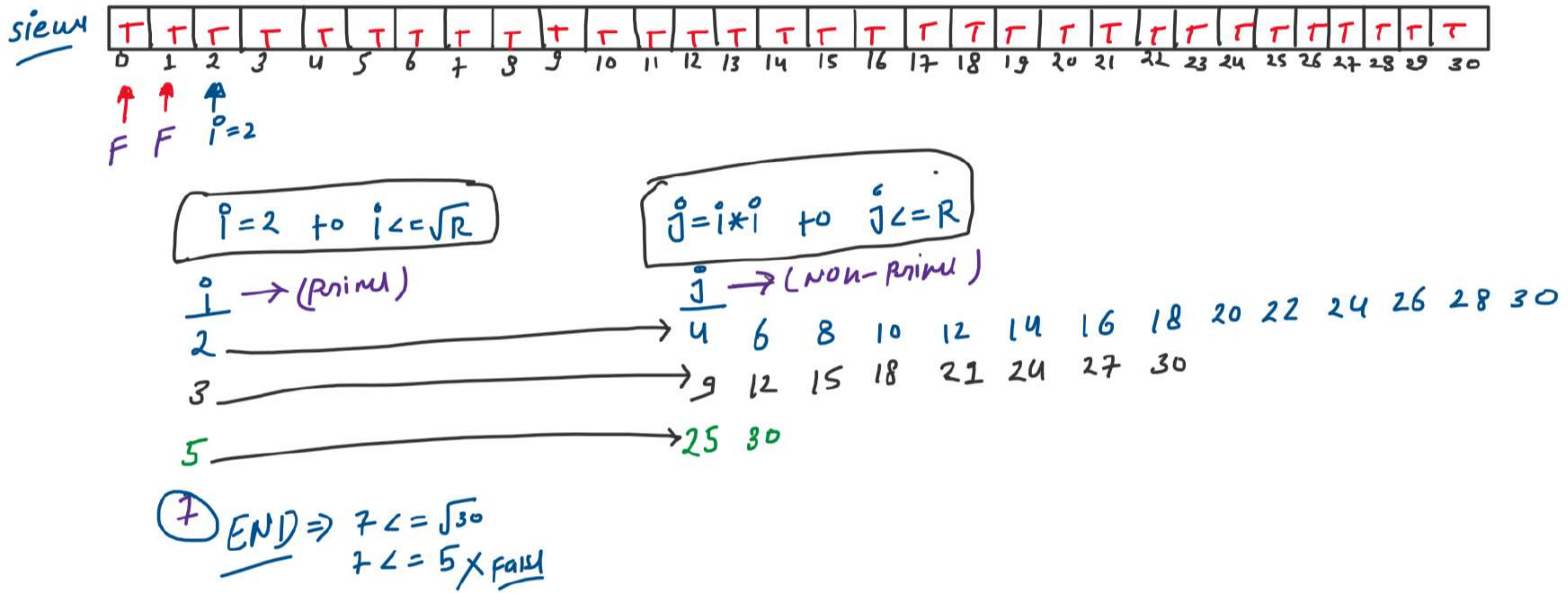
PROGRAM 07: SEGMENTED SIEVE PROGRAM (Find Prime in Interval)

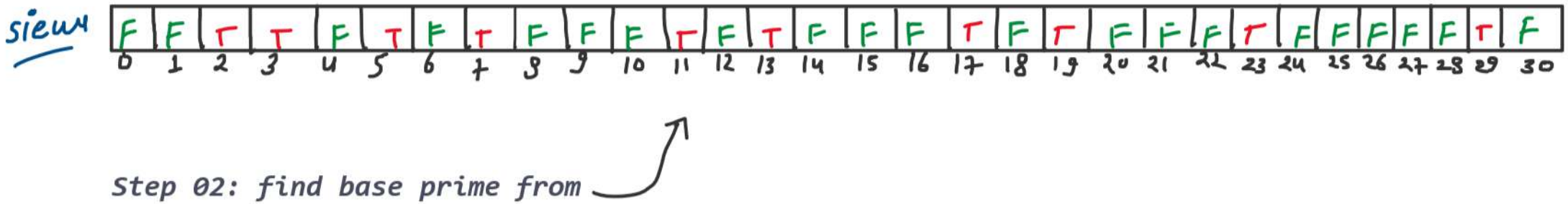
Ex

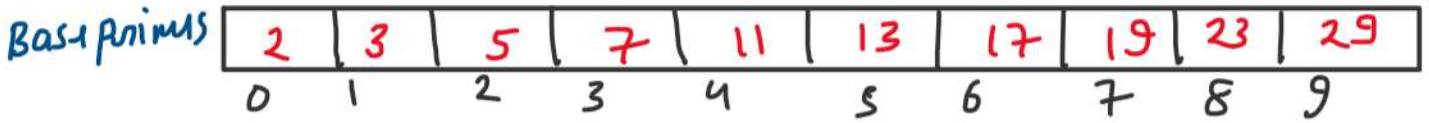
Examples: find Prime Numbers Between given Interval[Left, Right] (GFG)

Input : L = 20, R = 30
Output : 23, 29

Step 01: Apply Normal sieve from 0 to root R



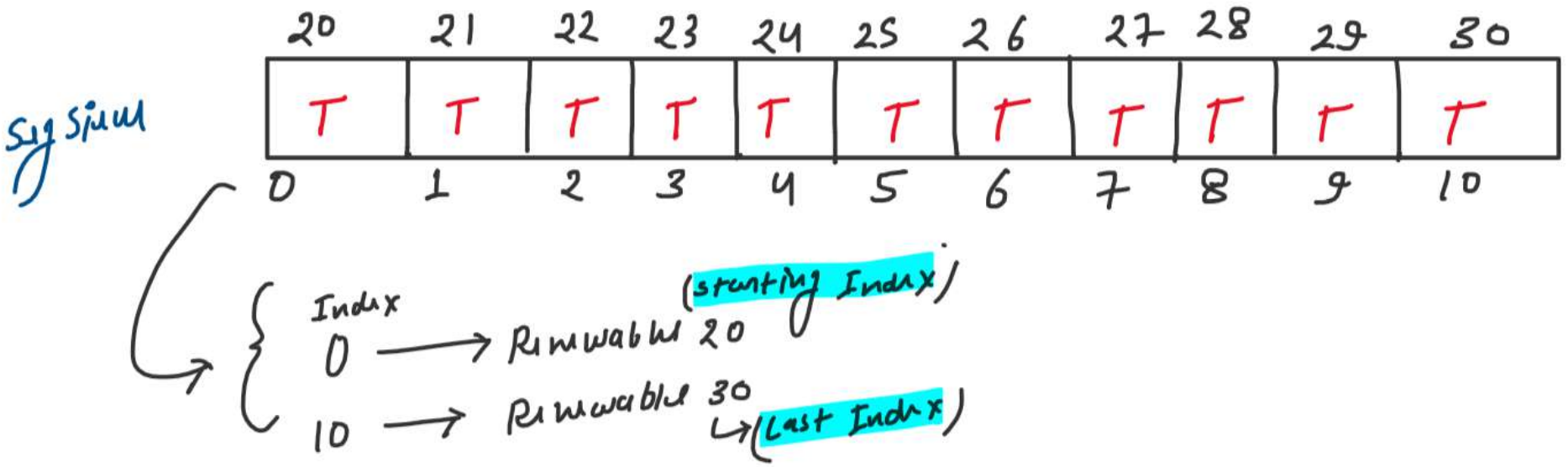

sieve
F F T T F T F T F F F T F T F F F T F T F F F T F F F F F T F
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Step 02: find base prime from


Base primes
2 3 5 7 11 13 17 19 23 29
0 1 2 3 4 5 6 7 8 9

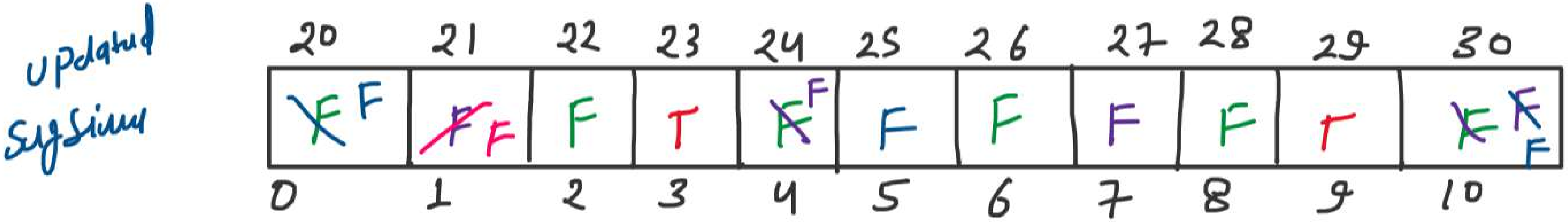
Step 03: segmented sieve:

L = 20 R = 30

segmented sieve size = R − L + 1
= 30 − 20 + 1
= 11



```
for( auto prime : basePrime ){
    int firstMul = (L/prime) * prime;
    if( firstMul < L ){
        firstMul += prime;
    }
    int j = max( firstMul, prime * prime);
    while( j <= R ){
        segSieve[j-L] = false;
        j += prime;
    }
}
```


Updated
Sys Sieve
20 21 22 23 24 25 26 27 28 29 30
F F F T F F F F F T F F
0 1 2 3 4 5 6 7 8 9 10

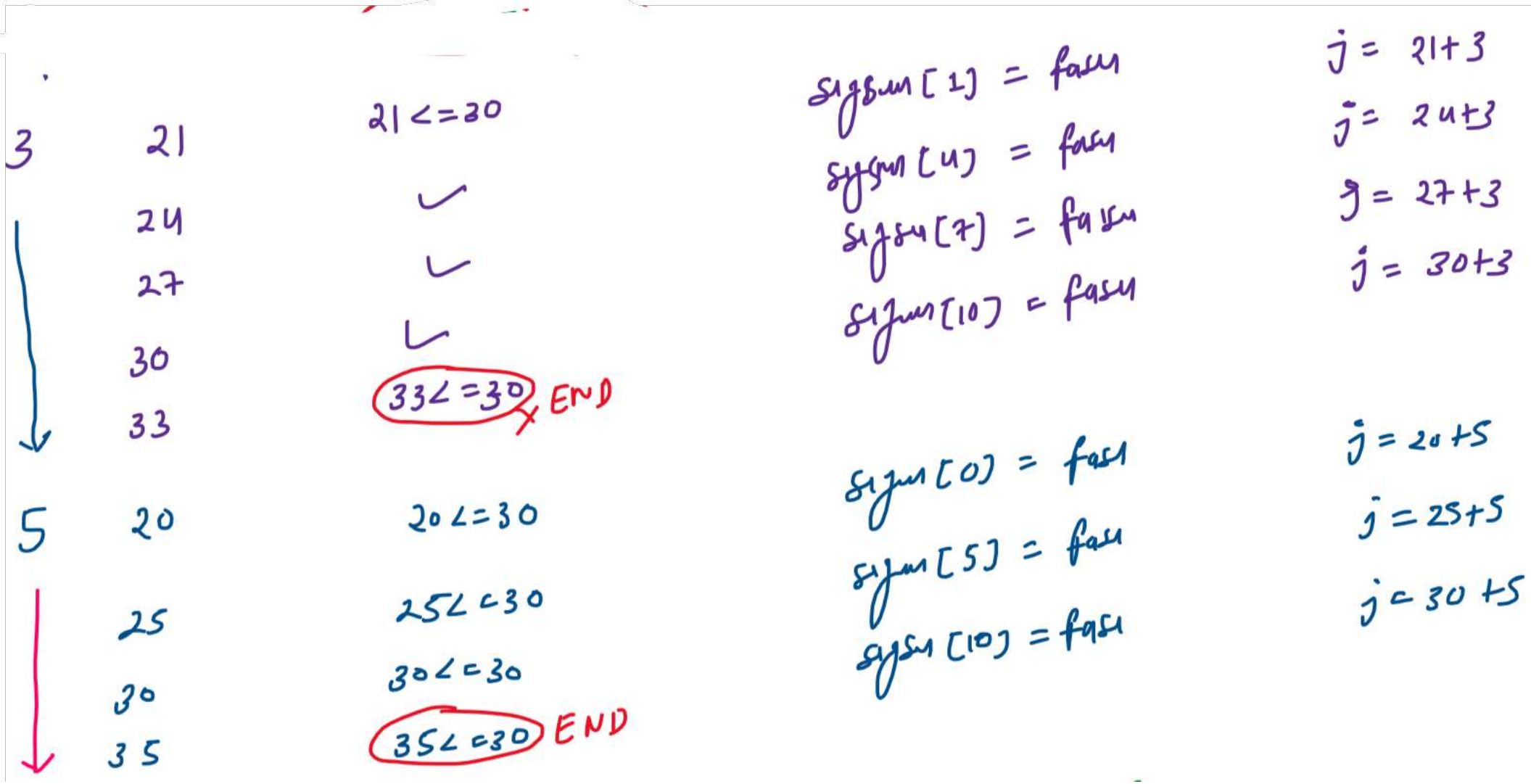
Prime	j	j <= R
2	20	20 <= 30
	22	✓
	24	✓
	26	✓
	28	✓
	30	✓
	32	32 <= 30 ✗ END

sieve[j-L] = false

sieve[0] = false
sieve[2] = false
sieve[4] = false
sieve[6] = false
sieve[8] = false
sieve[10] = false

j += prime

j = 20 + 2
j = 22 + 2
j = 24 + 2
j = 26 + 2
j = 28 + 2
j = 30 + 2


3
21
24
27
30
33
21<=30
33<=30
END
5
20
25
30
35
20<=30
25<=30
30<=30
35<=30
END
sysun[1] = fasu
sysun[4] = fasu
sysun[7] = fasu
sysun[10] = fasu
sysun[0] = fasu
sysun[5] = fasu
sysun[10] = fasu
j = 21+3
j = 24+3
j = 27+3
j = 30+3
j = 20+5
j = 25+5
j = 30+5

7 21

49 <=30 END ⟹ SAME process for (11 13 17 19 23 29)

↳ How

j = max(First_Mul , prime * prime)

= max(21 , 7*7)

= 49

Final ANS (23 and 29)