Foundation of Programming

The following is the start of a Java program which is intended to print out all prime numbers below 600.

```java
public class Primes {
    private static final int SIZE = 600, SQRTSIZE = 25;

    public static void main(String[] args) {
        boolean[] primes = new boolean[SIZE];
        for (int i = 2; i < SIZE; i++)
            primes[i] = true;

        int next = 2;
        while (next < SQRTSIZE) {
            for (int i = next; i < SIZE / next; i++)
                primes[i * next] = false;

            do {
                next++;
            } while (!primes[next]);
        }
    }
}
```

Explain how the program is intended to work. [5 marks]

Unfortunately one value determined by the program is 589 which is not prime. Where is the bug in the program and how may it be fixed? [4 marks]

All other values determined by the program are prime. If the bug were left unfixed and the final values were adjusted so that the program attempted to find all primes below 150, would any non-prime be determined? If so, what is it? If not, why not? [4 marks]

Supply the missing part of the program so that the values which are printed out are arranged 10 numbers to a line with each number in a field of 5 places. It is not necessary to write out the part of the program which is shown above (with or without the bug). [7 marks]