

# N7

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## 1 Patterns

One particular pattern was found relating to the number of quadratic residues in  $Z_p$  that helped me complete the program. That is that the number of residuals relating to  $p$ , is equal to  $\frac{p+1}{2}$ , which I used as my range, which made sure no duplicate residuals were found.

The most interesting pattern I found in relating whether  $-1 \in Z_p$  was that the sum of the numbers that gave the residues were equal to  $p$ . For example, for  $p = 5$ , 2 and 3 are the values and sum up to 5, similarly for  $p = 13$ , with 5 and 8. It is also observed that every value  $p$  that has a quadratic residue -1, can be congruent to mod4. This discovery helped eliminate an issue that was occurring while attempting to use multiple loops.