473 Algorithms

374 followup

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- HW 1

30% final

25% midterm 1

25% midterm 2

20% Homeworks.

- Modeling
- Algorithmic problem solving / thinking
- Reductions.
- Know what you dont know.

Q: There 125 sheep and 5 dogs in a flock. How old is the shepard?

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25 horses. Every horse run the race in the same time.

A race can have at most 5 horses.

Q: min # of races to figure out the 3 fastest horses?

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sort all the horses using minimum # of races.

Subset sum problem

$S = \{s_1, s_2, \ldots, s_m\}$ integer numbers

t: Target number

Q: $T \subseteq S$

$$\sum_{x \in T} = t$$

$s_1, \ldots, s_m$

$x_1, \ldots, x_m \in \{0,1\}$

$x_i = 1 \iff$ pick s_i to T.

$x_i = 0$ nope

Solve the following

$$\sum_{i=1}^{m} x_i s_i = t$$

$$x_i \in \{0,1\} \qquad i = 1, \ldots, m$$

integer program

For $x_1, \ldots, x_m \in \{0,1\}^m$ do

If $\sum x_i s_i = t$ then return true

return false.

$O(2^m \cdot m)$ $O(2^m)$

$$\sum_{i=1}^{m} x_i s_i = t$$

$x_i \in \{0,1\}$

$\max \sum x_i w_i$

Linear program

$\sum x_i s_i = t$

$x_i \in [0,1]$

$\max \sum x_i w_i$

Halting problem

P - program

I input

Q: Does P stop on the input I?

Is there a program solving this problem?