# Text Obfuscation

Reverse Engineering a Hack

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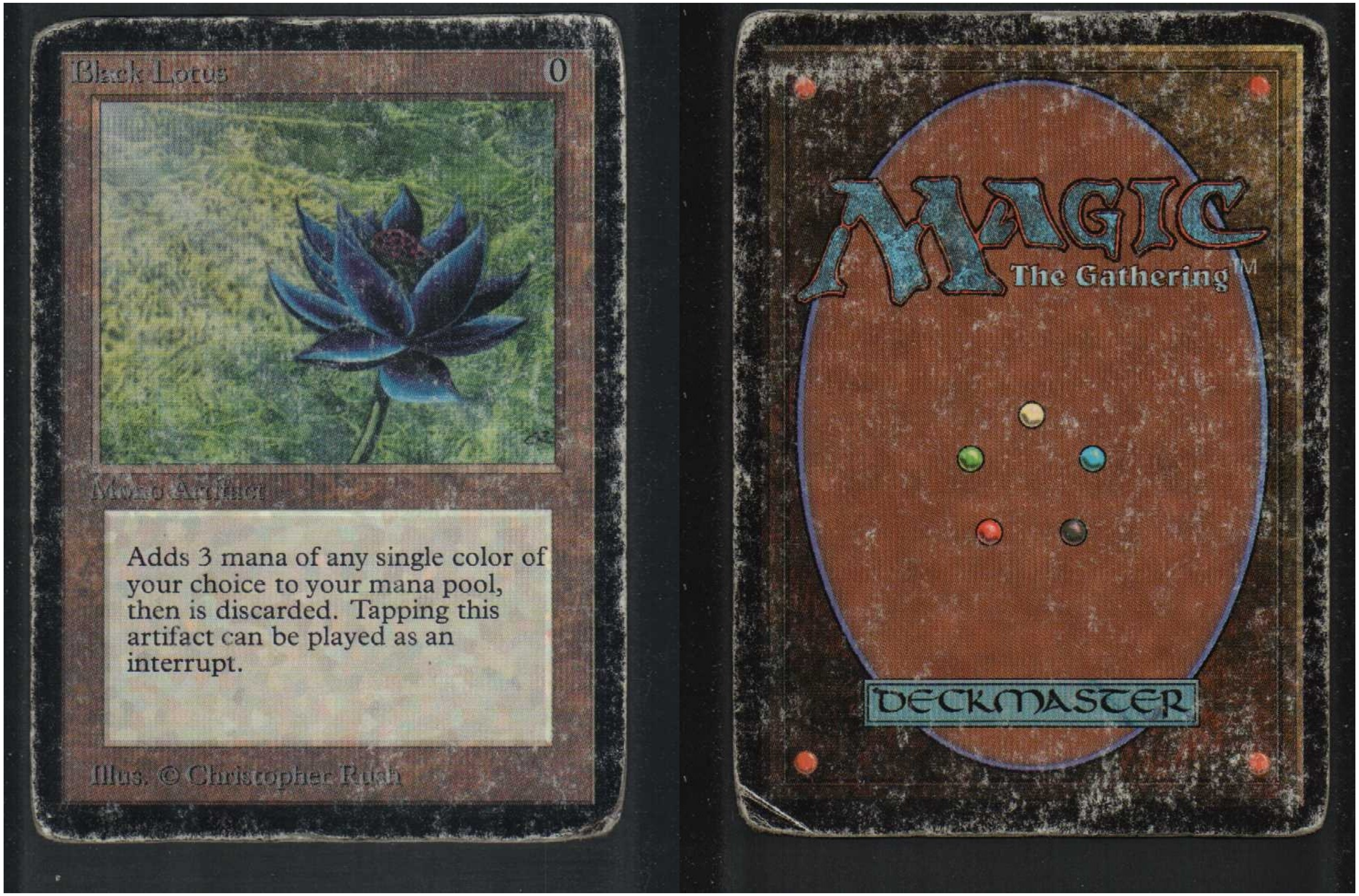
## Source Code (for Today's Talk)

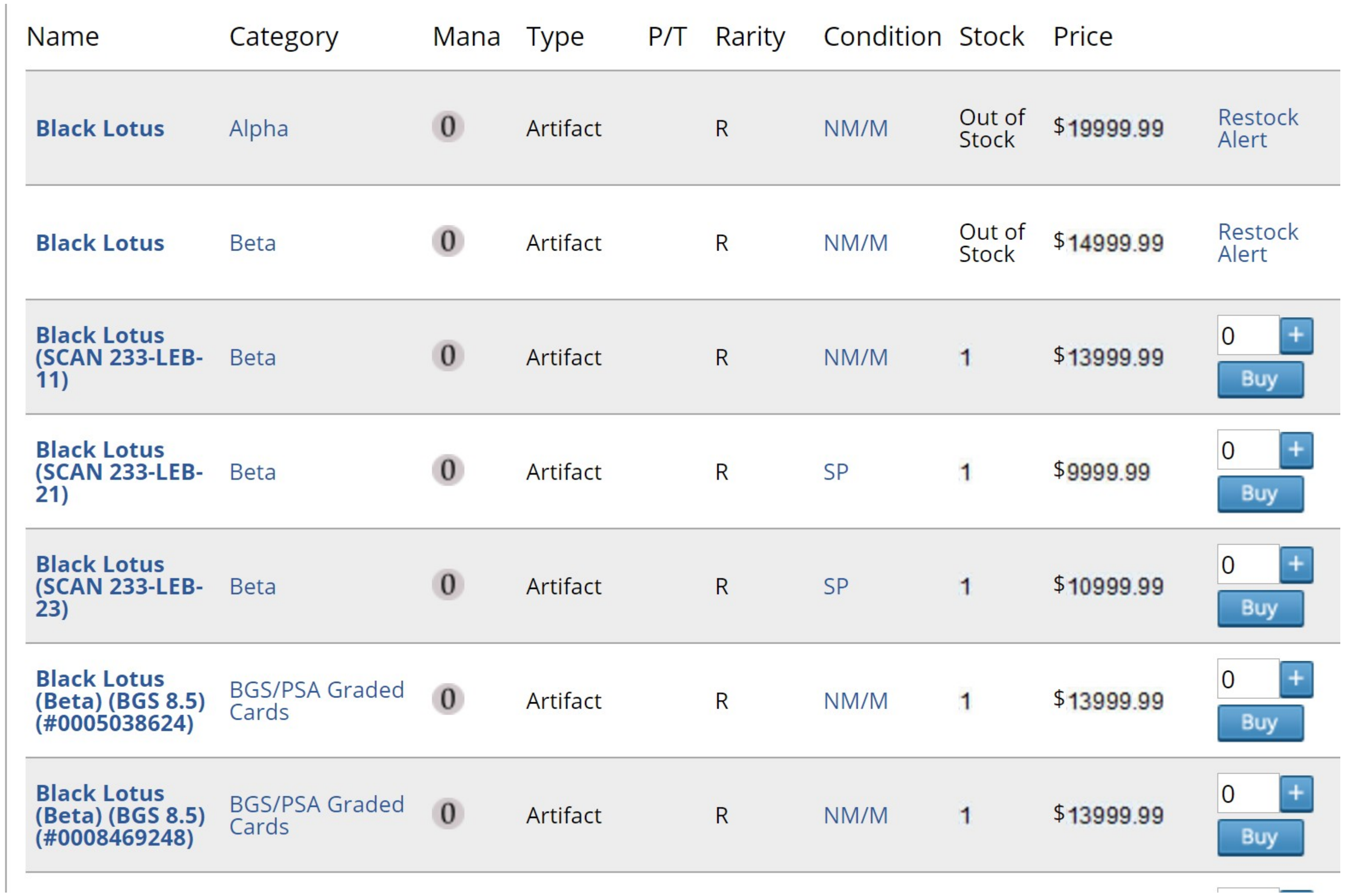
https://github.com/harmonicradius/diyScgApi

# Expensive Cardboard



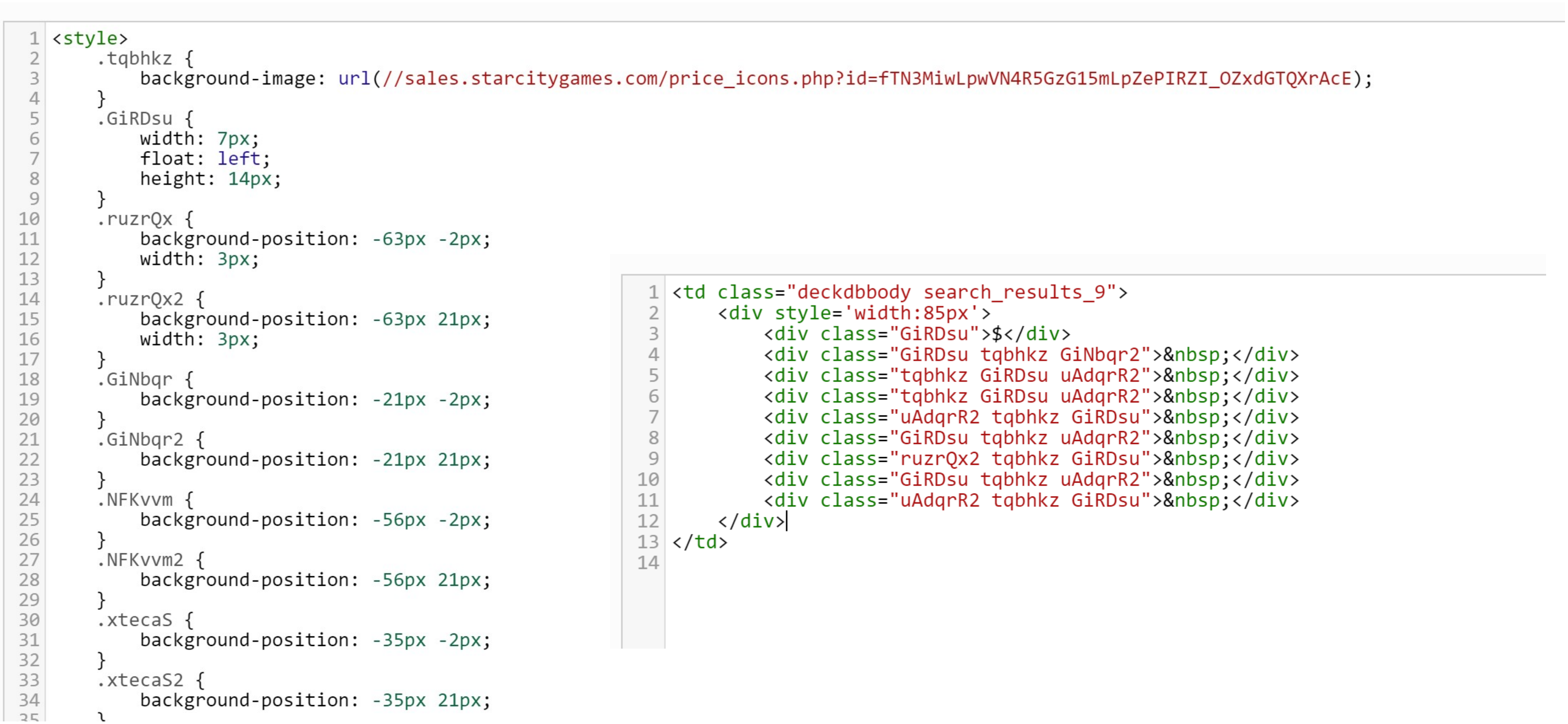
Adds 3 mana of any single color of your choice to your mana pool, then is discarded. Tapping this artifact can be played as an interrupt.

# Target Data

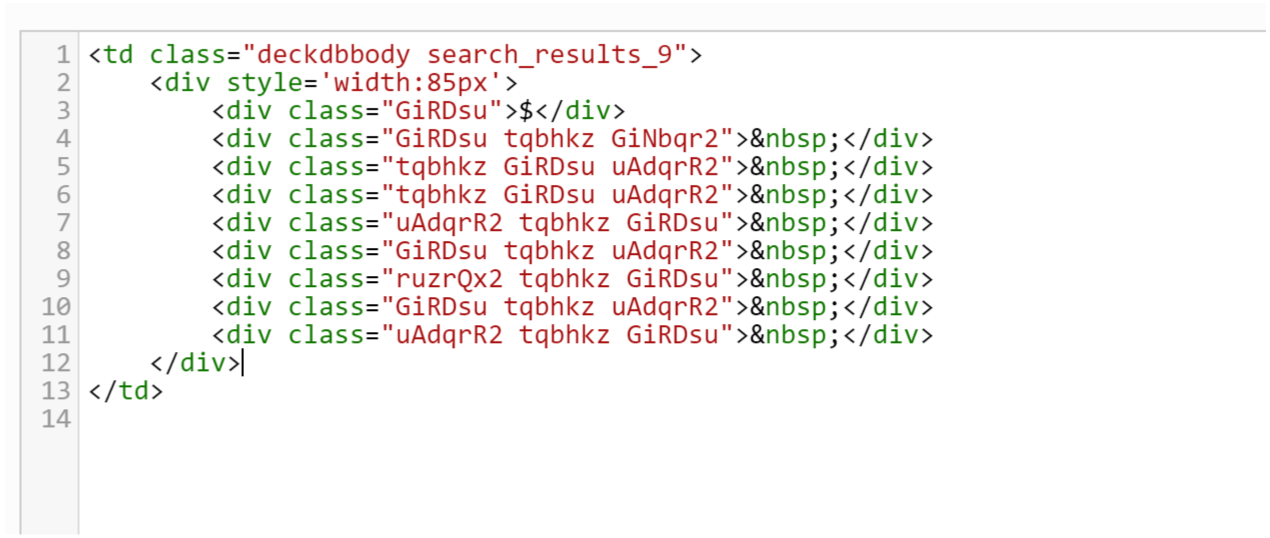


| Name | Category | Mana | Type | P/T | Rarity | Condition | Stock | Price | |
|---|---|---|---|---|---|---|---|---|---|
| **Black Lotus** | Alpha | 0 | Artifact | | R | NM/M | Out of Stock | $19999.99 | Restock Alert |
| **Black Lotus** | Beta | 0 | Artifact | | R | NM/M | Out of Stock | $14999.99 | Restock Alert |
| **Black Lotus (SCAN 233-LEB-11)** | Beta | 0 | Artifact | | R | NM/M | 1 | $13999.99 | 0 + Buy |
| **Black Lotus (SCAN 233-LEB-21)** | Beta | 0 | Artifact | | R | SP | 1 | $9999.99 | 0 + Buy |
| **Black Lotus (SCAN 233-LEB-23)** | Beta | 0 | Artifact | | R | SP | 1 | $10999.99 | 0 + Buy |
| **Black Lotus (Beta) (BGS 8.5) (#0005038624)** | BGS/PSA Graded Cards | 0 | Artifact | | R | NM/M | 1 | $13999.99 | 0 + Buy |
| **Black Lotus (Beta) (BGS 8.5) (#0008469248)** | BGS/PSA Graded Cards | 0 | Artifact | | R | NM/M | 1 | $13999.99 | 0 + Buy |

# Prices, Obscured

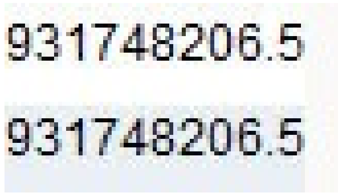


```
<style>
    .tqbhkz {
        background-image: url(//sales.starcitygames.com/price_icons.php?id=fTN3MiwLpwVN4R5GzG15mLpZePIRZI_OZxdGTQXrAcE);
    }
    .GiRDsu {
        width: 7px;
        float: left;
        height: 14px;
    }
    .ruzrQx {
        background-position: -63px -2px;
        width: 3px;
    }
    .ruzrQx2 {
        background-position: -63px 21px;
        width: 3px;
    }
    .GiNbqr {
        background-position: -21px -2px;
    }
    .GiNbqr2 {
        background-position: -21px 21px;
    }
    .NFKvvm {
        background-position: -56px -2px;
    }
    .NFKvvm2 {
        background-position: -56px 21px;
    }
    .xtecaS {
        background-position: -35px -2px;
    }
    .xtecaS2 {
        background-position: -35px 21px;
    }
```



```
<td class="deckdbbody search_results_9">
    <div style='width:85px'>
        <div class="GiRDsu">$</div>
        <div class="GiRDsu tqbhkz GiNbqr2">&nbsp;</div>
        <div class="tqbhkz GiRDsu uAdqrR2">&nbsp;</div>
        <div class="tqbhkz GiRDsu uAdqrR2">&nbsp;</div>
        <div class="uAdqrR2 tqbhkz GiRDsu">&nbsp;</div>
        <div class="GiRDsu tqbhkz uAdqrR2">&nbsp;</div>
        <div class="ruzrQx2 tqbhkz GiRDsu">&nbsp;</div>
        <div class="GiRDsu tqbhkz uAdqrR2">&nbsp;</div>
        <div class="uAdqrR2 tqbhkz GiRDsu">&nbsp;</div>
    </div>
</td>
```

# Each time the page loads...


931748206.5

931748206.5

- A new numbers image is generated with the order randomized.
- Accompanying CSS is generated that tells the page how to replace numbers
- Some of the CSS is a 'red herring'

## How to reverse this process

- Collect all of the CSS, and the randomly ordered image
- Use this to generate images for each number
- Compare those images to a known set of images representing the “true” numbers
- Return the numbers as a meaningful object

## Tools I Used

- Requests, and BeautifulSoup – tools to load the web page and save the data
- “convert.exe” - from the ImageMagick library for cutting images up
- Github.com / rework css to convert css into something we can parse through
- PIL (python image library) for comparisons, histograms, differences

# Relevant Mathematics

- To compare two images, we store the images as matrices (2-dimensional)
- To find the “distance” from one image to another, we need a “metric” which is positive (and zero if they are equal)
- A useful metric is the “root mean square”
- Find the difference between each pixel of the image, square the differences, sum the squares, divide by the size of the image

## Thanks!

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