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In [17]: caesar = ShiftCryptosystem(AlphabeticStrings()); caesar
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Out[17]: Shift cryptosystem on Free alphabetic string monoid on A-Z
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In [18]: K = 3
```

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In [3]: text = '''I MET A TRAVELLER from an antique land
Who said: Two vast and trunkless legs of stone
Stand in the desert. Near them on the sand,
Half sunk, a shattered visage lies, whose frown
And wrinkled lip and sneer of cold command
Tell that its sculptor well those passions read
Which yet survive, stamped on these lifeless things,
The hand that mocked them and the heart that fed.
And on the pedestal these words appear:
"My name is Ozymandias, King of Kings:
Look on my works, ye mighty, and despair!"
Nothing beside remains. Round the decay
Of that colossal wreck, boundless and bare,
The lone and level sands stretch far away.'''
```

```
In [19]: P = caesar.encoding(text);P
```

```
Out[19]: IMETATRAVELLERFROMANANTIQUELANDWHOSAIDTWOVASTANDTRUNKLESSLEGSOFTONEST
ANDINTHEDESERTNEARTHEMONTHESANDHALFSUNKASHATTEREDVISAGELIESWHOSEFROWNA
NDWRINKLEDLIPANDSNEEROFCOLDCOMMANDTELLTHATITSSCULPTORWELLTHOSEPASSIONS
READWHICHYETSURVIVESTAMPEDONTHESELIFELESSTHINGSTHEHANDTHATMOCKEDTHEMAN
DTHEHEARTTHATFEDANDONTHEPEDESTALTHESEWORDSAPPEARMYNAMEISOZYMANDIASKING
OFKINGSLOOKONMYWORKSYEMIGHTYANDDESPAIRNOTHINGBESIDEREMAINSROUNDTHEDECA
YOFTHATCOLOSSALWRECKBOUNDLESSANDBARETHELONEANDLEVELSANDSSTRETCHFAWAY
ABCDEFGHIJKLMNOPQRSTUVWXYZ
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In [20]: C = caesar.enciphering(K, P); C
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Out[20]: LPHWDWUDYHOOHUIURPDQDQWLTXHODQGZKRVDLGWZRYDVWDQGWUXQNOHVVOHJVRIVVRQHVV
DQGLQWKHGHVHUWQHDUWKHPRQWKHVDQGGKDOI V X Q N D V K D W W H U H G Y L V D J H O L H V Z K R V H I U R Z Q D
Q G Z U L Q N O H G O L S D Q G V Q H H U R I F R O G F R P P D Q G W H O O W K D W L W V V F X O S W R U Z H O O W K R V H S D V V L R Q V
U H D G Z K L F K B H W V X U Y L Y H V W D P S H G R Q W K H V H O L I H O H V V W K L Q J V W K H K D Q G W K D W P R F N H G W K H P D Q
G W K H K H D U W W K D W I H G D Q G R Q W K H S H G H V W D O W K H V H Z R U G V D S S H D U P B Q D P H L V R C B P D Q G L D V N L Q J
R I N L Q J V O R R N R Q P B Z R U N V B H P L J K W B D Q G G H V S D L U Q R W K L Q J E H V L G H U H P D L Q V U R X Q G W K H G H F D
B R I W K D W F R O R V V D O Z U H F N E R X Q G O H V V D Q G E D U H W K H O R Q H D Q G O H Y H O V D Q G V V W U H W F K I D U D Z D B
D E F G H I J K L M N O P Q R S T U V W X Y Z A B C
```

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In [21]: caesar.deciphering(K, C) == P
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Out[21]: True
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In [22]: # Histogram szyfrogramu
from collections import defaultdict
Cfreq = defaultdict(float)
```

```
In [23]: n = len(C) # długość
# uzupełnienie ilości wystąpienia każdej litery
for i in range(n):
    Cfreq[C[i]] += 1
Cfreq = dict(Cfreq) # konwersja z defaultdict na zwykły dict
# zapis procentowy
for k,v in Cfreq.items():
    Cfreq[k] = Cfreq[k]/n*100
```

```
In [24]: Eng_freq = {
    'A' : 8.55,      'K' : 0.81,      'U' : 2.68,
    'B' : 1.60,      'L' : 4.21,      'V' : 1.06,
    'C' : 3.16,      'M' : 2.53,      'W' : 1.83,
    'D' : 3.87,      'N' : 7.17,      'X' : 0.19,
    'E' : 12.10,     'O' : 7.47,      'Y' : 1.72,
    'F' : 2.18,      'P' : 2.07,      'Z' : 0.11,
    'G' : 2.09,      'Q' : 0.10,
    'H' : 4.96,      'R' : 6.33,
    'I' : 7.33,      'S' : 6.73,
    'J' : 0.22,      'T' : 8.94,
}
```

```
In [25]: # Sprawdzenie dwóch najczęściej występujących liter:
# W histogramie szyfrgramu i rozkładu liter języka angielskiego
c_letter = max(Cfreq, key=Cfreq.get)
eng_letter = max(Eng_freq, key=Eng_freq.get)
print(c_letter, eng_letter)
```

H E

```
In [15]: # Klucz to bezwzględna wartość różnicy odległości liter
key = abs(ord(str(eng_letter)) - ord(str(c_letter)))
key
```

Out[15]: 3

```
In [16]: # Sprawdzenie czy wyznaczony klucz odszyfrowuje wiadomość:
caesar.deciphering(K, C)
```

Out[16]: IMETATRAVELLERFROMANANTIQUELANDWHOSAIDTWOVASTANDTRUNKLESSLEGSOFTONEST
ANDINTHEDESERTNEARTHEMONTHESANDHALFSUNKASHATTEREDVISAGELIESWHOSEFROMNA
NDWRINKLEDLIPANDSNEEROFCOLDCOMMANDTELLTHATITSSCULPTORWELLTHOSEPASSIONS
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OFKINGSLOOKONMYWORKSYEMIGHTYANDDESPAIRNOTHINGBESIDEREMAINSROUNDTHEDECA
YOFTHATCOLOSSALWRECKBOUNDLESSANDBARETHELONEANDLEVELSANDSSTRETCHFARAWAY
ABCDEFGHIJKLMNOPQRSTUVWXYZ