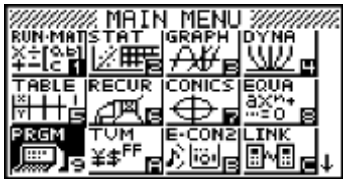
# Primes and Programming

*This resource was written by Derek Smith with the support of CASIO New Zealand. It may be freely distributed but remains the intellectual property of the author and CASIO.*




Select the **PRGM** mode from the **MAIN MENU** by using the arrow keys to highlight the **PRGM** icon and press **[EXE]** or pressing **[9]**.

The Greek mathematician Eratosthenes (3rd century B.C.) designed a quick way to find all the prime numbers. The idea is to find numbers in the table that are multiples of a number and therefore a composite number, and discard them. The numbers that are left will be prime numbers. Using the 100 chart below, highlight the number 1, this is **not** a prime number. **Why not?**

First, look for the **multiples of 2** and highlight them (leaving the number 2 unhighlighted, since it only has divisors of 1 and 2, and therefore a prime number). All the multiples of 2 will be composite numbers. Now, look for the **multiples of 3** and highlight them (except for 3, since it is a prime number). An easy way to do it is by counting in threes (3, 6, 9, 12, …). Now it's time to look for the **multiples of 5**. We don't need to look for the multiples of 4, why? It's easy to find the multiples of 5, they all end in either 0 or 5. We do not highlight the number 5, because it is a prime. Now, move on to the **multiples of 7** (we do not need to do multiples of 6, as $6 = 2 \times 3$ and we've already found the multiples of 2 and 3). We don't highlight the 7, since it is a prime.

Do we have to look for the multiples of 8, 9 and 10? **Why not?**

You can now move on to the number 11 and its multiples. Continue until you have all of the prime numbers listed between 1 and 100.

**100 chart:**

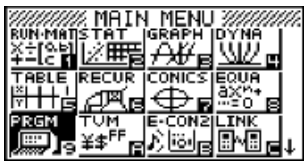
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 |
| 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 |
| 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | 60 |
| 61 | 62 | 63 | 64 | 65 | 66 | 67 | 68 | 69 | 70 |
| 71 | 72 | 73 | 74 | 75 | 76 | 77 | 78 | 79 | 80 |
| 81 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 |
| 91 | 92 | 93 | 94 | 95 | 96 | 97 | 98 | 99 | 100 |

A **BASIC** programme for finding a prime number is given below.

```
10 CLS
20 PRINT "LIMIT";
30 INPUT L
40 FOR N = 3 TO L
50    FOR D = 2 TO (N-1)
60      IF N/D=INT(N/D) THEN GOTO 100
70    NEXT D
80    PRINT N;
90    GOTO 110
100   PRINT ".";
110 NEXT N
120 END
```

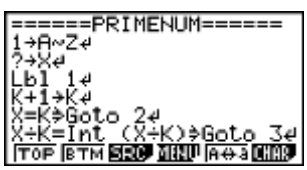
Writing a programme into the FX9750Gii using the calculators coding is gained via [**SHIFT**] [**VARS**] which gives you access to the **PRGM** commands.

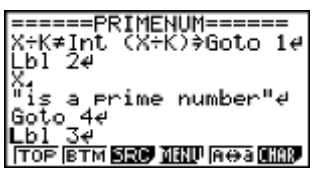
An example is below finding prime numbers:

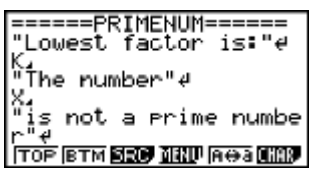


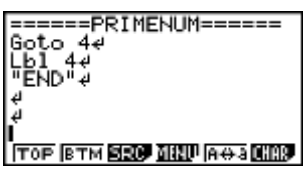




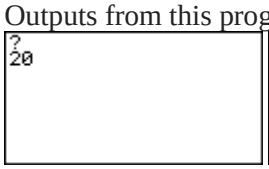


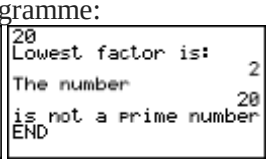



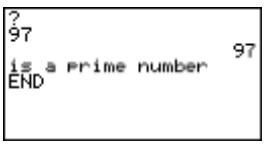




Outputs from this programme:

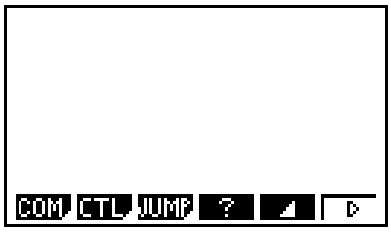


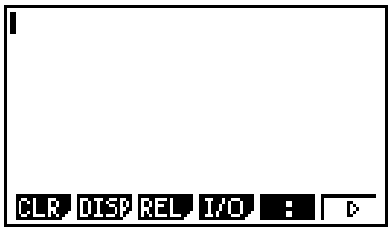



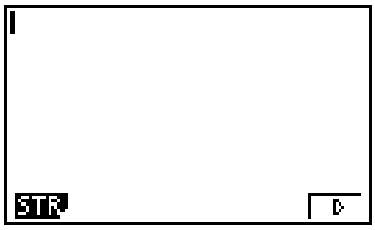




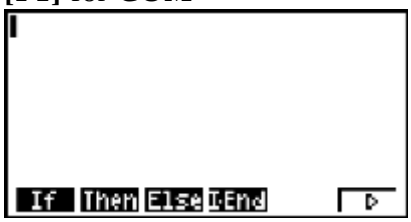
The Programming Tools required via **[SHIFT]** then **[VAR]** for the **PRGM** keys are.



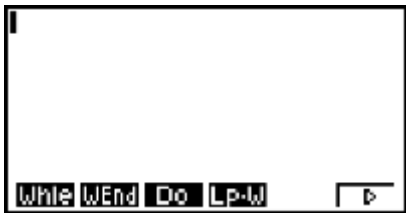



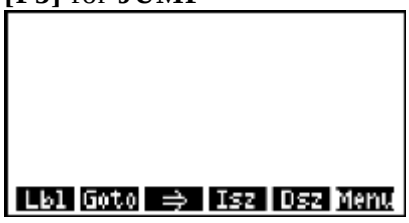

**[F1]** for **COM**



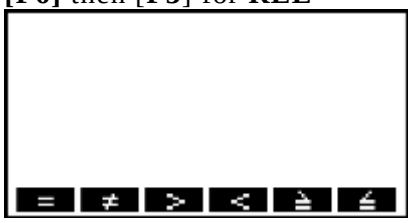




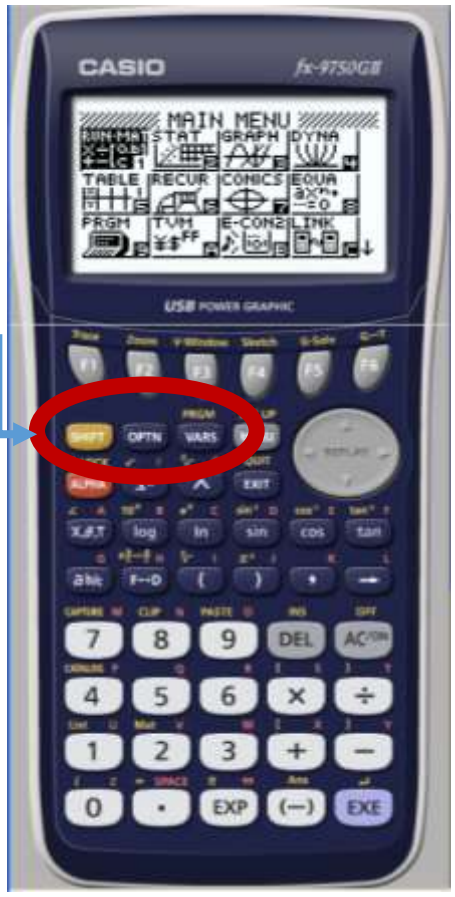

**[F3]** for **JUMP**



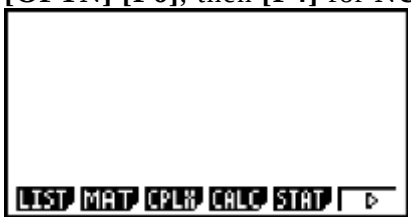

**[F6]** then [**F3**] for **REL**

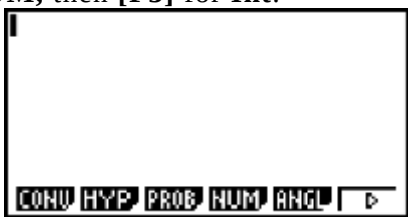


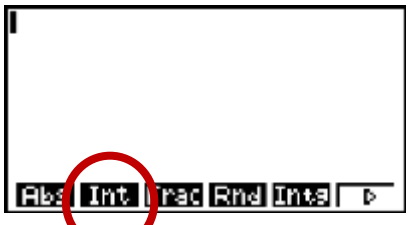

**[SHIFT]** then **[VAR]** for the **PRGM** keys




**Int(** (Integer value) is via:
**[OPTN] [F6]**, then **[F4]** for **NUM,** then **[F3]** for **Int**.




Primes between 1 and 100:
2, 3, 5, 7, 11, 13, 17, 19, 23, 29,
31, 37, 41, 43, 47, 53, 59, 61,
67, 71, 73, 79, 83, 89, and 97.

**Sources:**
https://en.wikipedia.org/wiki/Mersenne_prime
http://mathworld.wolfram.com/MersennePrime.html
https://www.mersenne.org/primes/
https://www.programiz.com/c-programming/examples/prime-number
https://www.robertsharp.co.uk/2010/10/08/prime-numbers/