#### THE PROBABILISTIC METHOD WEEK 12: P vs NP



JOSHUA BRODY CS49/MATH59 FALL 2015

## **READING QUIZ**

Which of the following is not a factor or term in the space complexity of the  $(\varepsilon, \delta)$ -approximation for  $F_2$  we saw last week?

- (A) log(n)
- (B) log(m)
- (C) 1/δ<sup>2</sup>
- (D) 1/ε<sup>2</sup>
- (E) None of the above

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(A) log(n)

(B) log(m)



(D)  $1/\epsilon^2$ 

(E) None of the above

#### MILLENNIUM PROBLEMS

[Clay Mathematics Institute 2000]

#### CMI Millenium Prize: \$1,000,000 for solving:

- (1) Yang-Mills and Mass Gap
- (2) Riemann Hypothesis
- (3) P vs NP
- (4) Navier-Stokes Equations
- (5) Hodge Conjecture
- (6) Poincare Conjecture
- (7) Birch and Swinnerton-Dyer Conjecture



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# LAST TWO WEEKS OF SEMESTER

- decision vs optimization problems
- polynomial time verifiers
- **P**, **NP**
- NP-Complete
- polynomial time reductions
- Randomized algorithms for NPComplete problems









## ALGORITHMS

**CLRS definition:** "An algorithm is any well-defined computational procedure that takes some value(s) as inputs and produces value(s) as output."





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#### **Important criteria:**

(1) must always halt (eventually)
 (2) Algorithm solving problem X must always return what X asks for.

#### THE PROBABILISTIC METHOD



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