```
# Part 2

'''
This script makes use of multiprocessing.pool in Python.Using
ThreadPool, many threads can split up the process of determining the
highest prime number in an array of N numbers.

In order to execute each array in parallel, it first creates random
arrays of N integers for various values of N.


It simultaneously determines the greatest prime number in each chunk
by using a ThreadPool with the number of threads indicated by the
variable T.

The script then uses the variables T, N_vl, ch_sze, a_s, m_ps, h_p,
t_t, t1, and t2 to display the greatest prime number obtained and the
total runtime for each value of N.

By using this method, the script makes effective use of the CPU
resources that are available, enhancing performance through
multithreading and parallelism.
'''
import numpy as np
import time
from multiprocessing.pool import ThreadPool as Pool

def is_prm(n):
    if n <= 1:
        return False
    if n == 2:
        return True
    if n % 2 == 0:  # n is divisible or not
        return False
    for i in range(3, int(n**0.5) + 1, 2):   # This runs for sqrt(n)
times.
        if n % i == 0:
            return False
    return True

def fnd_h_prm(a):
    m_p = None
    for n in a:
        if is_prm(n):
            if m_p is None or n > m_p:
                m_p = n
    return m_p

T = 4  # Number of threads = 4
```

```
N_vl = [1000, 5000, 10000, 50000, 121000]

# this runs for various N values
for N in N_vl:
    print(f"\nRunning for N = {N}")
    ar_y = np.random.randint(1, 10000, N)
    ch_sze = len(ar_y) // T
    a_s = [ar_y[i:i+ch_sze] for i in range(0, len(ar_y), ch_sze)]
    t1 = time.time()
    wr = Pool(T)   # initilalize the workers
    m_ps = wr.map(fnd_h_prm, a_s)
    wr.close()
    wr.join()
    h_p = max(m_ps)
    t2 = time.time()
    t_t = t2 - t1

    print("Highest Prime Number:", h_p)
    print("Total runtime:", t_t, "seconds")
```

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Running for N = 1000
Highest Prime Number: 9719
Total runtime: 0.021771907806396484 seconds

Running for N = 5000
Highest Prime Number: 9949
Total runtime: 0.22504258155822754 seconds

Running for N = 10000
Highest Prime Number: 9973
Total runtime: 0.02228999137878418 seconds

Running for N = 50000
Highest Prime Number: 9973
Total runtime: 0.07217574119567871 seconds

Running for N = 121000
Highest Prime Number: 9973
Total runtime: 0.15050482749938965 seconds
```