Lecture 4, 19 August 2025

Madhavan Mukund

https://www.cmi.ac.in/~madhavan

Programming and Data Structures with Python

Check primes in 1..n

for i in 1..n+1

To check i is prime

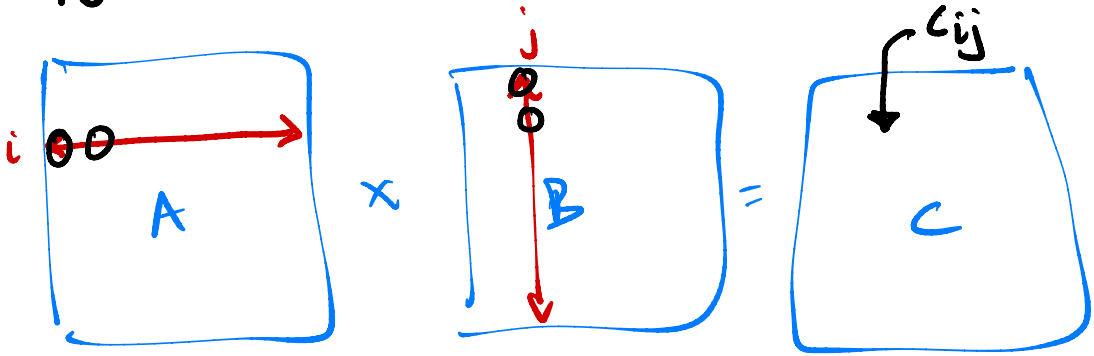
for f in 2 to $\sqrt{i}$

check if f divides i

Iteration within an iteration

"Nested iteration"

Multiply matrices

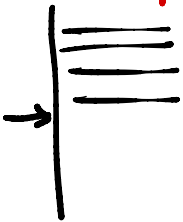


Functions

def isprime(m):

define

call

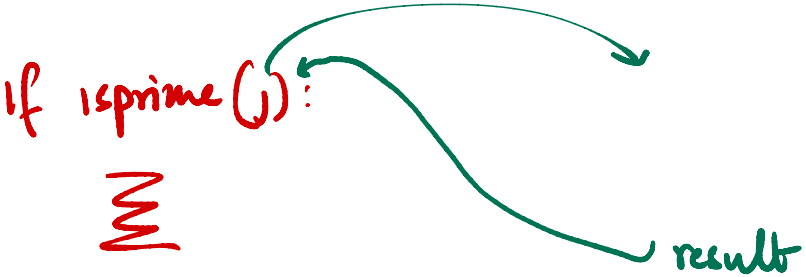


```
def isprime(m):
    result = True
    for j in range(2,m):
        if m%j == 0:
            result = False
    return(result)
```

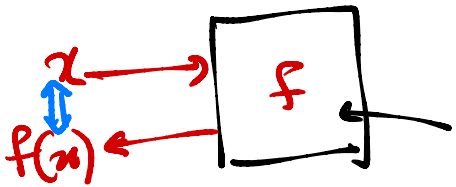
m = 7

m = y

```
isprime(7)
y = 8
isprime(y)
```


if isprime(j):
result

Functions "abstract away" details of computation



How f(x) depends on x

update implementation

"Modular" code

primelist

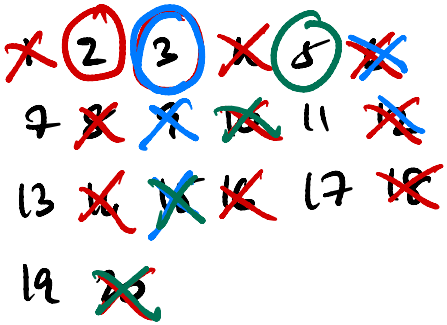
⇓

all primes upto j-1

isprime(j)

└ check factors in primelist

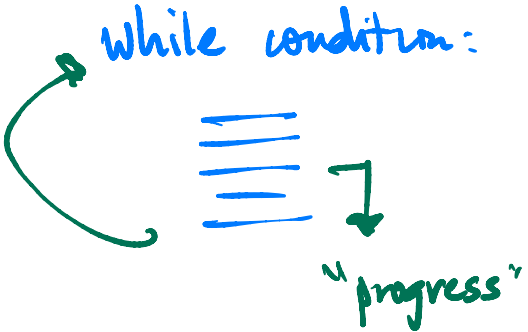
Sieve of Eratosthenes

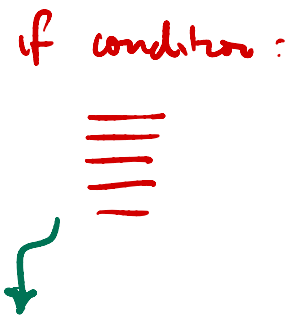


first n primes

"Iterate" till we find n primes

```
i = 1
primelist = []
While len(primelist) < n:
    if isprime(i):
        primelist.append(i)
    i = i+1
```


while condition:
"progress"


if condition:

"Infinite" loops

Does my program halt given input x?

"Halting Problem" – Turing showed it is not computable