# CS 2259 discrete structures

number line → non-discrete, continuous

++++++++      vs    . . . ... . _    (finitely many things)
                          ↖ discrete,
                    not all, specific

examples:
- programs
- # of ppl in class

Structure - smaller things
H₂O molecule → atom → electrons, protons + neutrons, etc
building → rooms, ceilings

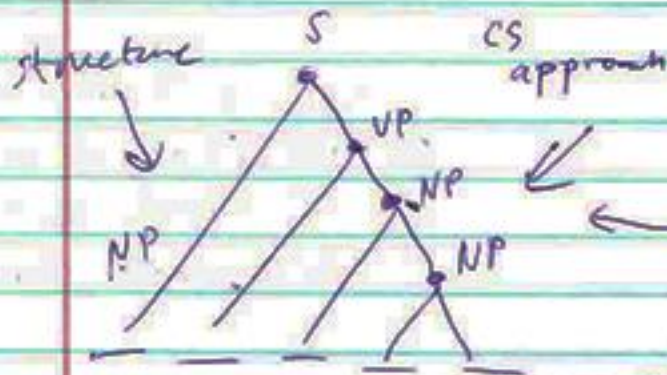"this is a nice book. ← structure
X This book is a nice.                  made of words,
✓ This book is nice.                    unless in a specific way.
                                        + order of words
                                        has to be made in particular way

structure        S        CS
                          approach
            ⬇         VP                    Syntax tree describes
                        NP  ⬅                         structure of
        NP                                            sentence
                            NP
        __   __   __   __

if (y < min) min = y;          if (x<y) min = x;
                                    min = min(x,y); ?
                               does not compute minimum

| x | y | s1 | s2 | find min | #(compares) | #(assigns) | |
|---|---|---|---|---|---|---|---|
| 2 | 3 | min=3 | 2<3(T) min=2 | 2 | 1 | 2 | |
| 2 | 2 | min=2 | 2<2(F) | 2 | 1 | 1 | 1. min = y |
| 3 | 2 | min=2 | 3<2(F) | 2 | 1 | 1 | 2. if (x<y) min = x; } ✓ |

if we change it to `<=`
    it adds more assignments

it <u>works</u>, but not <u>efficient</u>.

without counting you cannot analyze your code

even more efficient
    if (x<y) min=x;        } 1 test, 1 assignment
    else min=y;

without else statement ur code can still work,
but its inefficient.

PASCAL'S TRIANGLE.

$$1$$
$$1 \quad 1$$
$$1 \quad 2 \quad 1$$
$$1 \quad 3 \quad 3 \quad 1$$
$$1 \quad 4 \quad 6 \quad 4 \quad 1$$

$$\binom{18}{3} = \frac{18 \cdot 17 \cdot 16}{5 \cdot 3 \cdot 2 \cdot 1}$$

defines
choose

$$(x+y)^2 = x^2 + 2xy = y^2$$
$$(x+y)^3 = x^3 + 3x^2y + 3xy^2 + y^3$$
$$(x+y)^4 = x^4 + 4x^3 + 6x^2 + 4x + 1$$
$$(x+y)^n \Rightarrow \text{binomial theorem}$$