Shannon-Fano Coding

```
clc; clear; close all;

input_text = 'BANANA$';

codebook = shannon_fano_encode(input_text);

disp('Codebook:');
```

```
Codebook:
```

```
keys = codebook.keys;
values = codebook.values;
for i = 1:length(keys)
    fprintf('%s: %s\n', keys{i}, values{i});
end
```

```
$: 110
A: 0
B: 111
N: 10
```

```

encoded_string = '';
for i = 1:length(input_text)
    encoded_string = [encoded_string codebook(input_text(i))];
end
disp(['Encoded String: ', encoded_string]);
```

```
Encoded String: 1110100100110
```

```

original_size = length(input_text) * 8;  % Assuming 8 bits per character
compressed_size = length(encoded_string);  % Each binary digit is 1 bit
compression_ratio = original_size / compressed_size;

disp(['Original Text: ', input_text]);
```

```
Original Text: BANANA$
```

```
disp(['Original Size (bits): ', num2str(original_size)]);
```

```
Original Size (bits): 56
```

```
disp(['Compressed Size (bits): ', num2str(compressed_size)]);
```

```
Compressed Size (bits): 13
```

```
disp(['Compression Ratio: ', num2str(compression_ratio)]);
```

```
Compression Ratio: 4.3077
```

```

decoded_text = shannon_fano_decode(encoded_string, codebook);
disp(['Decoded Text: ', decoded_text]);
```

```
Decoded Text: BANANA$
```

```
if strcmp(input_text, decoded_text)
    disp('Decoding successful!');
else
    disp('Decoding failed!');
end
```

```
Decoding successful!
```