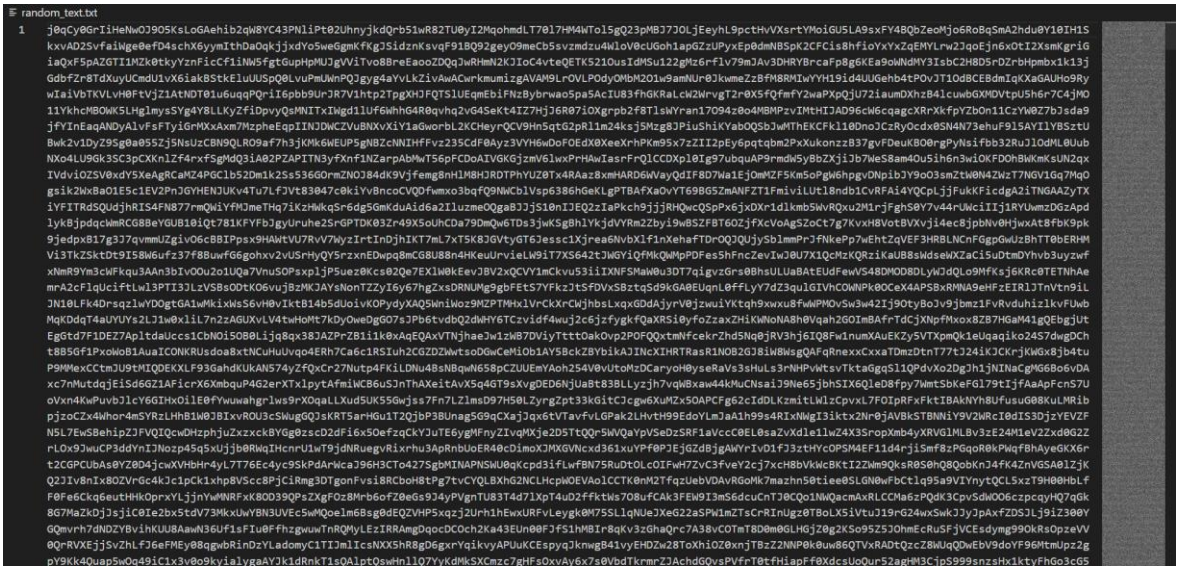
Zad 1

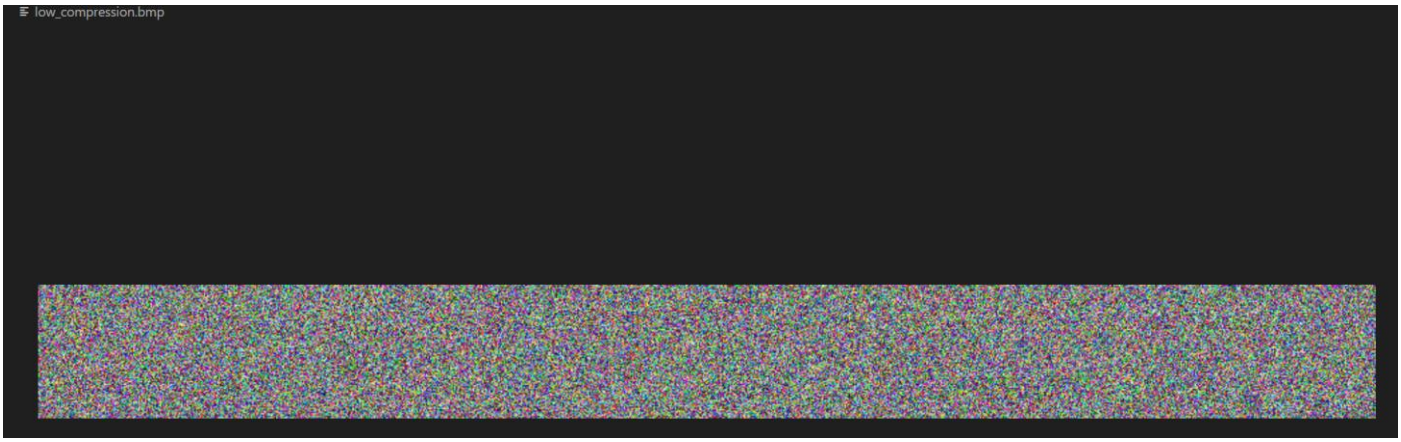
```
import random
import zlib
from PIL import Image

def generate_text_file(filename, length=100000):
    with open(filename, 'w') as f:

f.write(''.join(random.choices('ABCDEFGHIJKLMNOPQRSTUVWXYZabcdefghijklmnopqrstuvwxyz012345
6789', k=length)))

def generate_high_compression_bmp(filename, width=1000, height=100):
    image = Image.new('RGB', (width, height), color=(255, 255, 255))
    image.save(filename)

def generate_low_compression_bmp(filename, width=1000, height=100):
    random_data = [random.randint(0, 255) for _ in range(width * height * 3)]
    image = Image.frombytes('RGB', (width, height), bytes(random_data))
    image.save(filename)

def compress_and_report(file_path):
    with open(file_path, 'rb') as f:
        compressed = zlib.compress(f.read())
    return len(compressed)

high_compression_bmp_filename = "high_compression.bmp"
low_compression_bmp_filename = "low_compression.bmp"

generate_text_file("random_text.txt")
generate_high_compression_bmp(high_compression_bmp_filename)
generate_low_compression_bmp(low_compression_bmp_filename)

compression_high = compress_and_report(high_compression_bmp_filename)
compression_low = compress_and_report(low_compression_bmp_filename)

print(f"BMP z największą kompresją rozmiar ZIP {compression_high} bajtów")
print(f"BMP z najmniejszą kompresją rozmiar ZIP {compression_low} bajtów")
```

random_text.txt



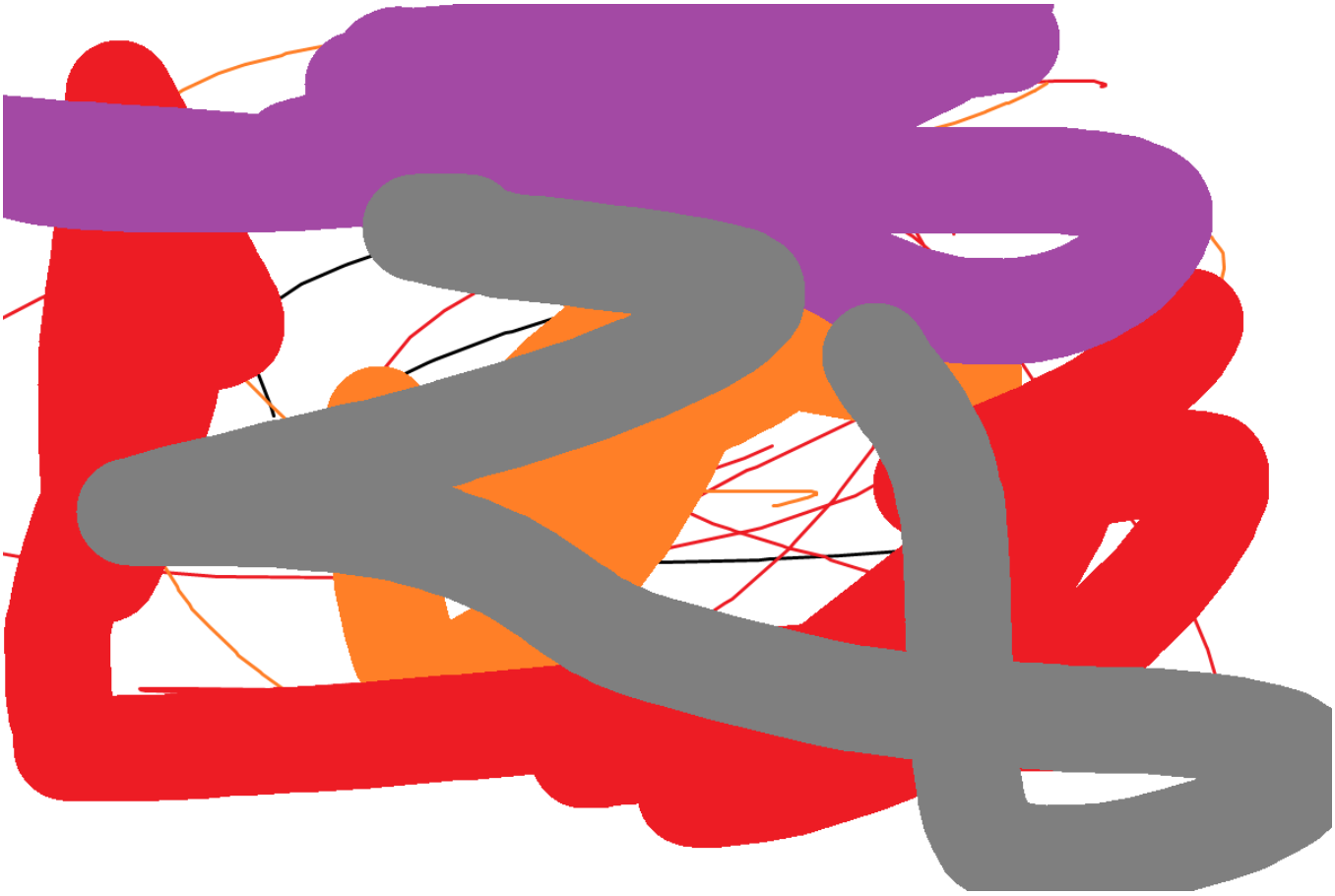
high_compression.bmp

low_compression.bmp



Zad 2

Plik bmp:



```python
from PIL import Image
import os

def convert_image_to_formats(input_file):
    image = Image.open(input_file)
    formats = ['PNG', 'GIF', 'JPEG']
    converted_files = {}

    for fmt in formats:
        output_file = f"{input_file.rsplit('.', 1)[0]}.{fmt.lower()}"
        image.save(output_file, fmt)
        converted_files[fmt] = output_file

    return converted_files

def calculate_file_size_and_compression_rate(original_file, converted_files):
    original_size = os.path.getsize(original_file)
    file_sizes = {'BMP': original_size}
    compression_rates = {}
    print(f"BMP: {original_size} bajtów")

    for fmt, file in converted_files.items():
        converted_size = os.path.getsize(file)
        file_sizes[fmt] = converted_size
        compression_rate = (original_size - converted_size) / original_size * 100
        compression_rates[fmt] = compression_rate
```

```
        print(f"{fmt}: {converted_size} bajtów, stopień kompresji:
{compression_rate:.2f}%")

    return file_sizes, compression_rates

input_file = r"D:\Visual Studio Code\Codes\zad2.bmp"

converted_files = convert_image_to_formats(input_file)

file_sizes, compression_rates = calculate_file_size_and_compression_rate(input_file,
converted_files)
```

BMP: 2880054 bajtów

PNG: 34706 bajtów, stopień kompresji: 98.79%

GIF: 20842 bajtów, stopień kompresji: 99.28%

JPEG: 57520 bajtów, stopień kompresji: 98.00%

Zad 3

H= $\log_2 (n^2)$

$\log_2 (n^2) = 2\log_2 (n)$

Entropia źródła wynosi $2\log_2 (\boldsymbol{n})$ bitów