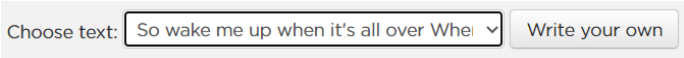
AP Computer Science Principles
Ticket Out the Door
Set 6: Lossless Data compression

Name _____ Period _____

Skill 6.02 Exercise 1
Navigate to https://studio.code.org/s/csp1-2021/lessons/9/levels/1 Watch the video on how to use the compression widget, https://youtu.be/LCGkcn1f-ms Select the text shown.  Copy and paste the original text below Take 10 minutes and see how much you can compress the text. Copy and paste your compressed text below, along with your dictionary and how much you were able to compress the text.
Compressed text
Dictionary
Percent compressed

Skill 6.02 Exercise 2
The alphabet is an example of text that cannot be compressed, can you think of others?
Refer to the text in the previous example, which words could not be used to compress the file

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Skill 6.03 Exercise 1

Refer to a portion of the heart image shown below.

How should the 2nd row be encoded in RLE

How should the third row be encoded in RLE

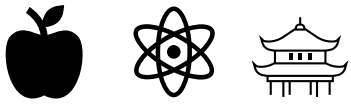
Skill 6.03 Exercise 2

The following is a compression of a 6x6 black and white icon, using RLE. What mathematical symbol does that icon resemble?

```
2,2,2
2,2,2
0,6
0,6
2,2,2
2,2,2
```

Skill 6.03 Exercise 3

Which icon below would be most compressed using RLE compression? Explain?



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Skill 6.04 Exercise 1

The characters in a sequence were optimized using the Huffman algorithm. Use the optimized binary to decode the sequence below.

```
111001
```

character	binary code
a	010
c	00
g	011
t	1

Make sure you start at the first bit on the left, and match up the codes from left to right. What DNA string do you come up with?

The same characters were optimized using the Huffman algorithm, resulting in a different set of codes. Use the optimized binary code to decode the sequence below,

```
001000011
```

character	Binary code
a	001
c	01
g	000
t	1

Skill 6.05 Exercise 1

Navigate to the Huffman Tree Generator

https://www.csfieldguide.org.nz/en/interactives/huffman-tree/

Create a random DNA sequence using combinations of a, g, t, and c. It can be any length you want, just keep it to four characters! Indicate the optimized binary code for each character below.

character	Binary code
a	
c	
g	
t	

Write the first characters of your encoded message below