

Loop Inv. & Halting Prob

4/9

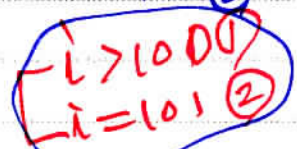
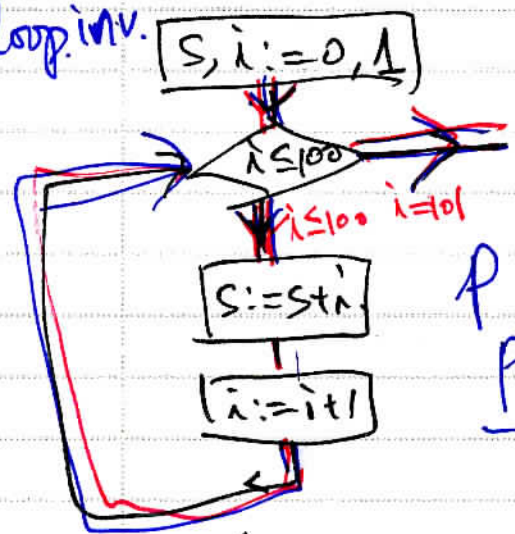
~~Big O notation~~

loop

1. loop invariance ...
2. loop terminating ...



① loop inv.



$S = 1 + 2 + \dots + 100$

P: loop invariance
 $P \wedge (i = 101)$



i	2	3	4	5	6	
S	0	1	3	6	10	15

Annotations: $0 \parallel 0$, $1 \parallel 1$, $3 \parallel 1+2$, $6 \parallel (1+2)+3$, $10 \parallel (1+2+3)+4$, $15 \parallel (1+2+3+4)+5$

$1+2+\dots+(i-1)$ $1+2+\dots+100$
 Prog. is difficult!
 Art of Programming
~~by~~ P. Knuth

$$P \equiv (S = \sum_{k=1}^{i-1} k)$$

$$P \wedge (i = 101) \equiv (S = \sum_{k=1}^{100} k)$$

② Terminating cond
 $T(i) = 101 - i \geq 0$
 in the loop

i	T(i)
1	100
2	99
...	...
100	1
101	0

monotonically decreasing ftn. (positive)
 \downarrow
 2+3 > 1+2

Optimization
Max/Min some ~~f~~^f $(x_1 \dots x_n)$
in a given constraint $C (c_1 \dots c_n)$
↑
linear

LP: Linear Programming
Problems NP

