Corona Coding Club Day 1 intro

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Thoughts from the author: The problems are sorted by difficulty within each section. Some of these problems are pretty hard. Work together! Ask Questions!

Pre-Lesson Homework: do the first 2 pythonprogramming.net tutorials. Post-Lesson Homeowrk: do the next 2 tutorials. Do any of these problems that you thought were interesting.

1 Easy Stuff

Demo program:

```
name = input()
print("Hello "+ name)
```

Question 1. *Create a program that prints all even numbers up to your age. -From "Python for kids"*

Question 2. *Create a program that asks someone for their name, adn then compliments them.*

Question 3. *Create a number guessing game. ("Im thinking of a number in [1,100]" User says "high and low", computer guesses numbers)*

2 Number Theory Stuff

Demo program: check if a number is a perfect square:

```
def checkIsSquare(n):
  i = 1
  while i*i <= n:
    if n == i*i:
      return True
    i+=1
  return False
```

Question 4. *Write a program to compute the n-th fibonacci number. Recall* $f_0 = f_1 = 1$, $f_n = f_{n-1} + f_{n-2}$. *Bonus: use linear algebra to do it in time* $O(\log n)$

Question 5. *Write a program that makes an array with* $x[i]$ *indicating whether* i *is prime or not.*

Question 6. *Write a function that checks if a number is prime.*

Question 7. *Write a program to compute the greatest common divisor of two numbers.*
Hint: you can bash it, or do the euclidean algorithm

3 Encryption Stuff

Demo: reverse cipher

```
"".join([chr(26-(ord(x)%26)+ord('a')) for x in input_string])
```

Question 8. *Make a program that does a caesar cipher. That is, it takes in some english text, and cyclically shifts all the letters by some key, for example 1.*

4 Signal Stuff

Demo program: makes a graph of some noise.

```
import matplotlib.pyplot as plt
import numpy as np
data = np.random.rand(100)
plt.plot(data)
plt.show()
```

Question 9. *Print a thousand random numbers.*

Question 10. *Generate a random signal with 1000 data points. Plot it. Make a smoothed version of the signal.*
Hint: use moving average