

Maximize: $2x_1 + 5x_2 + 9x_3 + 16x_4$

$x_1 + 2x_2 + 3x_3 + 5x_4 \leq 8$

r	x_1 1 f_1	x_2 2 f_2	x_3 3 f_3	x_4 4 f_4
ω				
0	0	0	0	0
1	1	2	0	2
2	2	4	1	5
3	3	6	1	9
4	4	8	2	11
5	5	10	2	16
6	6	12	3	18
7	7	14	3	21
8	8	16	4	25

minimise $x_1 + 2x_2 + 3x_3 + 5x_4$ $\swarrow$ weight

s.t. $2x_1 + 5x_2 + 9x_3 + 16x_4 \geq 12$

$x_1, \dots, x_4 \geq 0$ & integer $\nwarrow$ profit

Answer = 5

Time to solve problem

$$f_v(w) = \max_{x_i \leq \frac{w}{w_v}} \left[\dots \right]$$

n W #choices $\leq W$

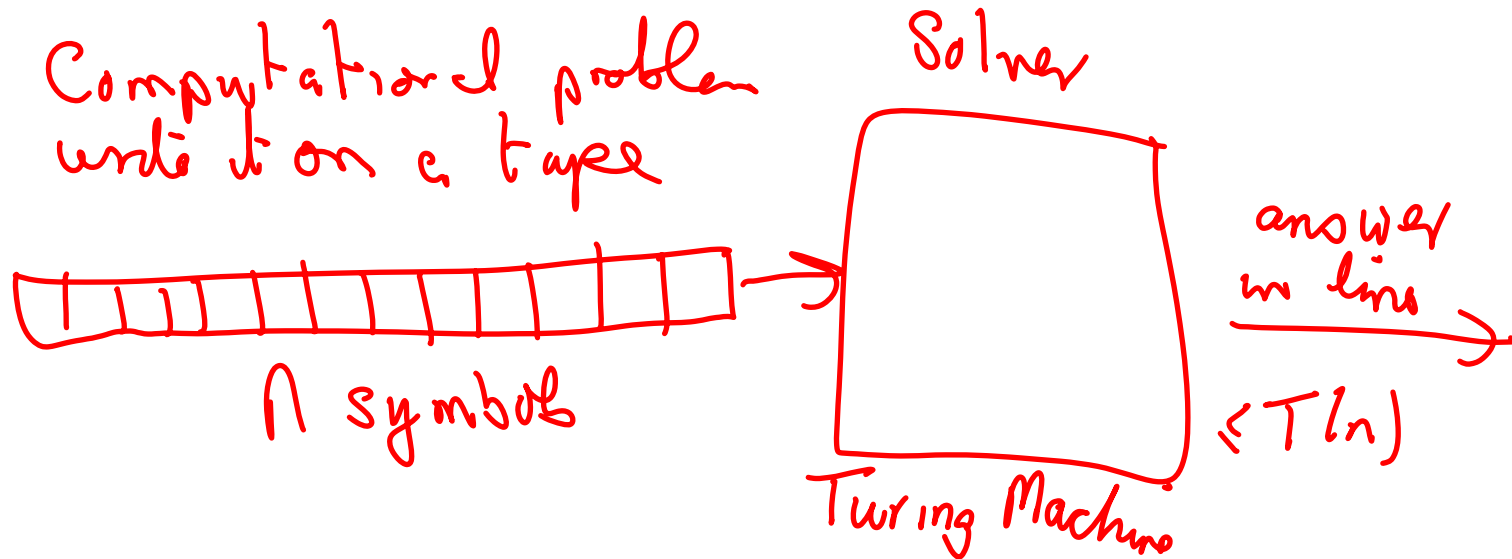
$$\text{Time} = O(nW^2)$$

$P = NP ?$

polynomial time solvable

Non-deterministic polynomial time

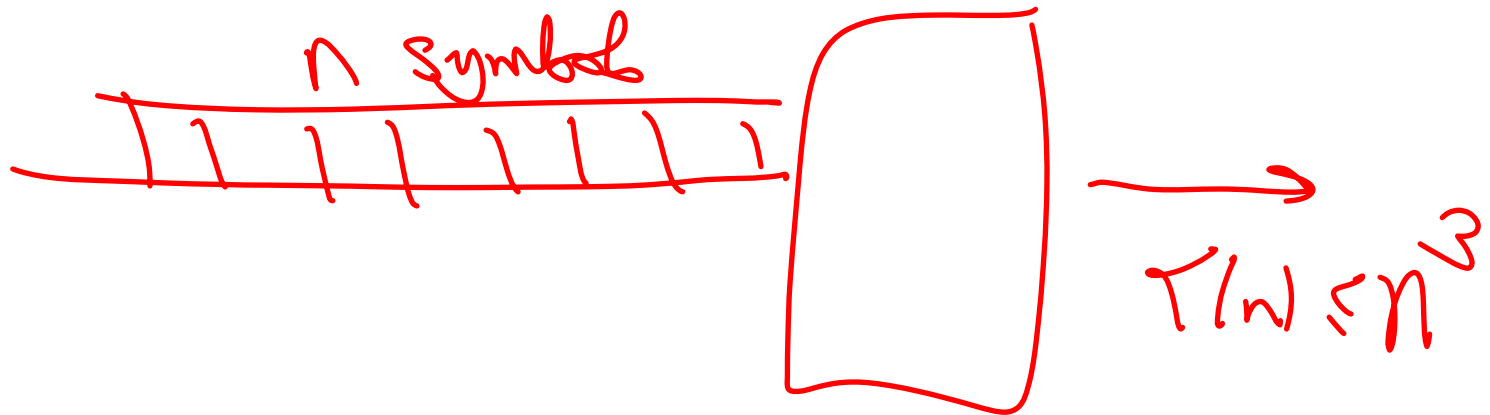
Model of computation:



Problem is in P $\exists$ a machine
for which $T(n) \leq \text{poly}(n)$.

Example:

Shortest Path



NP: you can just guess solution

