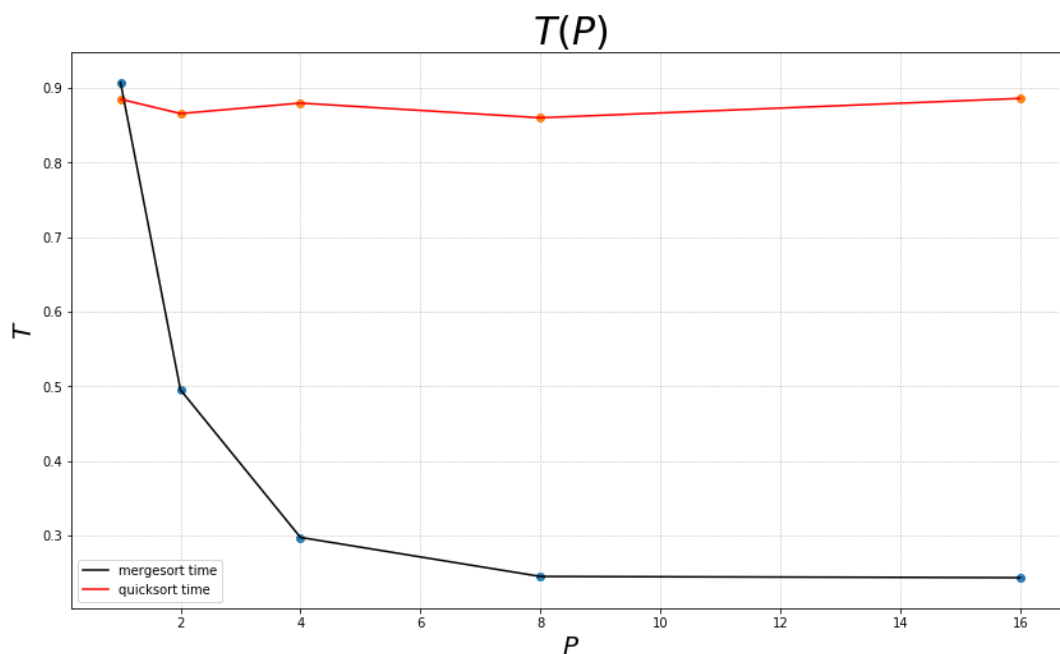
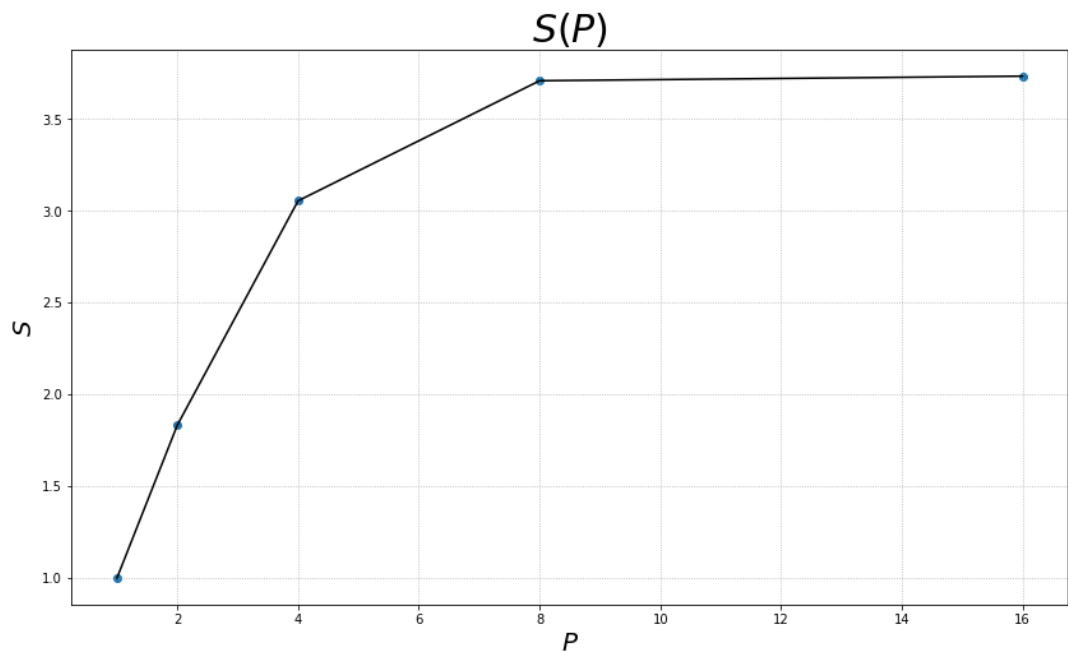


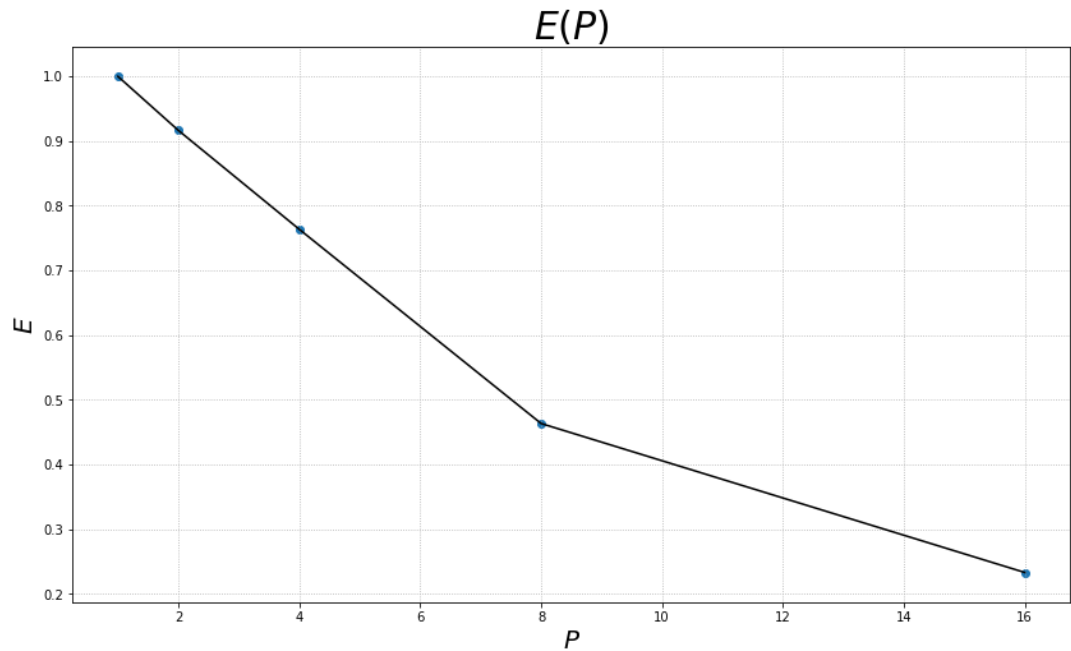
```
In [1]: import matplotlib.pyplot as plt
import numpy as np
n = 5000000
m = int(n / 16)
P_arr = [1, 2, 4, 8, 16]
T_m_arr = [0.907553, 0.495086, 0.297101, 0.244716, 0.243072]
T_q_arr = [0.885098, 0.865800, 0.879890, 0.860164, 0.886160]
plt.figure(figsize=(14, 8))
plt.xlabel('$P$', size = 20)
plt.ylabel('$T$', size = 20)
plt.title('$T(P)$', size = 30)
plt.grid(ls=':')
plt.scatter(P_arr, T_m_arr)
plt.scatter(P_arr, T_q_arr)
plt.plot(P_arr, T_m_arr, label = 'mergesort time', color = 'black')
plt.plot(P_arr, T_q_arr, label = 'quicksort time', color = 'red')
plt.legend()
plt.show()
```



```
In [2]: S_arr = [T_m_arr[0] / T_m_arr[i] for i in range(5)]
plt.figure(figsize=(14, 8))
plt.xlabel('$P$', size = 20)
plt.ylabel('$S$', size = 20)
plt.title('$S(P)$', size = 30)
plt.grid(ls=':')
plt.scatter(P_arr, S_arr)
plt.plot(P_arr, S_arr, color = 'black')
plt.legend()
plt.show()
```



```
In [3]: E_arr = [S_arr[i] / P_arr[i] for i in range(5)]  
plt.figure(figsize=(14, 8))  
plt.xlabel('$P$', size = 20)  
plt.ylabel('$E$', size = 20)  
plt.title('$E(P)$', size = 30)  
plt.grid(ls=':')  
plt.scatter(P_arr, E_arr)  
plt.plot(P_arr, E_arr, color = 'black')  
plt.legend()  
plt.show()
```



In [ ]: