

Sorting Competition

By: Jacob and Shamund (Group 8)

Rank and Correctness

- Took 9th in the class (12th overall)
- Sum of places 24
- Sum of medians 30953 milliseconds
- Sorted Correctly

Data Representation

We used TimSort

Array of 1000 possible long prime numbers

Why Store it?

```
static long[] A = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101,
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7877, 7879, 7883, 7901, 7907, 7919};
```

Code

```
public static long productOfPrimeFactors(long n) {
    long num = n;
    //System.out.println("This is the number: " + num);
    long prime1 = 1;
    long prime2 = 1;

    for(int i = 0; i < A.length; i++) {
        if(A[i] > num){
            return prime1 * prime2;
        }

        if(num % A[i] == 0) {
            if(prime1 == 1) {
                prime1 = A[i];
            } else{
                prime2 = A[i];
                return prime1*prime2;
            }
        }
    }
}
```

```
static long[] A = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101,
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7877, 7879, 7883, 7901, 7907, 7919};
```

Code

```
long bound = (long) Math.sqrt(num) + 1;
```

```
for (int i = 7919; i <= bound; i += 2) {
    if (num % i == 0) { // the first found factor must be prime
        if (prime1 == 1) {
            prime1 = i;
        } else { // the second found factor is a prime or a power of the first one
            if (i % prime1 != 0) { // now we know it's a prime
                prime2 = i;
                return prime1 * prime2;
            }
        }
    }
}

if (prime1 == 1 && prime2 == 1) {
    prime1 = num;
} else if (prime2 == 1) {
    long checker = num / prime1;
    while (checker % prime1 == 0) {
        checker = checker / prime1;
    }
    prime2 = checker;
}

return prime1 * prime2;
```

```
static long[] A = {2, 3, 5, 7, 11, 13, 17, 19, 23, 29, 31, 37, 41, 43, 47, 53, 59, 61, 67, 71, 73, 79, 83, 89, 97, 101,
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7877, 7879, 7883, 7901, 7907, 7919};
```

Efficiency

Theoretical Worst Case - $O(n \log n)$ on an array of n elements not sorted

Expected - $O(n \log n)$

Best - $O(n)$ on an array that is sorted

Interesting features and What We Tried

Nothing....

QuickSort - too slow