The Probabilistic Method

Week 13: P, NP, SAT

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CS49/Math59
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Clicker Question

What is the input length of SAT?

(how would you efficiently encode a SAT input?)

(A) **$\Theta(n+m)$**

(B) **$\Theta(nm)$**

(C) **$\Theta(n + m\log(n))$**

(D) **$\Theta(2^n)$**

(E) **None of the above**

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Consider the following SAT instance: $c_1 \wedge c_2 \wedge c_3 \wedge c_4$

for the following clauses:

$$c_1 = (x_1 \vee x_2 \vee \neg x_3) \qquad c_2 = (\neg x_1 \vee x_3 \vee x_4)$$

$$c_3 = (\neg x_2 \vee \neg x_3 \vee \neg x_4) \qquad c_4 = (x_2 \vee \neg x_3 \vee x_4)$$

Which of the following are satisfying assignments?

(A) $(x_1, x_2, x_3, x_4) = (F, F, F, F)$

(B) (T, T, T, T)

(C) (T, F, T, F)

(D) (F, T, F, F)

(E) Multiple Answers Correct

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Clicker Question

Design an algorithm recognizing SAT.

What is its runtime?

(A) $O(2^n m)$

(B) $O(n^m)$

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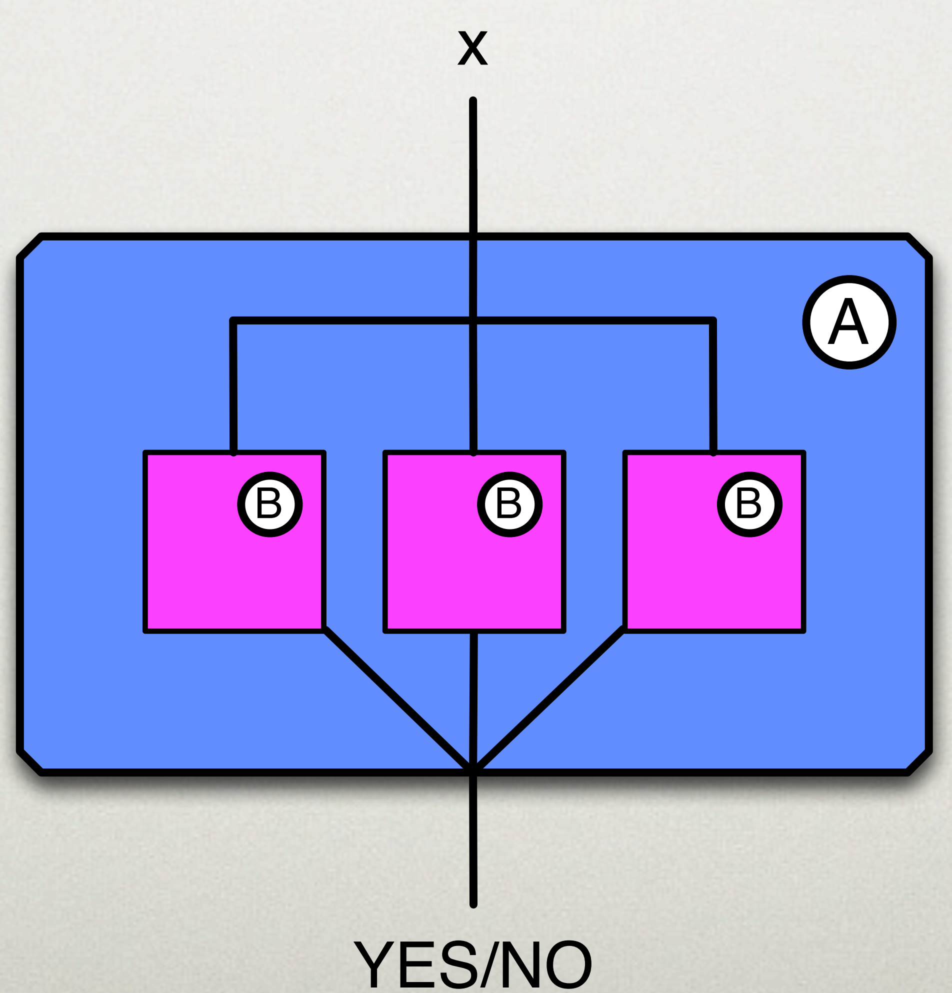
Polynomial Time reducibility

Definition: **A** is polynomial-time reducible to **B** (**A** $\leq_P$ **B**) if **A** can be solved using a *polynomial amount of time* plus a *polynomial number of solutions* to **B**.



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