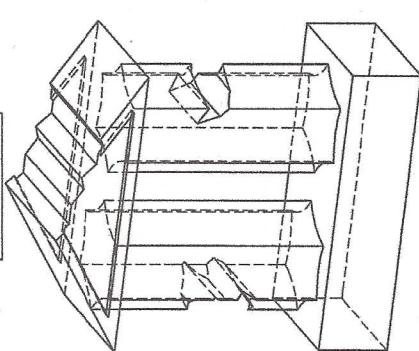




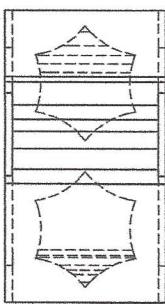
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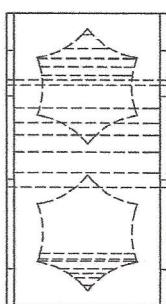
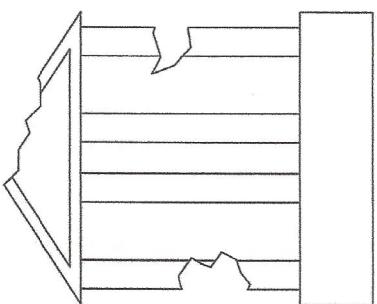
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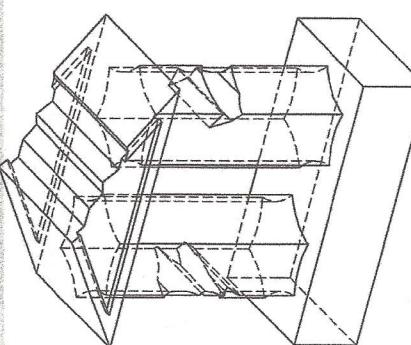


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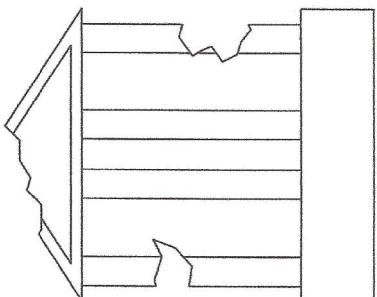
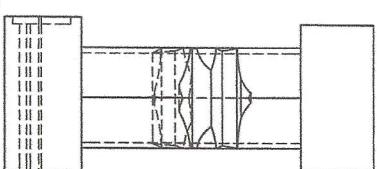


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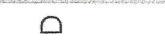
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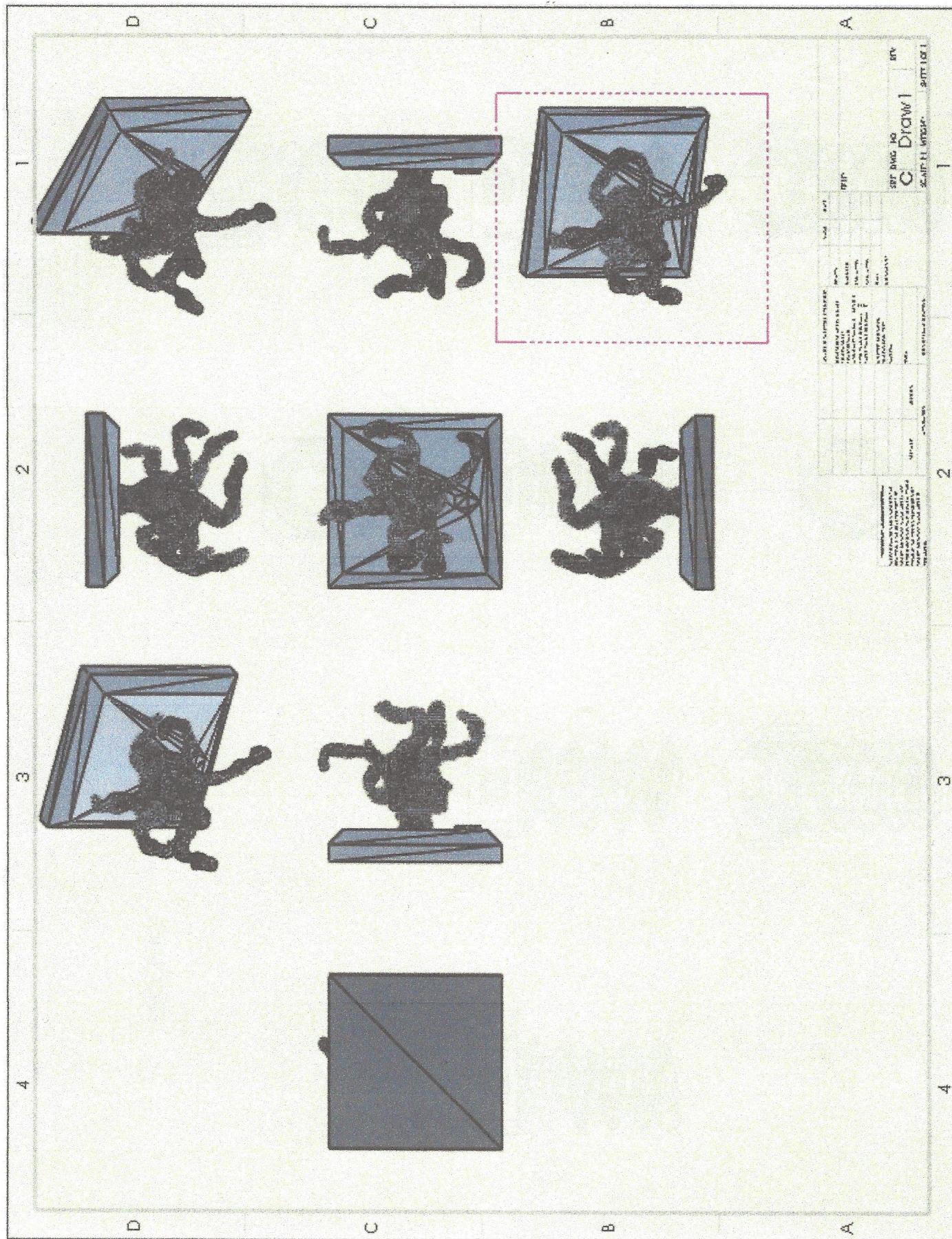
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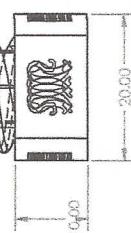
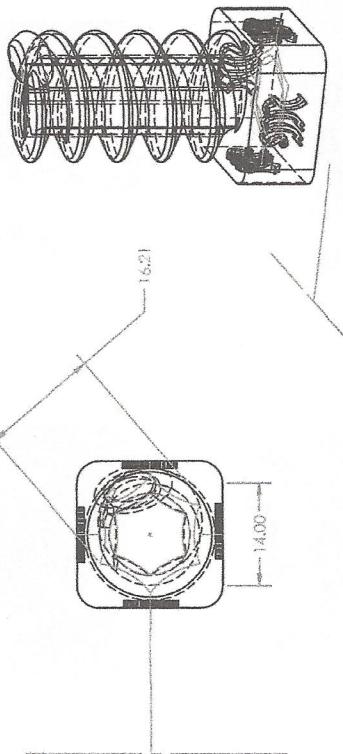
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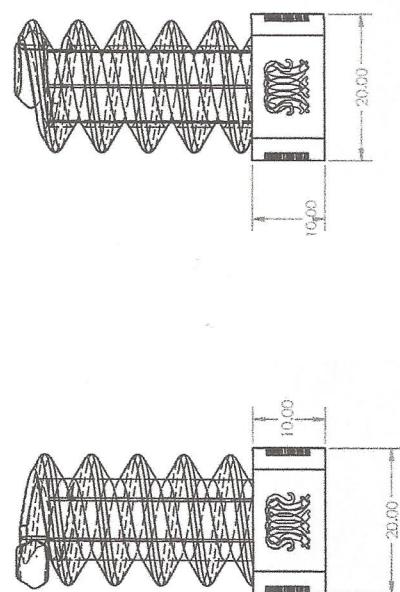
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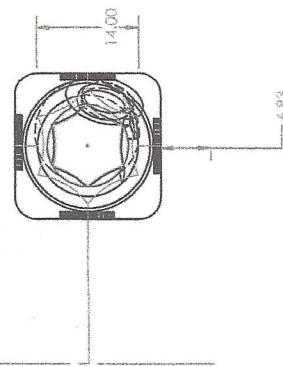


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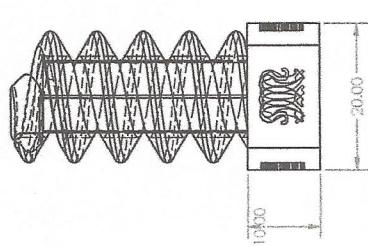


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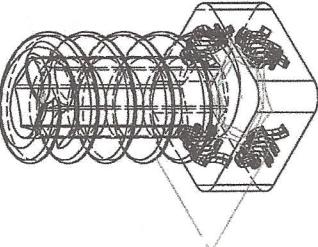
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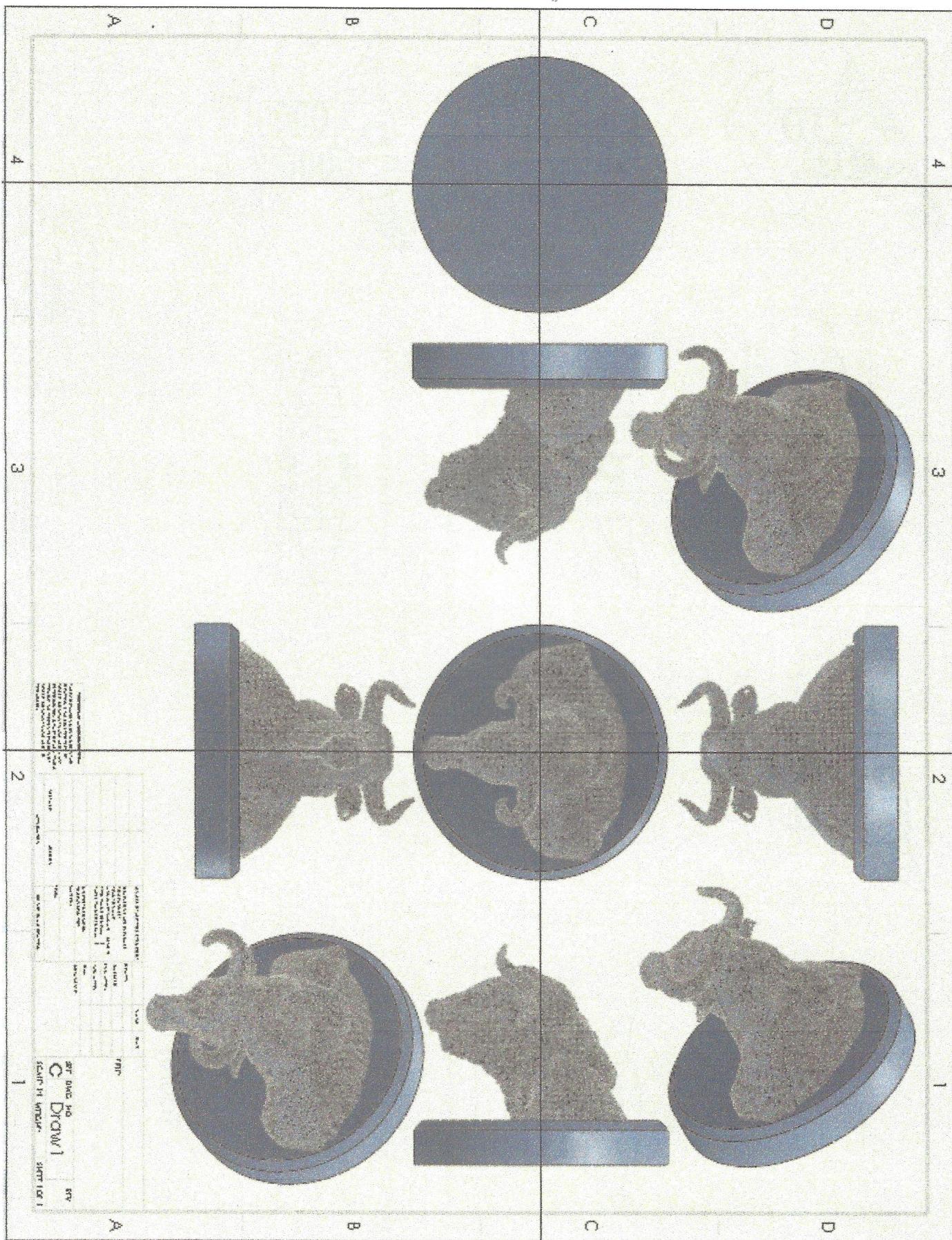


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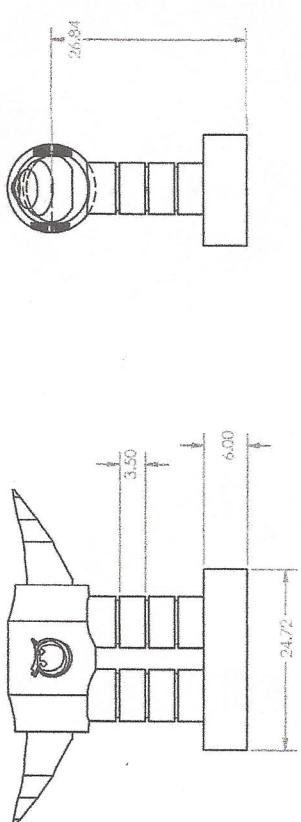
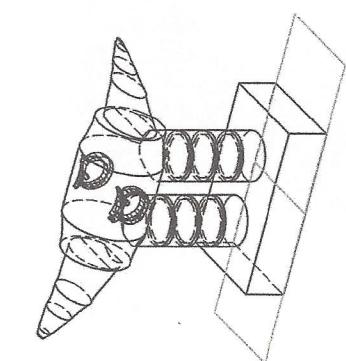
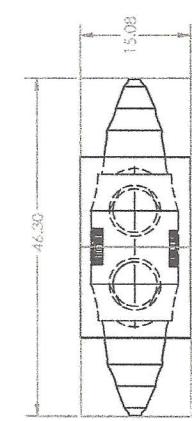
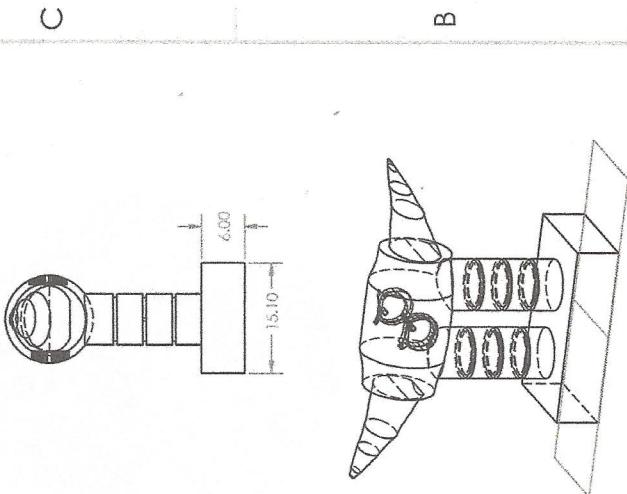
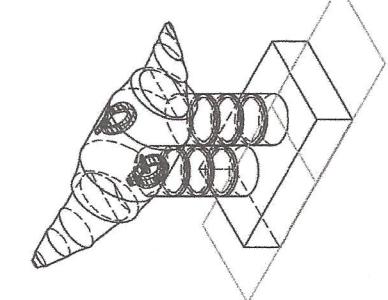
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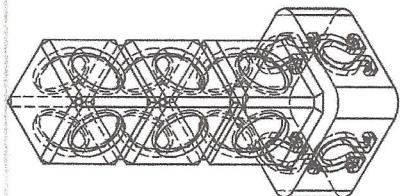
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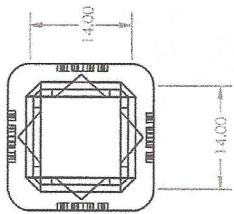
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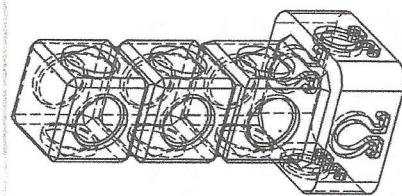
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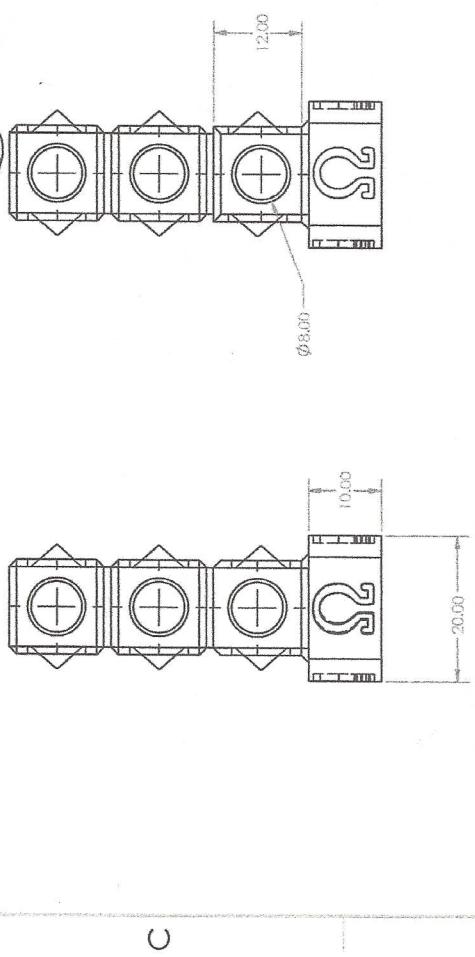
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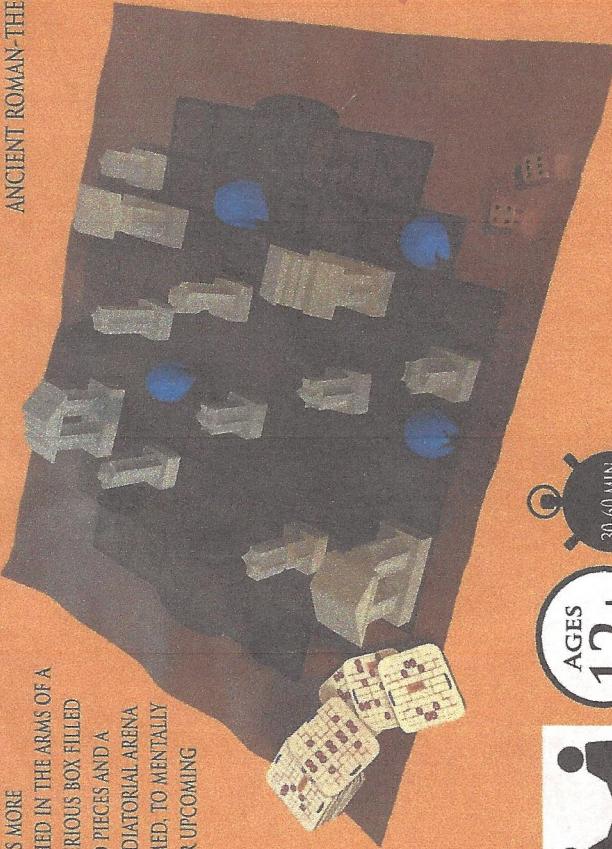
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Ο καλύτερος

MUNERA

IN EARLY 2019, TWO EXPLORERS STUMBLED UPON THE LOST RUINS OF THE ANCIENT CARTHAN GLADIATORIAL ARENA. THEY RETURNED WITH AN EXCAVATION TEAM AND UNEARTHED ALL SORTS OF TREASURES FROM BENEATH THE ARENA. SWORDS, SHIELDS, HELMETS... JEWELS, HOWEVER, NO TREASURE WAS MORE INTRIGUING THAN THE ONE CLUTCHED IN THE ARMS OF A GIANT ARMORED SKELETON: A MYSTERIOUS BOX FILLED WITH STRANGE INTRICATELY CARVED PIECES AND A MINIATURIZED VERSION OF THE GLADIATORIAL ARENA ABOVE THEIR HEADS. AS GAME IT SEEMED, TO MENTALLY PREPARE THE GLADIATORS FOR THEIR UPCOMING FIGHTS IN THE ARENA.

THE ULTIMATE GAME OF STRATEGY, DEFENSE, AND RISK MANAGEMENT! ORGANIZE YOUR FORCES AND OUTSMART YOUR OPPONENT IN A FUN, COMPETITIVE, ANCIENT ROMAN-THEMED GAME OF WAR!



CONTAINS EXPANSION PACKS:



TRAPS AND
TREACHERY



MEDUSA'S
MISCHIEF



AGES
12+

30-60 MIN



TWO PLAYERS



Munera

να κερδίσεις

THE COLLECTOR'S EDITION

INCLUDES:

- MUNERA CLASSIC EDITION
- TORIUS' TERROR EXPANSION
- MEDUSA'S MISCHIEF EXPANSION
- TRAPS AND TREACHERY EXPANSION



THE COLLECTOR'S EDITION

MUNERA

THE COLLECTOR'S EDITION

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TAURUS' TERROR
AN EXPANSION FOR MUNERA

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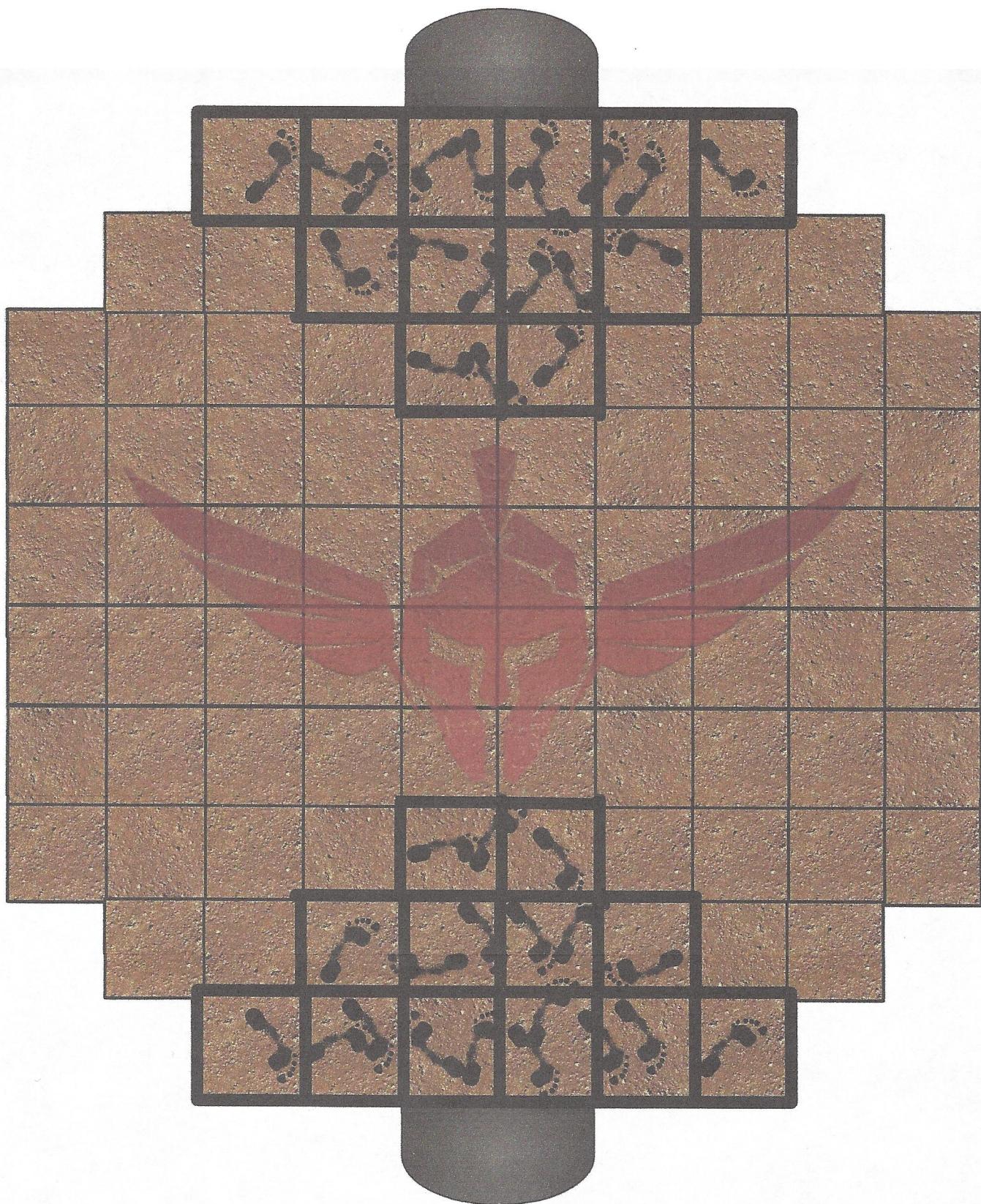
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AN EXPANSION FOR MUNERA

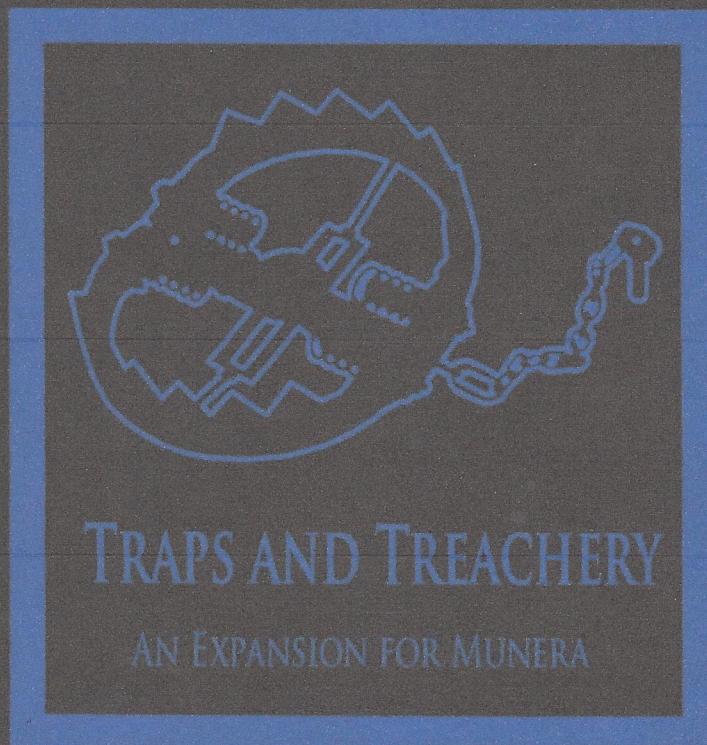
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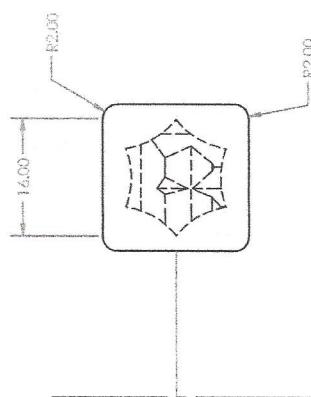
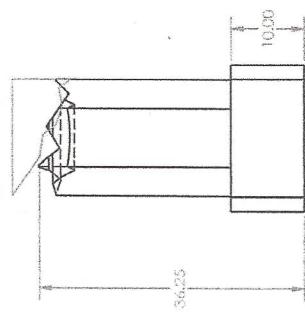
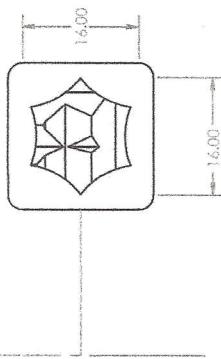
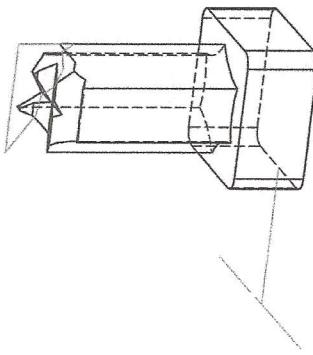
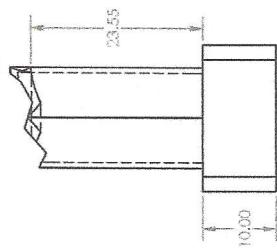
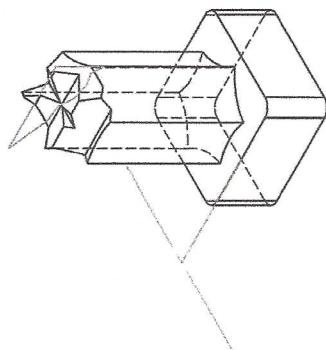
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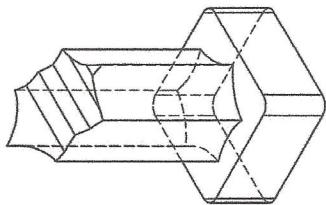
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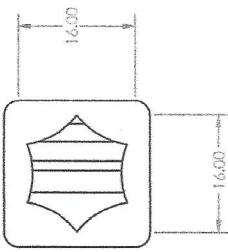
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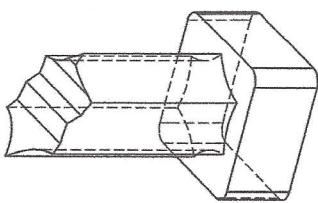
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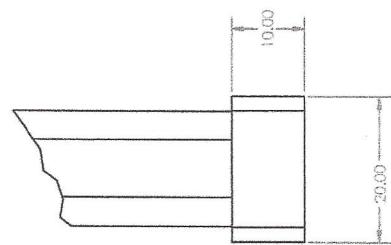
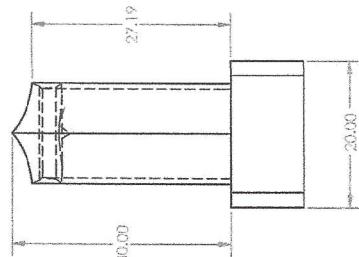
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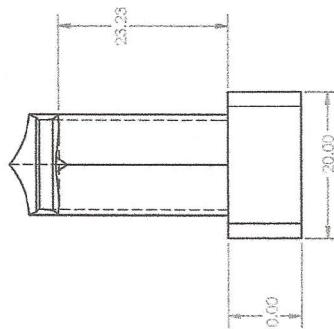
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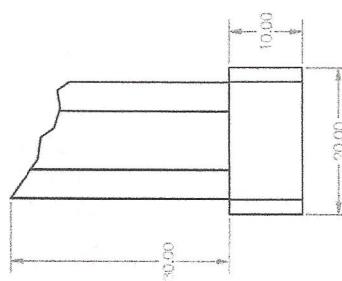
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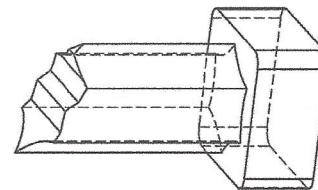
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Pillar_Munera_1

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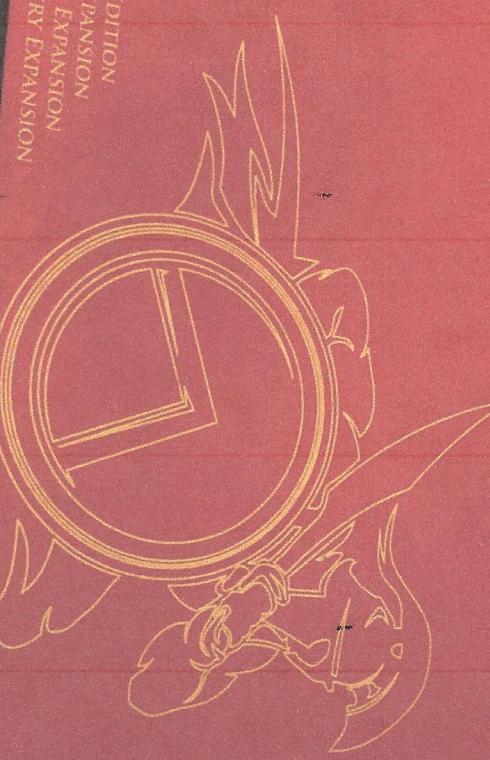
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MUNERA

THE COLLECTOR'S EDITION



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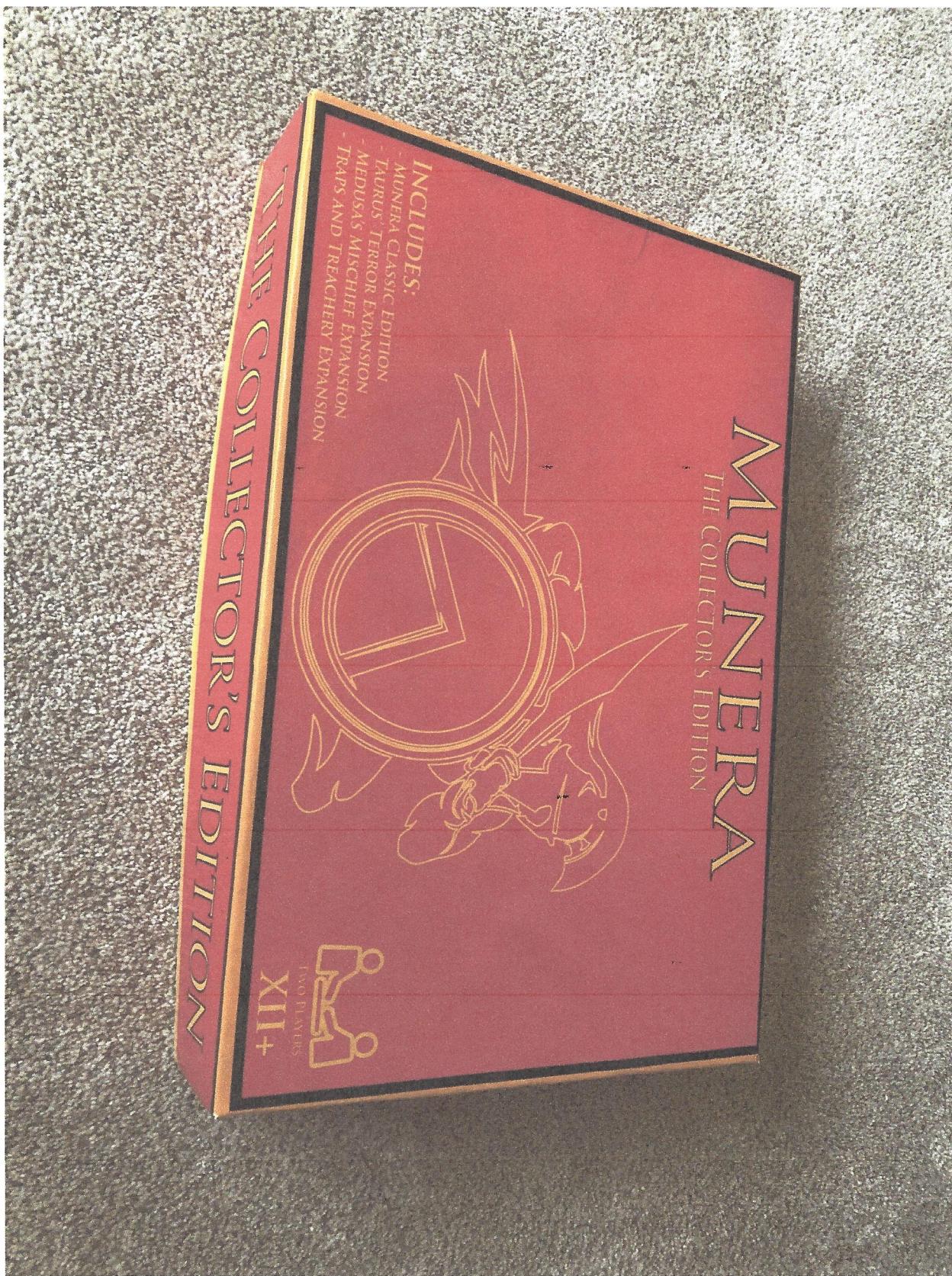
- MUNERA CLASSIC EDITION
- TAURUS TERROR EXPANSION
- MEDUSA'S MISCHIEF EXPANSION
- TRAPS AND TREACHERY EXPANSION



TWO PLAYERS

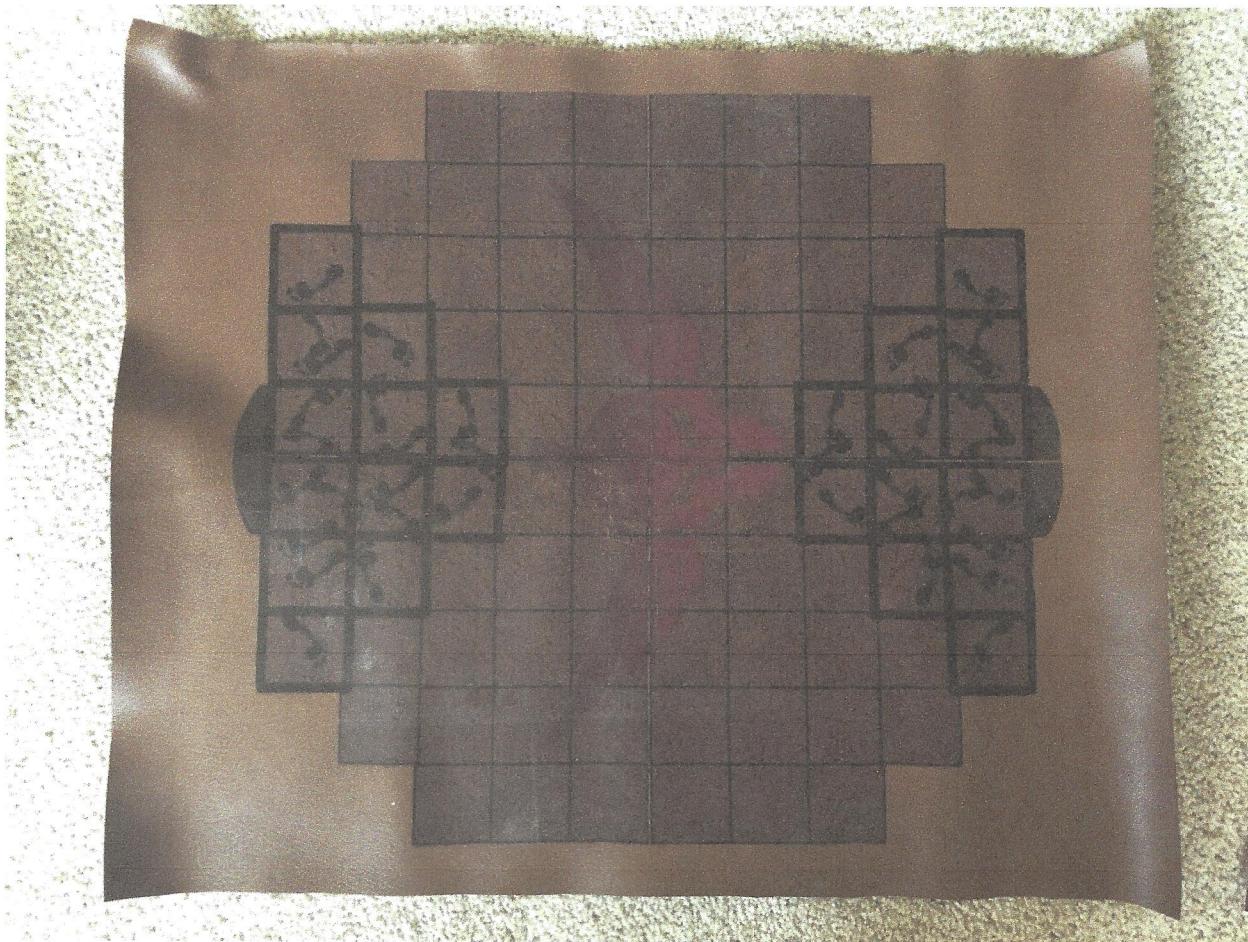
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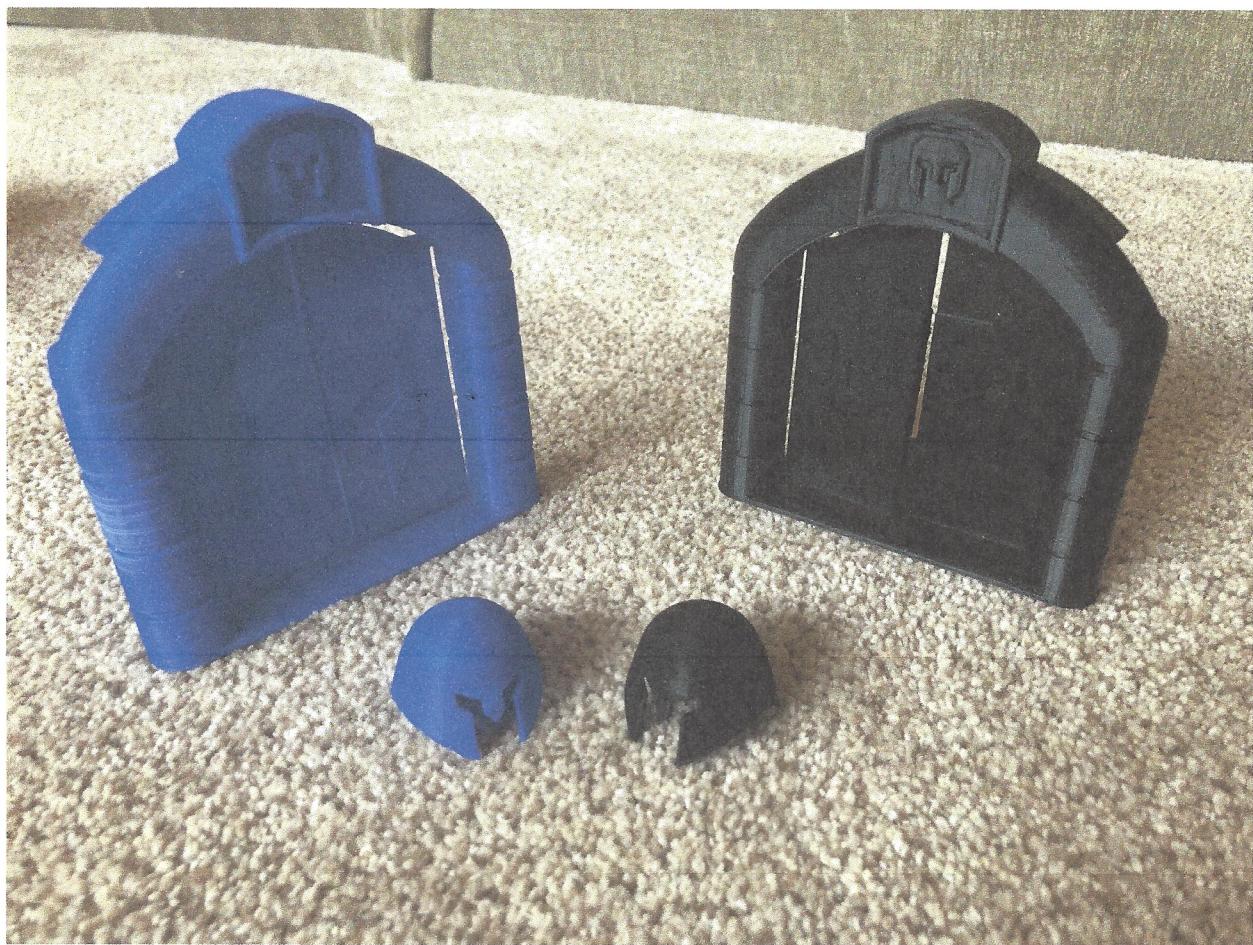
LIVE COLLECTOR'S EDITION



























MUNERA

Background: In early 2019, two explorers stumbled upon the lost ruins of the ancient Carthan Gladiatorial Arena. They returned with an excavation team and unearthed all sorts of treasures from beneath the arena. Swords, shields, helmets... jewels. However, no treasure was more intriguing than the one clutched in the arms of a giant armored skeleton: A mysterious box filled with strange pieces and a miniaturized version of the gladiatorial arena above their heads. A game, it seemed, to mentally prepare the gladiators for their upcoming fights in the arena.

Object: Use strategic positioning and coordinated attacks to eliminate all of the opponent's gladiators. The game is ended when the opponent has zero gladiators in the arena.

Contents: Arena-style Gameboard, 20 blue gladiator pawns, 20 black gladiator pawns, 8 single space pillars, 4 double space pillars, 2 dice, 1 bridge, 1 black gate, 1 blue gate, arena layout tiles

Setting Up

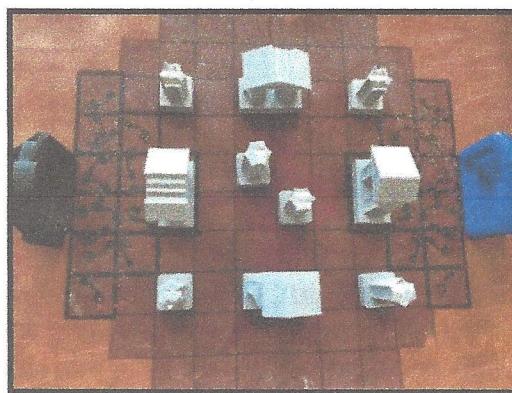
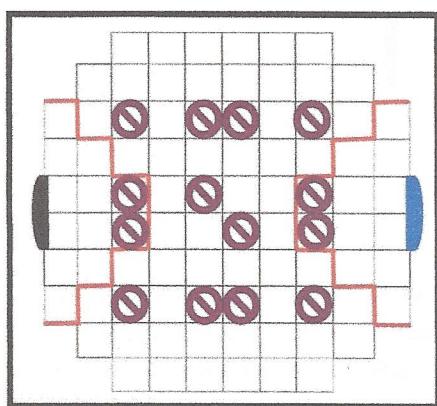
The Munera Arena has many versions, each requiring a different set of tactics. The layout of the **Arena** is determined by **Arena Tiles**.

Before the game, shuffle the **Arena Tiles** face down and have a player select one at random. This tile will display a small representation of the board and will instruct on how to set up the **Arena**.

A  symbol indicates that a space should be covered by a pillar piece. When two  are positioned over connected spaces, a double pillar can be used to cover both spaces.

The **blue** and **black** half ovals indicate where a **Gate** of the corresponding color should be placed. Gates will always be positioned in the same place.

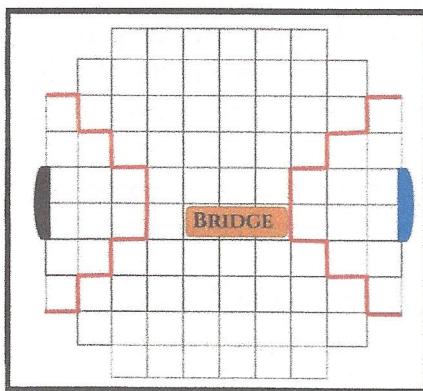
Pictured below is an example of an **Arena Tile** and its corresponding **Arena**



Arena Tiles may also have a **BRIDGE** Symbol covering three connected spaces in a

line. This indicates that the bridge should be placed on the board in this location as shown.

(Note how a space is left clear for usage in between the two pillars)



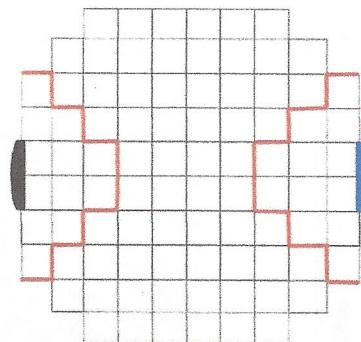
Gameplay:

First Turn: To determine who goes first, both players roll one die, the player who rolls the highest number goes first. The player who goes first uses the sum of the two die as their first roll. If both players roll the same number, roll again. The first player to go selects either the **Black** or **Blue** pieces to play.

On your first turn, you may deploy between 1 and 6 gladiators. In subsequent turns only one Gladiator may be deployed. (Rules for deploying gladiators can be found below.)

Gladiators enter the Arena through their colored Gate. On the first turn, these gladiators may only move within their teams Pit, indicated by the orange lines on the diagram below, and are indicated by bold borders and footprints in the actual Arena.

After both players have had a turn, gladiators may freely exit and enter either Pit.



What To Do On Your Turn: Roll two dice. The sum of the numbers rolled is the total amount of steps your team of Gladiators may take during your turn. Steps may be divided between multiple gladiators. Every time a gladiator moves one space, one of the gladiator's steps is expended. Gladiators can only move left, right, forward, and backward. They may not move diagonally. You may not move a gladiator through a space occupied by a Pillar or by an enemy Gladiator. You do not have to use all of your Gladiator's steps during your turn.

Deploying Gladiators: Once per turn, one new Gladiator may enter the Arena. If you choose to perform this action, put a Gladiator on one of the two spaces directly in front of the gate of your corresponding color. This action counts as one step. Once on the board, you may use steps on the newly deployed Gladiator. Captured Gladiators may not re-enter the Arena (see “capturing”).

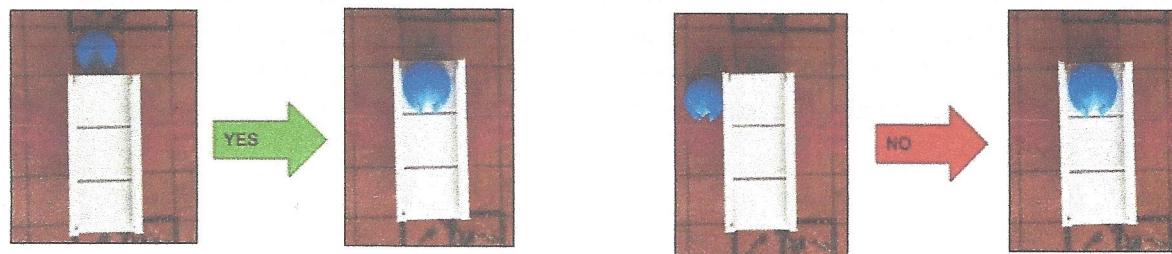
Gladiators in Formation: If you move two or more Gladiators onto the same space, the Gladiators get into a formation and stack on top of one another. Moving a stack costs one step per gladiator in the formation (for example, moving a stack of three Gladiators one space would count as 3 steps). Gladiators may move off of their stack with no penalty steps. Formations/stacks cannot exceed more than four gladiators. Your other Gladiators may pass through friendly stacks, but when your turn ends, no more than four may occupy a single space.

Capturing: You may capture an enemy Gladiator by moving one of your Gladiators onto a space occupied by an enemy gladiator(s). Captured Gladiators are removed from the board and may not re-enter the Arena. Enemy Gladiator stacks are captured by moving an equal or greater number of your gladiators onto the enemy space. For instance, if your opponent has a stack of three Gladiators on a space, all three of their Gladiators are captured if you move three or more of your Gladiators to that space. The attacking Gladiators do not have to be from the same stack, converging on the enemy from all directions is allowed as long as the total number of gladiators on the enemy's space is equal to or greater than the defending stack. Once an enemy gladiator or stack is captured, it is removed from the board. The attacking pieces form a new stack and overtake the space of the captured piece or stack. Once a gladiator has captured a piece, it can no longer move for the remainder of your turn. However, pieces not involved in the capture can still move through the captured space. (For instance, if you move four of your gladiators to a space with two enemy gladiators on it, only two of your gladiators must remain on the space where the capture occurred.)

Tip: Position your Gladiators to converge on the enemy.

Pillars: Gladiators may not move through or occupy a space covered by a pillar or double pillar.

The Bridge: The spaces on top of the bridge act as normal spaces in the Arena. The difference is, Gladiators may not enter or exit the Bridge through the long sides of the bridge, only the ends of the bridge. Additionally, pieces may pass under the bridge and treat the space under the Bridge as a normal space.



Ending The Game: When you capture a stack of enemy Gladiators and no more enemy Gladiators remain in the Arena, you are declared the victor of the Munera. The fate of the losing gladiators is now in your hands.

Remember, victory for a gladiator meant honor, wealth, and a step toward freedom.

MEDUSA'S MISCHIEF

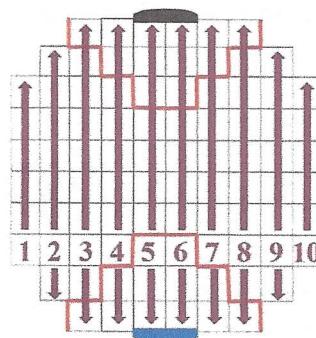
Background: 3,000 years ago, a lone gladiator was suiting up for battle in the Carthan Gladiatorial Arena. He was nervous, of course, but he had a trick up his sleeve: a vial of water from the River of Styx. He let the vial slide back and forth from hand to hand. This water could cure even the deepest of wounds, insuring him a certain victory. Suddenly, the arena master announced his name and he jumped a little, causing the vial to slip and shatter on the floor. He gulped and headed for the arena gates, unaware of who was just awakened under the floorboards-s-s-s-s.

Contents: One Medusa game piece, 2x green dice, four Medusa themed single pillars (there are no special rules assigned to the Medusa themed single pillars. They may be used in place of the standard single pillars when setting up the arena)

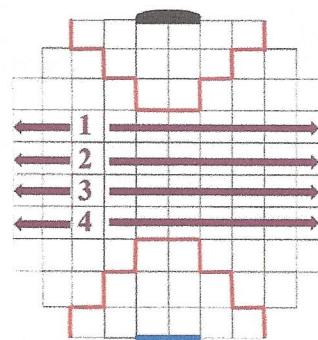
Setting Up

Medusa is unpredictable and slippery, and can thus emerge anywhere outside the pits of the Arena.

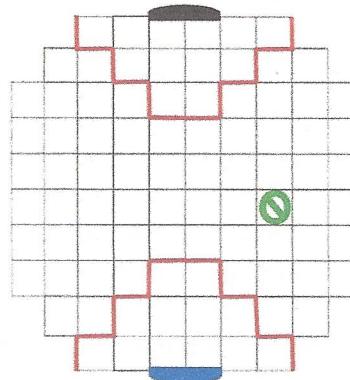
Placing Medusa: Medusa is placed in the arena after all pillars and the bridges have been placed on the arena board. To determine where to place the Medusa piece, first roll the dice. The number resulting from the roll corresponds to a column indicated on the diagram below. If the number exceeds 10, roll again.



Once you have determined the column Medusa will be on, roll one die again. The number resulting from the second roll indicates the row Medusa will be on as indicated by the diagram below. Place the Medusa piece on the space determined by the two dice rolls. If the number exceeds 4, roll again. If the Medusa piece lands on a space occupied by a pillar/double pillar, or if the space is otherwise already occupied, roll for the second number again (the number indicating the row).



Example: If the first number rolled was 8, and the second was 3, Medusa would be placed here.



Gameplay:

Evil Eyes: After receiving a curse from Minerva, the eyes of Medusa will turn anyone who meets them into stone.

The direction of Medusa's line of sight is indicated by an arrow on the Medusa game piece. Any piece that touches her line of sight is eliminated and removed from the arena.

Medusa's line of sight ends when it either touches the edge of the arena or a pillar/double pillar. If a gladiator has a pillar between itself and Medusa, the gladiator is not eliminated from the game.



(Gladiator is eliminated)



(Gladiator is safe)

Medusa begins the game looking to the right from the point of view of the blue team's side.

Rotation: If a player rolls the dice to determine their steps and one of the numbers rolled is a 1, Medusa rotates 90 degrees clockwise. Any gladiator in the new line of sight is immediately eliminated and removed from the board before the player uses their steps.

Snake Eyes: If a player rolls the dice to determine their steps and rolls a pair of ones, they may rotate Medusa to look in any direction (except diagonal) or leave her looking in the same direction.

Medusa cannot be captured.

GO AHEAD, TRY AND E-S-S-S-S-CAPE ME!

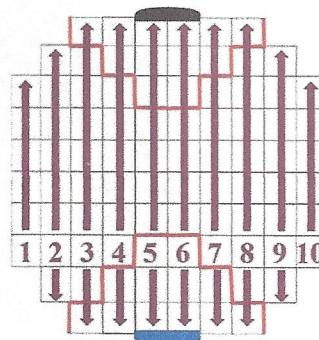
TAURUS' TERROR

Background: The owner of the Carthan Gladiatorial Arena, a wealthy patrician, was an enthusiastic exotic animal collector. He owned animals from all reaches of the globe, lions, rhinos, even wild dogs. The only thing he loved more than owning animals: releasing them into the arena. One day, a mysterious merchant pulling a large, wooden cart with a shaking bronze box on it approached the arena owner in the street. He claimed to have captured a creature of legend, and for a price, he would be willing to give it to him. Impressed by the violent shaking of the box, the arena owner hastily accepted the deal and ordered his servants to haul the cart to the arena, unaware that he had just received more than he bargained for....

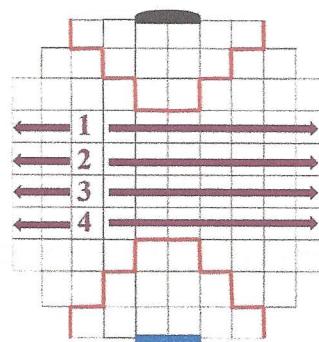
Contents: One Taurus game piece, 2x red dice, two Taurus themed double pillars (there are no special rules assigned to the Taurus themed double pillars. They may be used in place of the standard double pillars when setting up the arena)

Setting Up

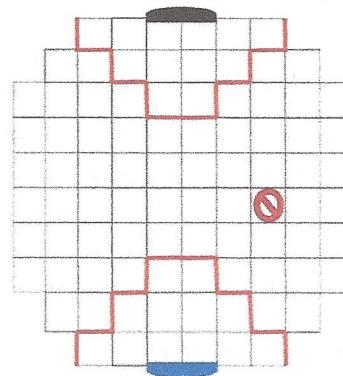
Placing Taurus: Taurus is placed in the arena after all pillars and the bridge have been placed. To determine where to place the Taurus piece, first roll the dice. The number resulting from the roll corresponds to a column indicated on the diagram below. If the number exceeds 10, roll again.



Once you have determined the column Taurus will be on, roll one die again. The number resulting from the second roll indicates the row Taurus will be on as indicated by the diagram below. Place the Taurus piece on the space determined by the two dice rolls. If the number exceeds 4, roll again. If the Taurus piece lands on a space occupied by a pillar/double pillar, or if the space is otherwise already occupied, roll for the second number again (the number indicating the row).



Example: If the first number rolled was 8, and the second was 3, Taurus would be placed here.



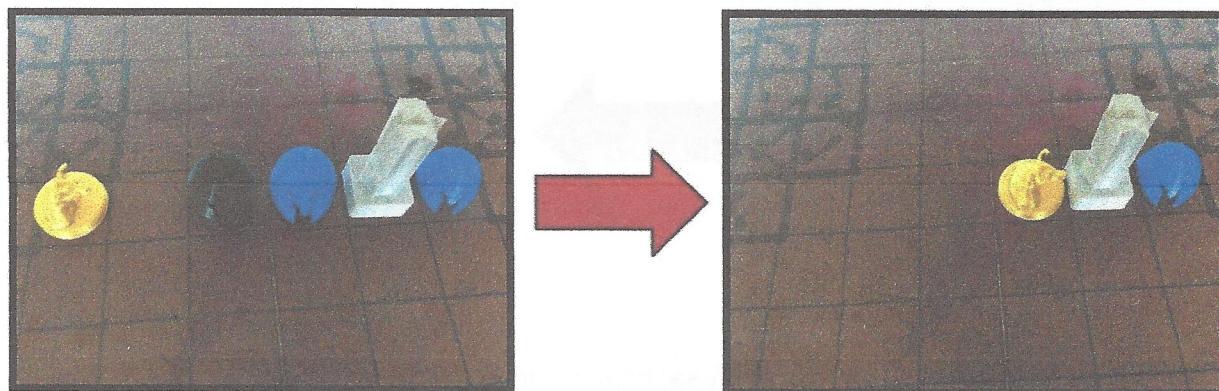
Gameplay:

CHARGE: If a player rolls the dice to determine their steps and rolls doubles, they must move Taurus. Taurus must move to a different space than the one he started on before the player can move any of their gladiators.

Taurus can move in any direction except diagonally. Once the player starts moving Taurus in a direction, they must continue moving him that direction until he runs into either a pillar/double pillar, the edge of the arena, or another expansion game piece (except for floor traps from the Traps and Treachery expansion). Taurus is not affected by floor traps and may move over, or reside on them without any effect). When Taurus runs into any of the things mentioned above, he stops on the space before it. The player may now continue their turn.

If Taurus passes through, or ends on a space a gladiator is on, the gladiator is eliminated and removed from the arena. Any gladiator on any team that is hit by Taurus is eliminated.

Taurus cannot be captured.



YOU CAN'T RUN FOREVER, EVENTUALLY YOU'LL TRIP!

TRAPS AND TREACHERY

Background: The night before the summer solstice gladiatorial games, a team of gladiators picked the lock on the Carthan Arena doors. They moved silently into the arena and began rigging it with traps, executing the task with striking efficiency. In less than an hour, they were gone without a trace. They weren't taking any chances in the next day's fight, but little did they know, neither was the other team....

Contents: Six floor traps, two trap pillars, 2x blue dice

Setting Up

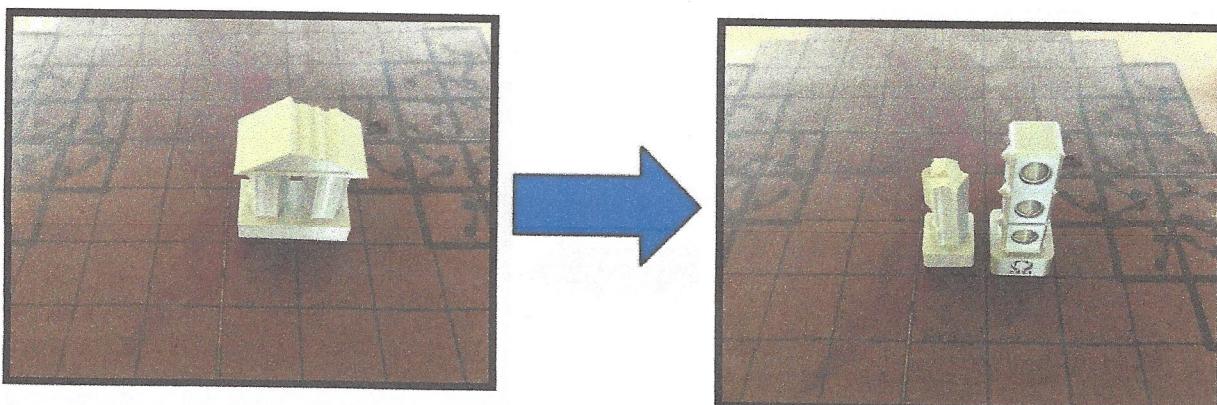
Rigging The Arena: After the arena has been chosen and the pillars, double pillars, and bridge have been placed, each player receives three floor traps and a trap pillar.

Each player rolls a die. The player who rolls the larger number gets to place the first floor trap. If both players roll the same number, both players must re-roll.

Players alternate placing floor traps on the arena board. Floor traps may be placed on any space not occupied by a pillar, double pillar, or bridge. Floor traps may not be placed in either team's pit (If unclear on where the pit is, refer to the main Munera rules).

After all floor traps have been placed, the trap pillars are placed. The player who got the lower number in the dice roll gets to place their trap pillar first, followed by the other player.

Trap pillars take the place of a regular pillar. To place a trap pillar, remove the regular pillar from the arena and put the trap pillar on the same space. If you would like to place a trap pillar on a space occupied by a double pillar, remove the double pillar, place the trap pillar on the desired space, and fill the other space that was occupied by the double pillar with a single pillar.



If another expansion piece (such as Medusa) happens to land on a space occupied by a floor trap, the trap is removed and replaced with the expansion piece. The player who placed the trap must then choose a different space to place the trap. This does not apply to the Taurus piece from the Taurus' Terror expansion, as he may start on top of a floor trap.

Gameplay:

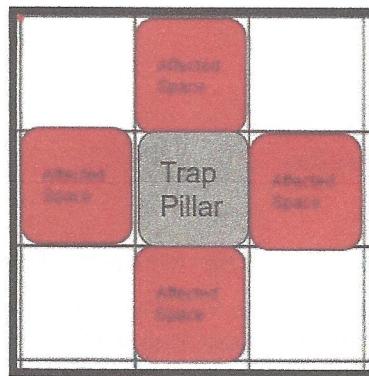
Floor Traps: Any time a gladiator lands on or passes over a space with a floor trap, they must roll the dice. If they roll doubles, the trap is set off and the gladiator is eliminated and removed from the arena.

Up to four gladiators may attempt to pass over a floor trap at once. If you attempt to move more than one gladiator over the floor trap, a single dice roll determines the fate of all gladiators on the space.

If a gladiator survives a floor trap, the gladiator may remain on the space with the floor trap. As long as no new gladiators enter the space, the player does not have to re-roll each turn to see if the trap goes off. However, if another gladiator lands on or passes over the floor trap, the dice must be rolled. If the gladiator sets off the trap, all gladiators on the space are eliminated and removed from the arena.

If a stack of enemy gladiators is captured on a floor trap, the attacking gladiators must roll the dice to see if the trap is activated.

Trap Pillars: The trap pillar affects the four spaces touching the four sides of the pillar (see diagram below). The four spaces affected by the trap pillar follow the same rules as the floor traps. If an affected space is covered with a pillar or double pillar, the trap pillar has no effect on that space.



“I’ve Predicted Your Every Move!”

Design Process

Imagine/create: Before creating any pieces, we designed our game using paper cutouts and pencil drawings. We spent several days play testing game ideas. After we created a concept and designed a game we loved playing, we wrote down the rules and moved on to fabrication.

Designing The Helmets

Ask: How do we design a game piece that allows four pieces to occupy a single space on the game board?

Imagine: We decided that the best approach was to have pieces stack on top of one another.

Create: Our first idea was based on the game Backgammon: have round pieces with magnets inside allowing them to stick together. We could then laser engrave logos or pictures on top of the pieces.

Test: Upon playtesting with Backgammon pieces, we realized the magnets made it difficult to unstack the pieces.

Create: We fabricated round wooden pieces on our lathe (wood turner) that fit on top of one another like Legos.

Test: After playtesting with these pieces, we ultimately decided the design was not visually interesting enough.

Create: We designed 3D gladiator helmets in SolidWorks, a CAD 3D design program that allows you to make 2d sketches and extrude them and manipulate them into 3D parts. To make the pieces stack, we first started with a thimble-shape to ensure that the pieces would fit on top of each other. We then extrude cut a helmet design into the piece (See page 19)

Test: Before printing, we wanted to make sure the pieces would fit together so we wouldn't waste filament in the 3D printers. To do this, we used a program called Solidworks Visualize. The program allows you to upload parts you have designed to see how it will fit together. We uploaded two copies of our piece and confirmed they were able to stack.

Create: After some failed prints and reworks of our design, we used a Sindoh printer to make the prints. We used PVA filament for the supports on the 3D printed pieces, which dissolves in water, making the prints look smoother

Designing The Game Board

Ask: How can we make our game board look ancient?

Imagine: Make our game board roll up like an ancient scroll.

Plan: Burn the board onto a piece of pleather with a soldering iron.

Create: The pleather melted and shriveled.

Plan: Use two pieces of transfer paper and a t-shirt press to melt our design into a piece of pleather

Create: On our second attempt, we managed to get the transfer paper to work. By rubbing the design, we were able to simulate wear and tear. We also added a layer of silicon over the design to prevent further damage. (See page 34)

Creating The Main Box and Three Expansion Boxes

Plan: Make boxes from chipboard and use our schools vinyl banner printer to create a vinyl wrap for the game box

Create: We first designed the vinyl wraps for the boxes in Adobe Illustrator. We decided to line the edges of our box with greek words that relate to the game, such as "honor" and "glory". We created our own png image of the game for the bottom of our box by photographing out game on a white sheet, then Photoshopping out the white parts of the image.

Create: Following advice we got on an online forum for board game designers, we were able to make a box from chipboard and CA glue

Create: In order to apply the vinyl wraps to the boxes without wrinkles or bubbles, one of us had to hold the unapplied vinyl sticker in their lips while using both their hands to pull away the release liner, while the other used both hands to apply the sticker and smooth away any air trapped under the vinyl. (See pages 29-33)

Create: To create the interior compartments for the pieces, we mapped the layout of the interior of the box onto a piece of chipboard, then cut and folded the chipboard to make dividers for our pieces. We finished off the inside of the box with a coat of black spray paint.

Designing the Pillars and Bridges

Imagine: We wanted to make our game board change from game to game to encourage players to try out different strategies.

Plan: We decided to design pieces that look like Roman ruins that would functionally block off certain areas of the arena board, forcing players to change up their strategy.

Plan: Create a single Corinthian style Roman pillar that is crumbling to cover a single space on the arena board.

Create: We used SolidWorks to create the different single pillar designs. To create the pillar, we sketched and extruded a hexagon, creating a hexagon shaped pillar. We then created a circular sketch pattern of arcs, and used them to cut the pillar into that recognizable Corinthian column with its six rounded channels running up it. To create the worn look of the pillar, we created a bunch of random shapes and extrude cut the pillar in random places. From there, we added a square base. Three versions of the single pillar were created, but only versions two and three made it into the final game. (See pages 16, 35, and 36)

Plan: Create two Corinthian style Roman pillars linked by a supporting beam to covers two spaces on the arena board

Create: To create the double pillar, we simply mirrored our single pillar design to create an identical pillar right next to it, then added two triangle extrudes on top of the pillars. We then did random extrude cuts to create the same worn look. We created two versions of the double pillar. (See pages 21-22)

Plan: Create a bridge that gladiators can pass over and under based on the design of a Roman aquifer

Create: To get the look we were going for, we used shallow, rectangle shaped cuts in our bridge design, giving it the appearance of being constructed from slabs of marble. (See page 20)

Improve: We initially printed the pillars in white to look like marble, but we switched to grey to create a more ancient look.

Creating the Arena Tiles

Imagine: We wanted to use tiles that would indicate where to place the pillars, as opposed to cards as tiles are more fun to handle.

Create: We cut our tiles out on a laser engraver. We then applied vinyl sticker prints with the board layouts that we designed in Adobe Illustrator onto the tiles.

Improve: Between states and nationals, all parts detailed above, excluding the arena tiles, were remade scaled up 200%.

Creating the Medusa's Mischief Expansion Pieces

Imagine: For our Medusa themed expansion, we wanted to create a game tile of Medusa's snake covered head.

Plan: Create the head in real life so it is more lifelike than we can achieve in Solidworks, then use an XBOX Kinect that we turned into a 3D scanner (a project from earlier this year) to scan the head and turn it into an STL file (3D model).

Create: To construct Medusa's head, we took a foam mannequin head and stuck metal wires into the top of it. We then wrapped the wires in wool and masking tape. The 3D scan turned out better than we anticipated. We decided to print Medusa in gold color. (See page 24)

Plan: Create a single pillar with a snake coiled around it.

Create: The snake pillar is actually a modified upside down screw we made in Solidworks. By fileting (or rounding out) the thread of the screw, we were able to make a convincing snake body. We then cut the center of the screw into the shape of a Corinthian pillar. From there, we used MeshMixer, another CAD 3D modeling software primarily used for sketching on curved surfaces and combining objects, to create the head of the snake. (See page 23)

Creating the Taurus' Terror Expansion Pieces

Imagine: For our Taurus expansion, we wanted to combine a bull's head with a human torso.

Plan: Combine a 3D scan of a human's upper body with a scan of a bull's head.

Create: We took a 3D scan of our friend who wanted to be part of the game, using our XBOX Kinect scanner, and used MeshMixer to combine our friend with a 3D scan of a bull we found online. We also printed Taurus in gold color. (See page 26)

Plan: Create a Taurus themed double pillar for the Taurus expansion.

Create: The Taurus double pillar is a modified version of the double pillar we already 3D modeled in SolidWorks. The only difference is the horns on top, which we created using lofts (essentially we sketched circles on surfaces suspended in mid air, and told the program to connect the circles), and the replacement of the hexagon shaped pillars with round, Doric style pillars. (See page 25)

Creating the Traps and Treachery Expansion Pieces

Plan: Create a spiked floor tile that covers a single space on the board.

Create: Using SolidWorks, we extrude cut 16 circular holes into an extruded square. From there we extruded small cylinders inside of the holes and sharpened them to a point using the chamfer function. (See page 27)

Plan: Create a single pillar with spikes pointing in four directions.

Create: We made the pillar in SolidWorks using the same process as the floor spikes, except this time on an extruded square. (See page 28)

Comprehensive Cost Breakdown

Material Type	Quantity of Material Used (with appropriate units)	Price Per Unit	Real Cost (\$)
Hatchbox PLA 3D Printer Filament (Grey)	1.1 spools (based off readings from printer)	19.99 per spool	21.99
Hatchbox PLA 3D Printer Filament (Black)	.05 spools (based off readings from printer).	19.99 per spool	0.99
Hatchbox PLA 3D Printer Filament (Black)	.05 spools (based off readings from printer).	19.99 per spool	0.99
Hatchbox PLA 3D Printer Filament (Silver)	.04 pools (based off readings from printer).	19.99 per spool	0.8
36x40 2mm Thick Chipboard	2 boards	7.98 per board	15.96
2pcs D6 16mm Metal Alloy Custom and Unique Six Sided Die	1 Package	10.91 for two	10.91
Ialnai 6pcs Hand Polished 6 Sided Die (Red)	2 Dice	9.99 for six	3.33
Ialnai 6pos Hand Polished 6 Sided Die (Green)	2 Dice	9.99 for six	3.33
Ialnai 6pos Hand Polished 6 Sided Die (Blue)	2 Dice	9.99 for six	3.33
Kodack Matte Removable Calendered Vinyl	3.5 Feet	\$150 per sixty feet	8.75
Rust Oleum Painters Touch Spray Paint (Flat Black)	1/3 can	\$4.87 per can	1.62
Rust Oleum Painters Touch Spray Paint (Flat Blue)	1/20 can	\$4.87 per can	0.24
Rust Oleum Painters Touch Spray Paint (Flat Green)	1/20 can	\$4.87 per can	0.24
17x11 Glossy Printer Paper	1 sheet	\$1.24 per sheet	1.24
8.5x11 Glossy Printer Paper	3 sheets	\$0.62 per sheet	1.86
Dark Brown Pleather	1/3 yard	\$5.34 per yard	1.78
		Sub Total:	77.36
		Sales Tax:	3.86
		Total:	81.23

TECHNOLOGY STUDENT ASSOCIATION PLAN OF WORK

Date	Task	Time involved	Team member responsible (student initials)	Comments
By 11/1/20	Create the Munera base game for TSA districts.	Create the leather game board, probably 4 hours. Create box ~3 hours Write rules ~6 hours	Lw Pa	Our initial attempt to burn the board onto a piece of leather caused it to melt. We instead used transfer paper and a high-heat press on the leather, which did not stick.
By 11/20/20	Use the week after districts to use and apply judges feedback	We work until after districts	Lw Pa	The judges complained our pieces were too hard to stack, so we 3D modeled new ones.
By 12/10/20	Create pillars and bridges along with new board layouts and rules	3D modeling pillar pieces ~4 hours x 5 pieces 3D Model the gates of the bridge	Lw Pa	The initial designs were able to be built off of for later designs, Bridge was redesigned before states
By 12/20/20	Scale Up All pieces by 200%	3D printing ~49h printing the new board and hairs	Lw Pa	The new scaling of the helmets caused them to collapse so we designed support structures. New board takes four separate presses.
By 1/1/21	Create expansion packs for the game.	We predict each expansion will take about a week to make.	Lw Pa	We made three expansions, we had to redesign the box to fit the new pieces
By 1/20/21	Finish documentation for the board game.	Based on previous experience, two days and an extra day to revise	Lw Pa	Two pages is not nearly enough to talk about every step in our design process.

Adviser signature



STUDENT COPYRIGHT CHECKLIST

(for students to complete and advisors to verify)

- 1) Does your solution to the competitive event integrate any music? YES NO

If NO, go to question 2.

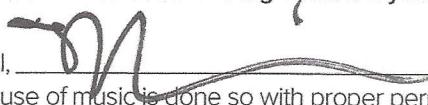
If YES, is the music copyrighted? YES NO

If YES, move to question 1A. If NO, move to question 1B.

1A) Have you asked for author permission to use the music in your solution and included that permission (letter/form) in your documentation? If YES, move to question 2. If NO, ask for permission (OR use royalty free/your own original music) and if permission is granted, include the permission in your documentation.

1B) Is the music royalty free, or did you create the music yourself? If YES, cite the royalty free music OR your original music properly in your documentation.

CHAPTER ADVISOR: Sign below if your student has integrated any music into his/her competitive event solution.

I,  (chapter advisor), have checked my student's solution and confirm that the use of music is done so with proper permission and is cited correctly in the student's documentation.

- 2) Does your solution to the competitive event integrate any graphics? YES NO

If NO, go to question 3.

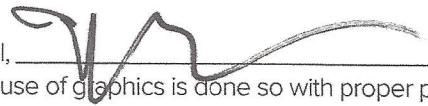
If YES, is the graphic copyrighted, registered and/or trademarked? YES NO

If YES, move to question 2A. If NO, move to question 2B.

2A) Have you asked for author permission to use the graphic in your solution and included that permission (letter/form) in your documentation? If YES, move to question 3. If NO, ask for permission (OR use royalty free/your own original graphic) and if permission is granted, include the permission in your documentation.

2B) Is the graphic royalty free, or did you ~~create your own graphic~~? If YES, cite the royalty free graphic OR your own original graphic properly in your documentation.

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I,  (chapter advisor), have checked my student's solution and confirm that the use of graphics is done so with proper permission and is cited correctly in the student's documentation.

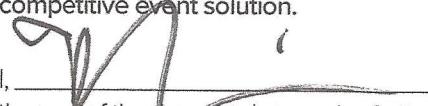
- 3) Does your solution to the competitive event use another's thoughts or research? YES NO

If NO, this is the end of the checklist.

If YES, have you properly cited other's thoughts or research in your documentation? If YES, this is the end of the checklist.

If NO, properly cite the thoughts/research of others in your documentation.

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I,  (chapter advisor), have checked my student's solution and confirm that the use of the thoughts/research of others is done so with proper permission and is cited correctly in the student's documentation.

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