

Each assignment in the coursework involved writing a generator which produces possible solutions, a tester to verify these and ultimately applying a filter to the generator using the tester.

Question 1: Light Show

Every week, *The Sunday Times* newspaper publishes a Teaser. Teaser 3172, of Sunday 9th July 2023, was as follows.

My bedside clock displays the time and date using eight digits; for example, at 9.43am on 28th June, the display would be



Each digit in the electronic display lights up some (or all) of seven light segments, the above display lighting up a total of 45 segments.

On one occasion recently, the displayed digits were all different and the total number of lit segments was prime. The same was true exactly one day later. Then, just one minute after the second occasion, the number of lit segments was the average of the numbers of lit segments on those two previous occasions.

What was that third display?

Question 1 corresponds to the code in `Light.hs`

Question 2: Digital Trio

Teaser 3158, of Sunday 5th May 2023, was as follows.

“I have a couple of subtraction problems for you”, George told Martha. Look: $N1 - N2 = N3$ and $N3 - N4 = N5$. Can you solve them if I tell you that $N1$, $N3$ and $N5$ are all three-digit whole numbers whose sum is less than 2000, the same three non-zero digits appearing in all three numbers but no digit being repeated within any of those numbers? $N2$ and $N4$ are both two-digit whole numbers using two of the three digits mentioned above, and the first digit of $N1$ is not equal to the first digit of $N2$.

What is $N1$?

Question 2 corresponds to the code in `Trio.hs`

Question 3: Easier to Ask the Audience

Teaser 3145, of Sunday 1st January 2023, was as follows.

“I have forgotten the phone number!” complained Martha, about to phone a friend. “So have I!” replied George, “but I have some vague memories of it. It is a perfect square with all the digits different, and the last digit is equal to the number of digits to be dialled. The last-but-one digit is odd and one of the digits is zero. Also the second and third and last-but-one digits are all exact multiples of the first digit. Maybe you can work it out.”

Martha proceeded to dial the number correctly.

What number did she dial?

Question 3 corresponds to Audience.pl

Question 4: Cube Route

Teaser 3149, of Sunday 29th January 2023, was as follows.

I have a set of ten cards, each of which has a different digit written on it. All the cards have been used to make a set of prime numbers. After discarding the smallest prime, and without changing the order of any cards, I have placed the remaining primes in order of decreasing size to give a large number. It is possible, without changing the order of any cards, to break this number into a set composed entirely of cubes. Neither set contains a number with more than four digits.

List, in order of decreasing size, my set of prime numbers.

Question 4 corresponds to Cube.pl