Lecture 16

Asymptotic Analysis
- method for describing limiting behavior
- Study of the properties of a function

— In Computer Science, AA is the evaluation of the performance of an algorithm in terms of the input size (n), where n is very large

Algorithm
A finite set of precise instructions to solve a problem
- every algorithm is constructed using a finite set of statements

Simple C Statements
① Expressions

printf
scanf — read formatted data
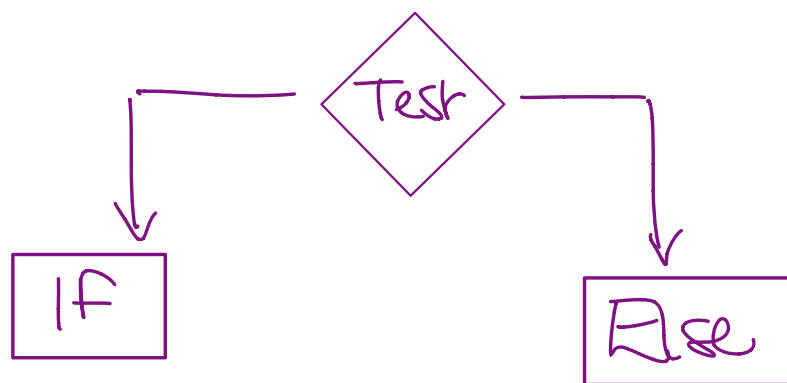assignment statements — set a := 1

② Jump Statements
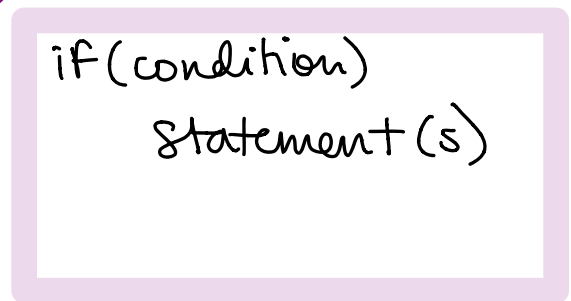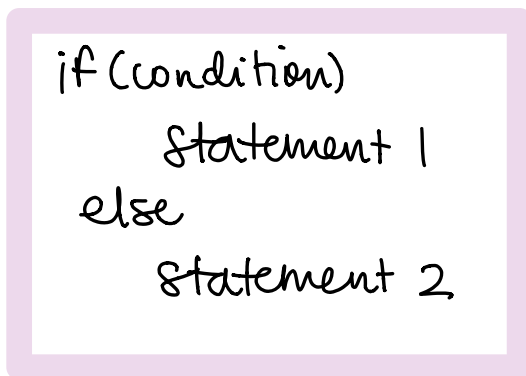 goto, break, continue, return, etc.

③ Null statement
    ; → nothing happens

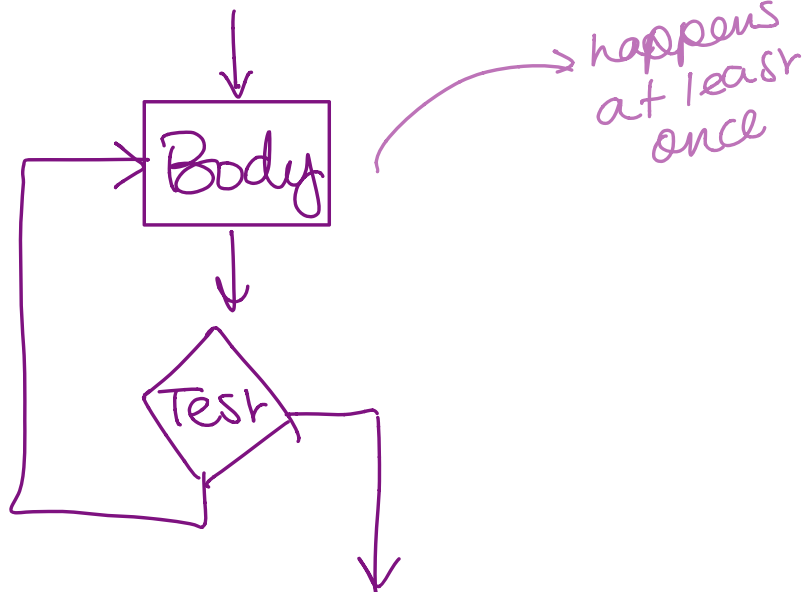# Rules for Constructing Statements
(From smaller (Statements))

ⓘ

if (condition)
    Statement 1
else
    Statement 2

if (condition)
    Statement (s)

```
        Test
   ↙          ↘
  If          Else
```

② for (initialization; termination;
            incrementation)

③ while (condition)
        statements

④ do - while statement

happens
at least
once

```
int i=0;
 do
    printf (i);
     i = i+1
  while (i<=5)
 return 0
```

⑤ "Missing" (switchcase)

⑥ Block

A block

$$S_1$$
$$S_2$$
$$S_3$$
$$\vdots$$
$$S_n$$
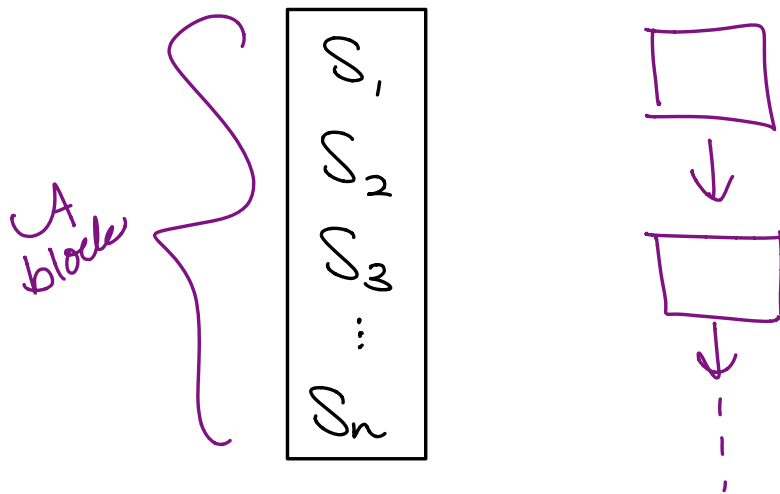
```
printf ("a\n");
pnntf(" b\n");
```

output
a
b

Choosing An Algorithm

- program w/ small amounts of data
  - USE EASIEST TO IMPLEMENT ALGORITHM

- program to be used & maintained by many people over a large period of time

① Simplicity
② Clarity
③ Efficiency (especially for large size problems)

Running Time

- amount of time it takes measured as a function of the size of the input (f(n))

Input size

- Size of an array
- Verticies or edges of a graph
- Degree of a polynomial
- Number of elements in a matrix
- etc.

Homework:

https://u.osu.edu/alzalg.1/files/2019/10/hw7.pdf