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Tartalomjegyzék

Sage List comprehension

Reminder

```
[expression for element in iterable_thing]
```

This creates a list which contains the **expression** for every element of **iterable_thing**. An iterable thing is a list for example, like a list created with the **range** function.

```
[expression if condition for element in iterable_thing]
```

Similar to the previous one, except only the elements for which the **condition** holds will be included.

```
[expression if condition1 else expression_alt for element in iterable_thing1
           for element2 in iterable_thing2
           ...
           for elementN in iterable_thingN]
```

We can write multiple fors.

Example:

```
[n^2 for n in range(1, 5)]  # [1, 4, 9, 16]
[n for n in [-1, 2, -3, 4] if n > 0]  # [2, 4]
```

Tasks

What do these do?

Execute the following, and then study how they work.

```
[n for n in range(1, 10)]
```

```
[(n, m) for n in range(1, 10) for m in range(1, 5)]
```

```
[n for n in range(1, 10) if is_prime(n)]

[n for n in range(1, 100) if n % 5 == 0 and n % 7 == 1]

[(n, m) for n in range(1, 5) for m in range(n, 5)]

[(m, n) for n in range(1, 10) for m in range(n, 10) if m % n == 0]

sorted([(m, n) for n in range(1, 10) for m in range(n, 10) if m % n == 0])

sum([n for n in range(1, 10) if is_prime(n)])
```

A little spoiler for the following: spoiler

```
[n for n in range(1, 100) if n == sum([m for m in range(1, n) if n % m == 0])]
```

Solve the followings

1. Find the square numbers x below 1000, where x + 1 is a prime. For example 4. (Find all of these numbers.)
2. Find those (x, y) pairs of numbers, where both are prime and their integer division (//) is prime as well. For example (11, 2).
3. Find the 3 digit numbers with the form xyz, where xyz (= 100 * x + 10 * y + z) = x^3 + y^3 + z^3. For example 1, 5, 3, because $1^3 + 5^3 + 3^3 = 153$.
4. Find the numbers below 10000, which can be written as the sum of 2 cube numbers in two different ways.

- Find the first 10 derivative of $\cos(x)\sin(x)x^2$, including the 0^{th} derivative, evaluated at 0, as an 11 long list.
- Plot the previous function and its derivatives on a plot on the interval $[-2, 2]$

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