Learning Goals · Describe Pand NP informally, and why these ideas are important · Define NP Announcements · Prove a problem is in NP Exit Tickets

Types of Problems									l mi	//ION	9011	ars									
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Can mathematically characterize Easy / Puzzle

P and NP	•	•	•	•	

- P
- Informal:
- NP
- Informal.

- Polynomial Time

All Problems



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Which picture is correct?

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NP problems are YES-NO: example of NP problem: 35AT 3SAT

IS 3SATENP?

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Proof that 35ATENP																			
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Formal (ish) Definition of NP A problem is in NP If 0

Group Work Hamiltonian Path Problem: X is a YES instance iff X describes adjacency matrix of a graph G with vertices s,t s.t. there is a path from s to t that goes through each vertex exactly once. X= SUVE X= SUVE 50110D SONI x ___ k __ (| __ x __ (k ___ k __ FIDI II IID FUDIO YES instance No instance Show: Prove: Hamiltonian Path ENP · Describe M(X,y) · Analyze runtime of M. in terms 07 Is Knapsack in P? NP? · If yes, 3 y: M(x,y)=1 • If no, Yy: M(Xiy)=D

Group Work Hamiltonian Path Problem: Given an adjacency matrix for a graph G=(V,E) and s, t eV, is there a path from s to t that goes through each vertex once.



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Knapsack: Runtime is O(n.W) · N = number of items ·W= size of Knapsack What is imput size? (assume max value is \$100). A) $O(\log(n)W)$ B) O(log(n) + log(w))C) O(log(n) + W) \mathcal{D}) $\mathcal{O}(n \log W)$ ex: