

# CRYSTAL WARS

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## Document History

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0.0.1	05.06.21	Initial Draft	Zara Batalvi, Kyle Cole, Piotr Jackowski, Nathaniel Natindim

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# CRYSTAL WARS

## Game Summary

Crystal Wars is a **trading card game** which takes inspiration from worldly mythology. Users battle strategically with a variety of mythical gods, monsters, and spells.

### Crystal Wars Lore

Not much is known about **Kosmokai**, an ancient world, void of anything you or I would call familiar. The only thing well-documented is an ongoing **war between cosmic forces**, which began with discovery of **crystalline structures** buried deep in the ground below. When chiseled, a brilliant light cascaded around any unsuspecting human that dared strike the stones. Gone were the crystals, vaporized into nothingness as monsters, gods, and ghouls took their place. Those beings which arose, an ancient slumbering force hidden in the underbelly of the earth, swore an allegiance to whichever humans freed them. Soon, the inhabitants of Kosmokai came to realize that with more crystals, they could create a **unrivaled, loyal legion of monsters**--an unopposed force in the world. Not long after the initial Summoning, the power-hungry fools of the land found themselves fighting for such an opportunity.

Now, the people of Kosmokai find themselves at the epicenter of crystal chaos. Competing heroes, villains, and opportunists attempt to gather crystals, build defenses, and utilize monsters for their own gains. Which one will you be, dear reader? And more importantly, will you succeed?

## Game Overview

### Core Gameplay Mechanics

The overarching **battle-style game mechanics** are comparable to games like Hearthstone or Yu-Gi Oh.

### First Turn

Each player begins with **30 HP** and **4 crystals** (these are used to pay the cost of cards).

- Draw Phase: Players draw 5 cards as their starting hand.
- Attack Phase: Players utilize their 4 starting crystals for actions of their choosing. Actions could be as follows:

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- (1) Placing attack cards. Players could place up to two Weak Tier cards (2 crystals each) or one Average Tier Card (4 crystals) on the game field.
- (2) Placing or activating spell cards, which will influence the battle in ways that attack cards could not.

## Subsequent Turns

Each subsequent turn, **crystals reset to 4**, and **player HP is impacted by any damage done by opponent moves**. Player HP can only be affected if the target player has no current character cards on the field (you can't take on the hero until you've finished off his army!) or via special effect cards that might allow such abilities.

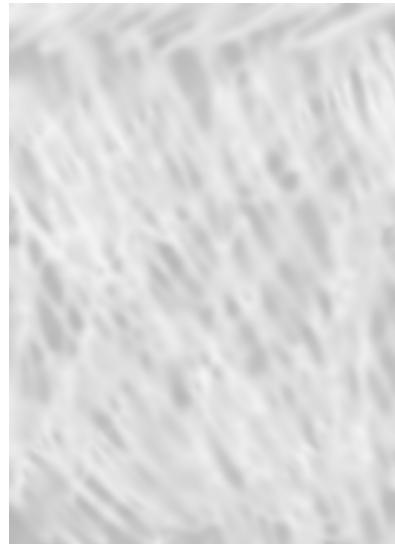
- Sacrifice Opportunity: Players may increase their crystals by sacrificing a card previously placed on the field. For each card sacrificed, players earn 2 crystals. This allows individuals to place higher cost cards in the Primary phase.
- Draw Phase: Players may draw up to one card.
- Primary Phase: Players may place any character cards.
- Attack Phase: Players may use spells and/or attack the opponent's characters--or the opponent directly, if possible.
- Secondary Phase: Players may cast any remaining spells.
- End Phase: The current player's turn is over. Some actions might occur at this point, depending on which cards are on the field. For example, a card's effect might cause it to be destroyed at the end of the turn.

The game concludes when one player's HP has been reduced to zero. Congratulations, hero! You've conquered in a war of crystals.

## Card Overview

Three types of cards exist within Crystal Wars: **spells, monsters, and monsters with special effects**. Each type is indicated by card color.

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## Monster Cards

Your average ghouls and gods. All brawns.

## Spell Cards

Enchanting, magical abilities which can strengthen your army and attack your opponent.

## Monster Effect Cards

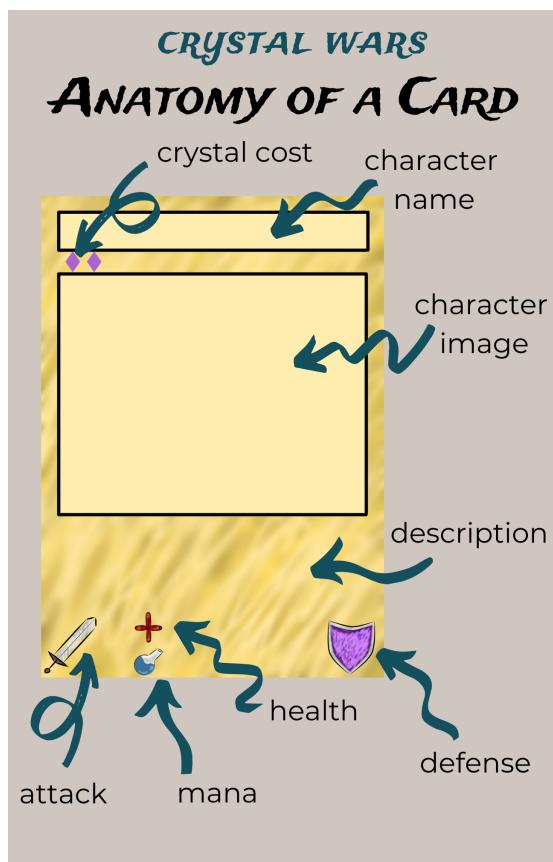
Magical characters who have castable spells as part of their abilities. Brains and brawns--a double whammy!

All cards fall within one of four cost categories, which determines how many crystals a player must spend to place the card. Cards with higher costs will be more powerful in their various attributes.

- Weak Tier Card: 2 Crystals
- Average Tier Card: 4 Crystals
- Legendary Tier Card: 6 Crystals
- God Tier Card: 8 Crystals

All character cards (monsters with and without special effects) have **attack, defense, health, and mana attributes.**

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**Attack:** This number represents the **amount of damage a character does**--either to another character or the opposing player (if the player has no character cards on the field).

**Defense:** This number represents **how much damage a character can take** before attacks begin affecting their health.

**Health:** This is a character's **health status**. Once health reaches zero points, this character has been defeated and the card is discarded.

**Mana:** Think of mana as **crystal currency** for the characters themselves. A character will spend mana to perform their described abilities, and each round, characters receive 1 mana to spend or save (unless an opposing player's character or spells prevent this!).

## Game Loop

Getting technical, our loop is slightly different than the mainstream version because of the **event-based nature** of our game.

```
while(window.isOpen)
{
    window.DispatchEvents();
    Update();
    Render();
}
```

**Render()** acts as the drawing function. **Update()** keeps track of card stats (HP, attack, etc.), and when to switch turns.

Almost all the work is done by the **DispatchEvents()**. This function tells the program to finish any events created before **Update()** and **Render()**, including clicking, mouse movements, window resizing, typing, and releasing the

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mouse. This strategy means that we don't need to continuously check if a card was clicked or not in the **Update()** function. Instead, we only need to check when the mouse was pressed.

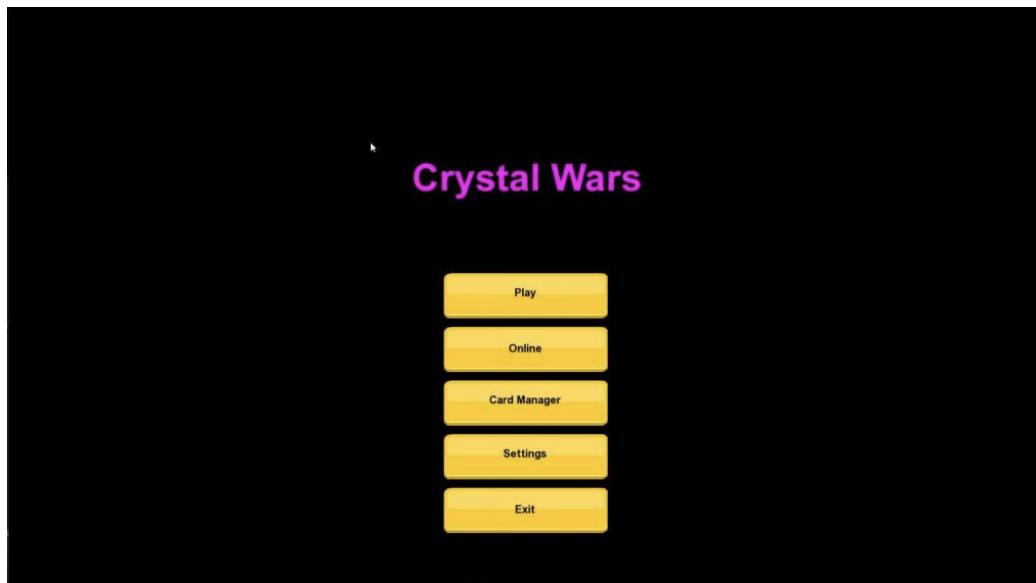
## Database

The chosen database for this project was **MongoDB**. The initial cluster was created in **MongoDB Compass** and a root user account was created in order to allow access from anyone who can push or pull from the repo. The root name and password was stored in a connection string.

Initial **CSV data** was added into the database through Compass and then tested to ensure that documents could be listed. Player stats were also implemented into the development process

## User Interface / Screens

### 1. Main Menu



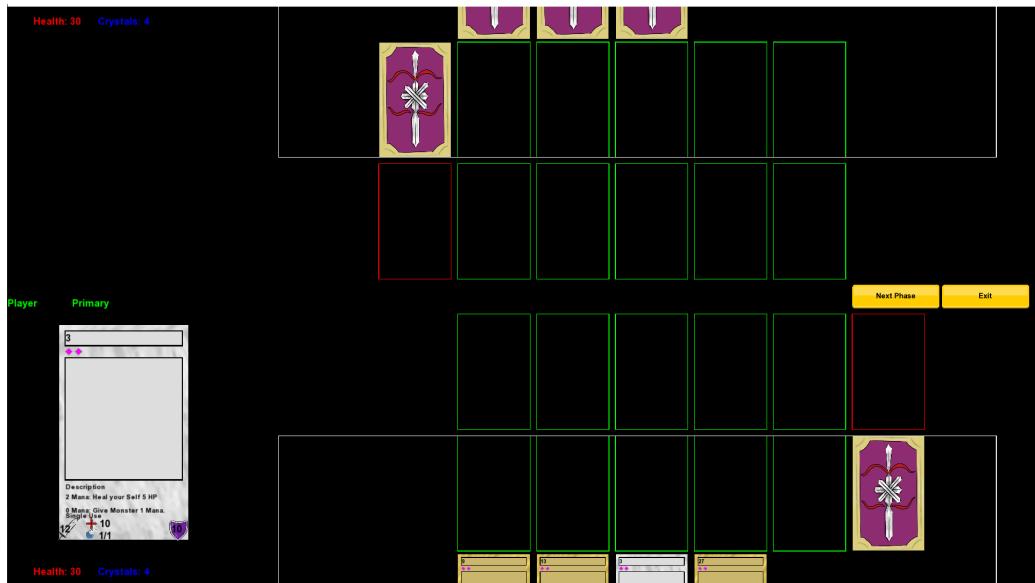
On this screen, users choose from the five possible button options.

1. Play, which leads users to the Gameplay screen.
2. Online, which leads users to the Network Setup screen.
3. Card Manager, which leads users to the Deck Selector Screen.
4. Settings, which lead users to the Settings screen.

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5. Exit, which terminates the game.

## 2. Gameplay Screen

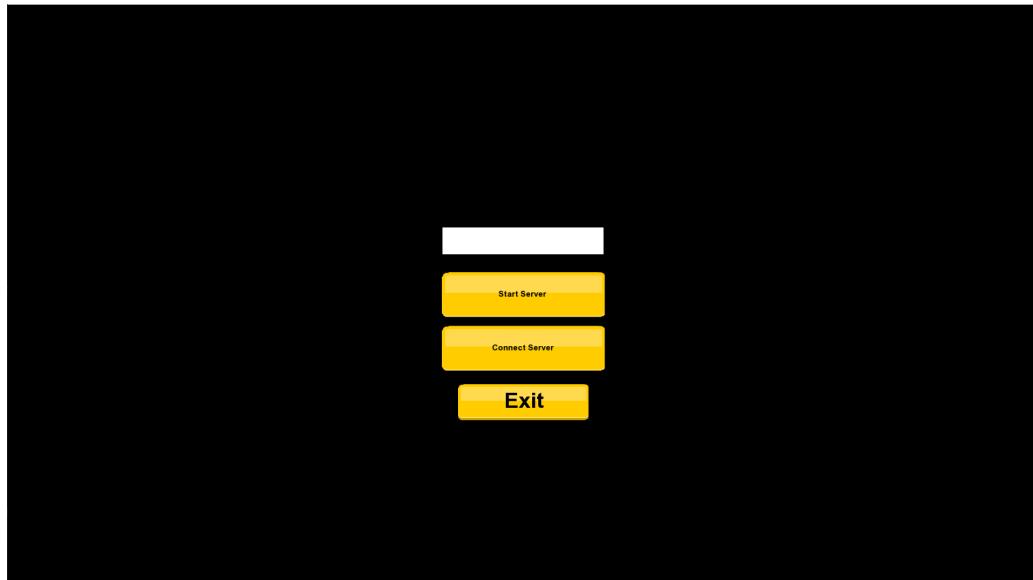


On the gameplay screen, a **player's personal field** is shown on the bottom half. On the rightmost side, one will see the **draw pile** (the facedown cards) and the **discard pile** (the red rectangle). The faceup cards toward the bottom of the screen are a **player's current hand**, and the **last selected card** from that hand is seen on the leftmost side of the screen. The 10 green rectangles represent **current spaces for playing cards** on the field. The bottom row is for spell cards, while the top row is for monster cards. On the bottom left-hand side, players can check their health and crystals. The white box outline, such as the one shown above, is where a player needs to click to attack the opponent.

The “**Next Phase**” button allows players to move through the phases mentioned in the [Core Game Mechanics](#) sections (i.e. Draw, Primary, Attack, Secondary, End). Players can check what the **current stage** is on the left of the screen (in this screenshot, the text reads “Primary”).

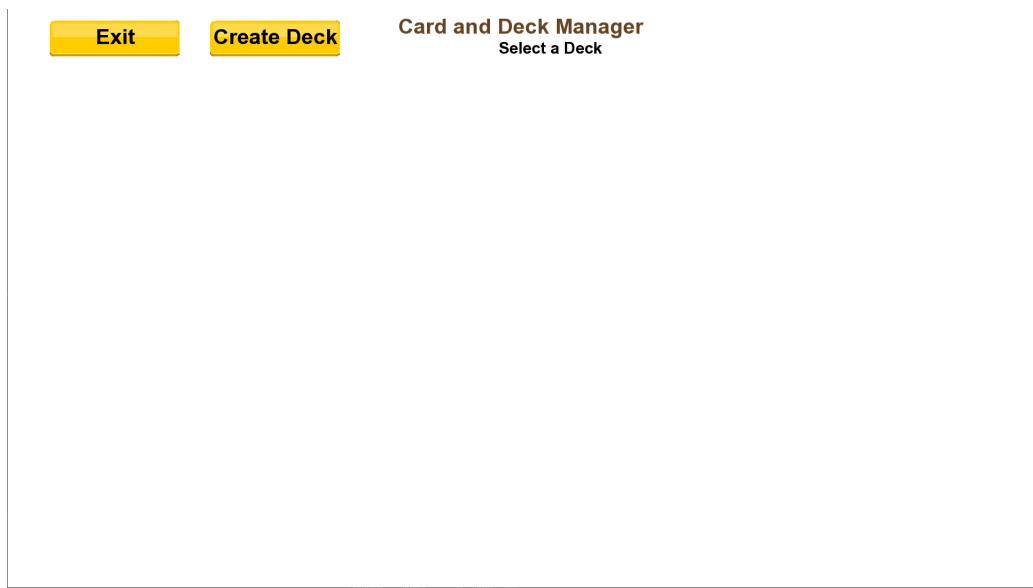
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## 3. Network Setup



On this screen, users can either create or connect to a server to enable online play.

## 4. Deck Selector



On this screen, users can choose their current deck, which will be used during gameplay. Choosing to "Create Deck" will lead to the Deck Editor screen.

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## 5. Deck Editor



On the Deck Editor screen, players select cards to personalize new decks. The most recently selected card is displayed in a zoomed-in fashion on the left-hand side. Once a deck has been created, users may exit.

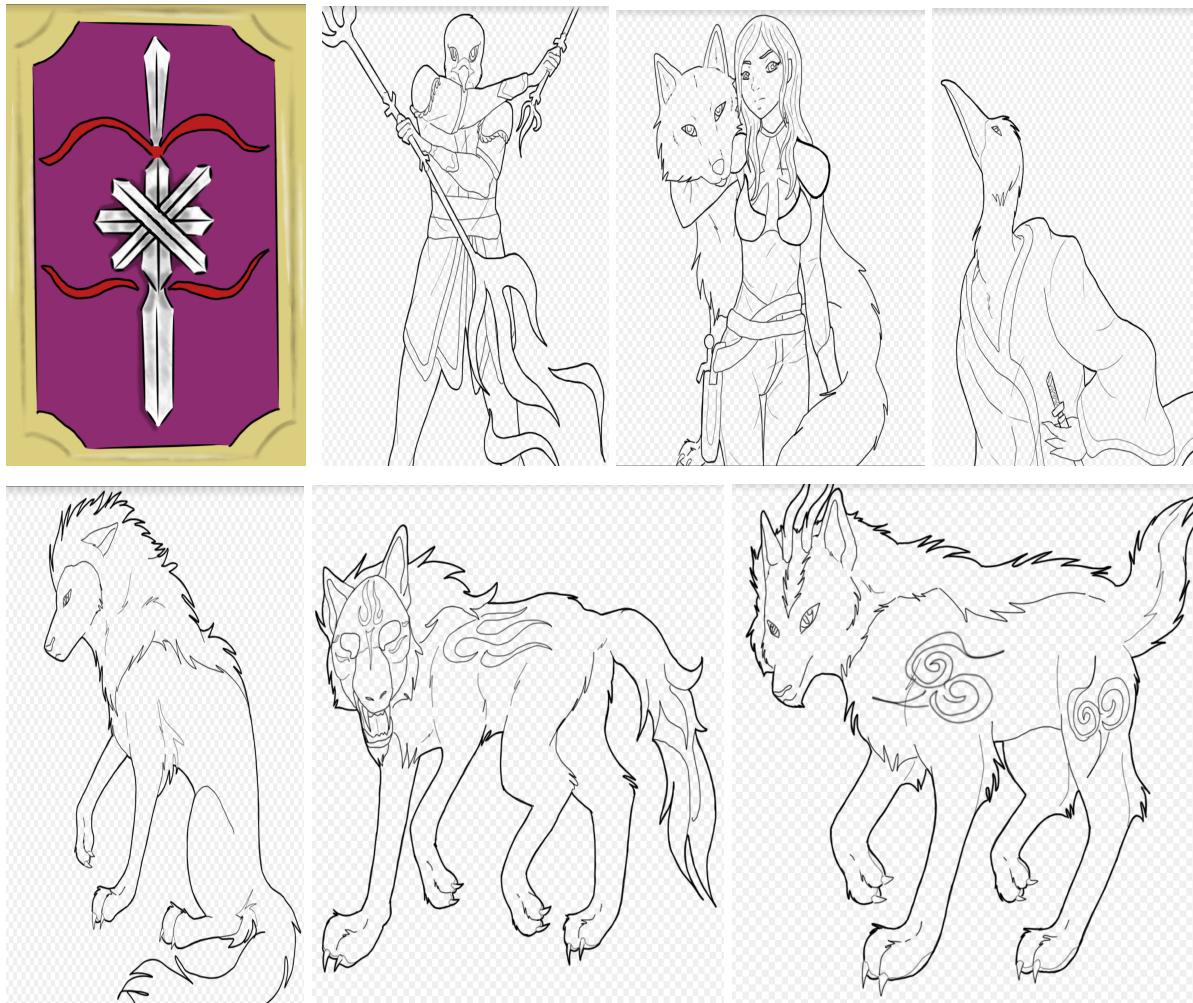
## 6. Settings

The settings screen is still in development, but it will allow users to adjust resolution, volume, and--once this feature has been implemented--user account information.

# Art / Graphic Design

Our game takes inspiration from **Greek, Egyptian, Chinese, and Japanese mythology**. Among some of the creatures is Cerberus, a Guardian Lion Dog, an Oriental Dragon, and a phoenix. There are also some gods and goddesses such as Poseidon, Anubis, Persephone, and Artemis. Some of the designs are based on reference works as far as an overall outline of the human form (see [References](#)). Unless otherwise stated, all monster designs have been designed and sketched by Kyle Cole. Kyle has also designed and colored the overall card design (ie: front/back of the cards). A small sampling can be found below. (See Github [repository](#) for the remaining images)

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From top left to bottom right:  
Back design, Ra, Artemis, Tengu, Guardian Lion Dog, HellHound, Kirin.

## Testing

Our testing is primarily done by **running the game, throwing various scenarios at it, checking for crashes, and recording any bugs**. We try our best to **mimic predicted user behavior** and mistakes.

### Buttons

To ensure working buttons, we always **click newly added buttons** to check that they perform as wanted. A recurring issue has been **rapid clicking**, which will cause code to execute multiple times. This issue was resolved by **implementing a timer** as a buffer whenever buttons are clicked.

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## Cards

Since quite a few different actions can be performed with cards, testing this aspect is a bit tricky. Testing involves:

- Clicking cards quickly or in sporadic ways.
- Placing cards in incorrect spots on the gamefield and observing the code's response.
- Attempt using cards in the Attack Phase.
- Attempt using spells to ensure they act as intended.

## Card Manager

When testing deck editing by creating new decks, we found it difficult to control the cards as they move from the Cards view to the Deck view (see the [Deck Editor](#) screen above). This issue has been resolved using a default view to draw the current card and check bounding boxes.

## Online

Debugging the connection has been the hardest part of implementing online play. Not only do we need to ensure a proper connection, but we must also verify that correct starting data is sent.

This includes a bunch of error testing due to a new error occurring each time it was run. There were errors in the looping for the server side; some variables were null at certain moments so they needed checks. Furthermore, a lot of **try clauses** needed to be added since the connections throw all sorts of different exceptions.

We encountered issues with purposeful disconnecting and sudden disconnects. If one player disconnected, the situation was easily handled by a **try-catch clause** catching the exception-to-data flow. The problem occurred when data stopped mid-stream, and thus, more **try-catch clauses** were needed to catch the issue.

With connection and disconnecting handled, we had to make sure data was **properly serialized, sent, and reconstructed**. We encountered many visual bugs, which meant the cards were either being corrupted in the sending phase or the reconstruction was incorrect. Upon further gameplay testing

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and code examination, we recognized an issue in reconstruction. Visual bugs ceased when every item being sent had a **custom constructor**.

## License

### MIT License

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## References

### Technical Resources

#### GitHub Repository

- <https://github.com/pjack700/Comp312CardGame>

#### Hearthstone Game Mechanics

- <https://activeplayer.io/hearthstone/>

#### MIT License

- <https://opensource.org/licenses/MIT>

#### Simple and Fast Multimedia Library (SFML)

- <https://www.sfml-dev.org/>

### Trading Card Sizes [Google Search]

#### Printing and Proxies

	Inches	Pixels (300dpi)
Card	2.5"x3.5"	750×1050 pixels
Art box	2.3"x1.8"	690×540 pixels
Text box	2.3"x1.28"	690×384 pixels

#### Yu-Gi Oh Game Mechanics

- [https://yugioh.fandom.com/wiki/Game\\_mechanics](https://yugioh.fandom.com/wiki/Game_mechanics)

### Art Resources

#### Anubis & Poseidon Base

- <https://www.deviantart.com/manga124/art/Pose-Study-Sword-2-Single-Male-712306843>

#### Artemis Base

- <https://www.deviantart.com/bases-xs/art/Lucia-Edit-17-521523146>

#### Gaia Base

- <https://www.deviantart.com/death-tendency/art/Female-Pose-04-315461467>

#### Hades & Thor Base

- <https://www.deviantart.com/manga124/art/Pose-Study-Sword-Single-Male-712280913>

#### Ishtar Base

- <https://www.deviantart.com/bases-xs/art/384-329218891>

# *CRYSTAL WARS*

Medusa Base

- <https://www.deviantart.com/death-tendency/art/Female-Pose-07-315462061>

Persephone Base

- <https://www.deviantart.com/death-tendency/art/Female-Pose-02-315461129>

Ra Base

- <https://www.deviantart.com/manga124/art/Pose-Study-Swords-Male-Single-714506026>