

$$\begin{array}{r} 431 \\ \times 433 \\ \hline \end{array}$$

# Advanced Algorithms

- Students will be able to:
- define computation and some basic ideas of the theory of computation
- discuss computability and understand there are some things computers cannot solve
- explain the Halting Problem
- identify some advanced search algorithms
- understand how AI programs represent games with game trees
- understand how AI programs use uninformed and heuristic search algorithms to play games

## Journal

Given  $y = 7x + 4$  and  $x=3$  what are the steps to find  $y$ ?

Given  $y = 7x + 4$  and  $y=3$  what are the steps to find  $x$ ?

Factor 81,927,497 and 81,927,499. Can you figure out the steps?

Multiply  $431 \times 433 \times 439$ . What are the steps?

# Inverse Operations

mod = remainder  
%

## Easy

$x^2 \leftrightarrow \sqrt{\quad}$   
- +  
- (opposite)  
fractions

## Hard

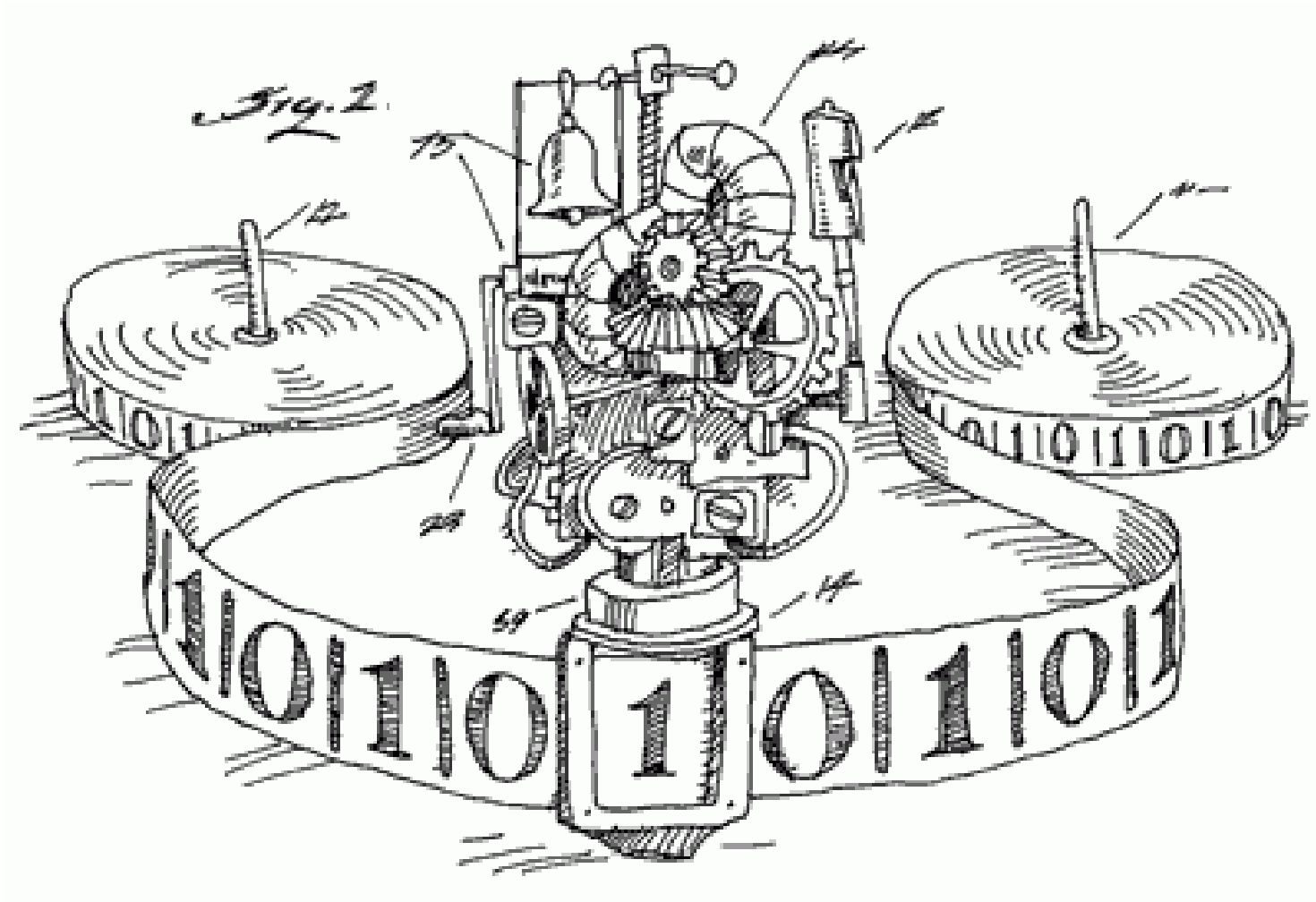
?  
? depending upon what you know  
depending upon values  
Factorization  
sin / cos / tan  
integrals  
 $10^x / \log / e / \ln$   
trig identities  
Pythagorean theorem

## Inverse Algorithms

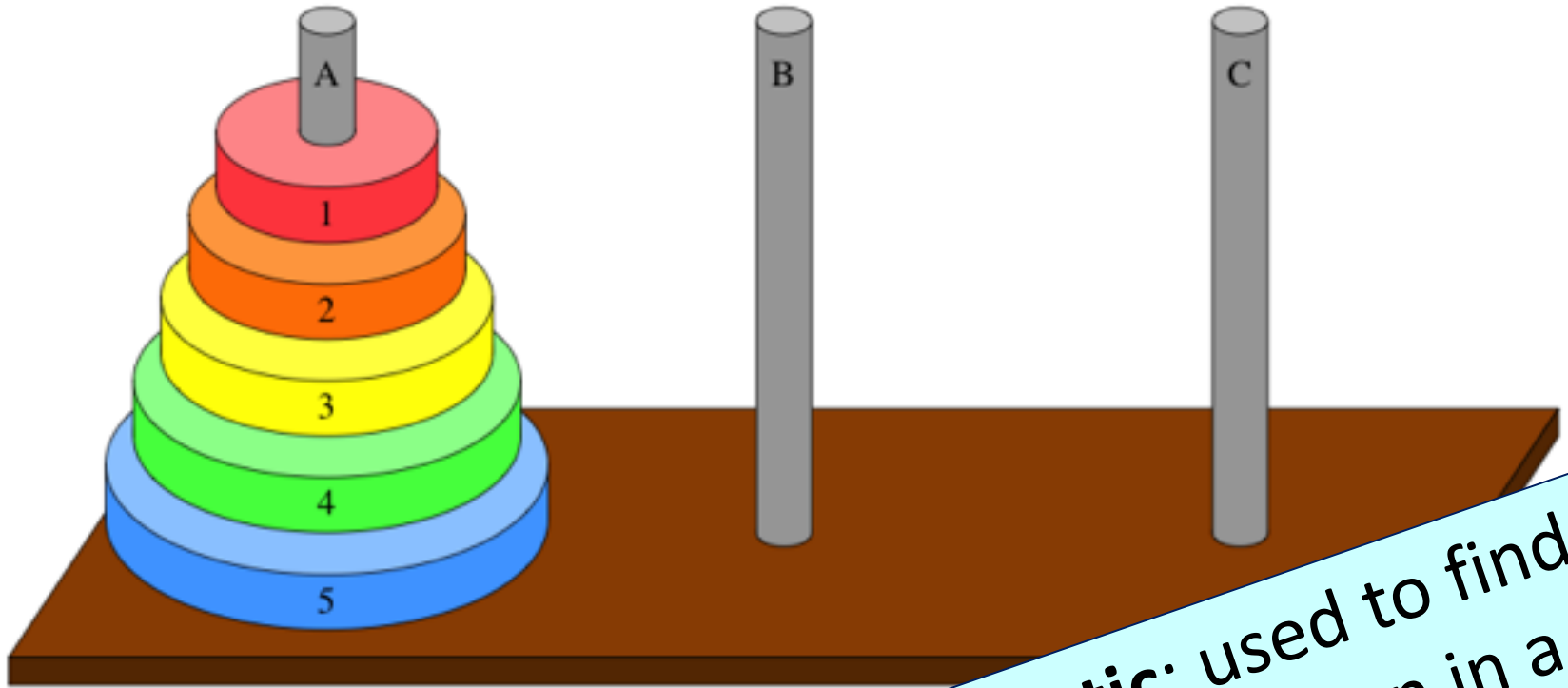
encryption

Sorting

# Computation & Computability

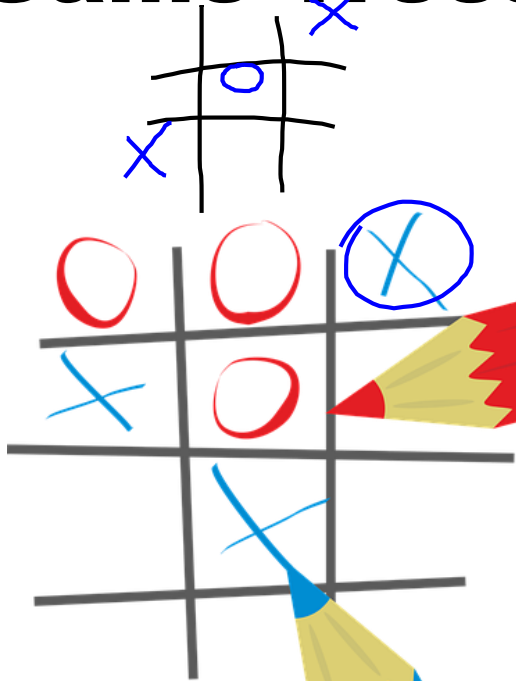


# Towers of Hanoi – Another Algorithm



**Heuristic:** used to find a good solution in a reasonable time

# Game Trees

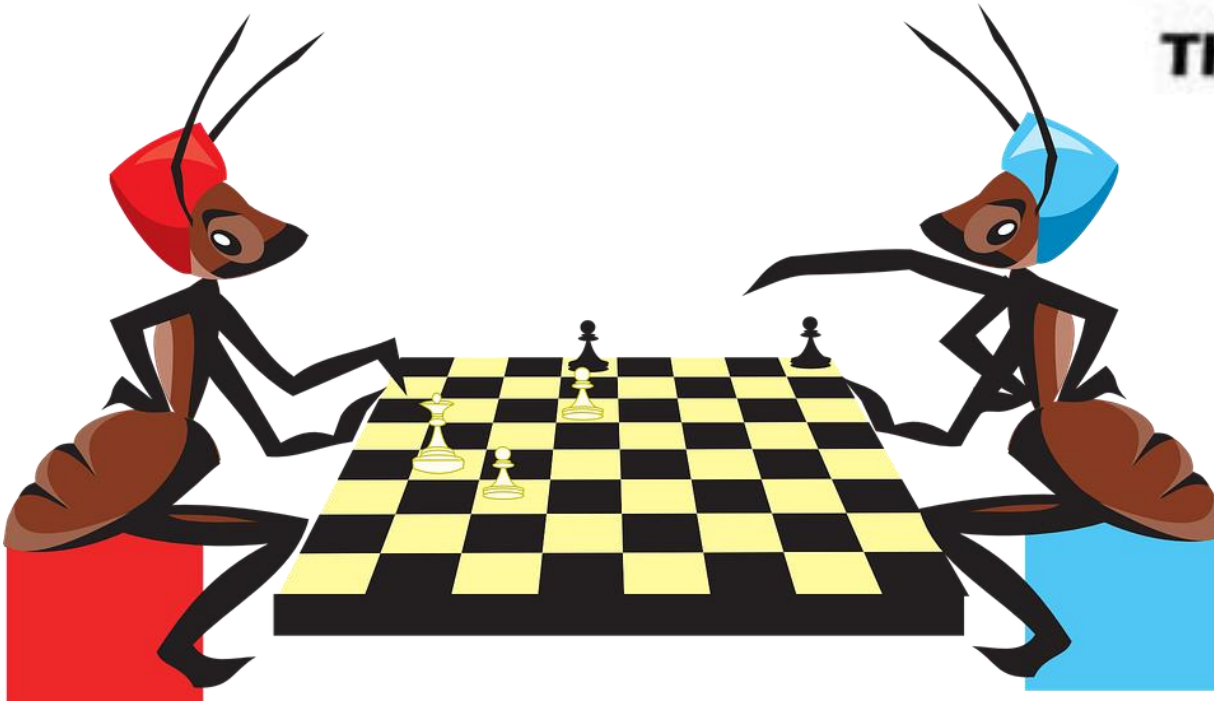


top right corner  
center  
lower left corner

# Game Trees

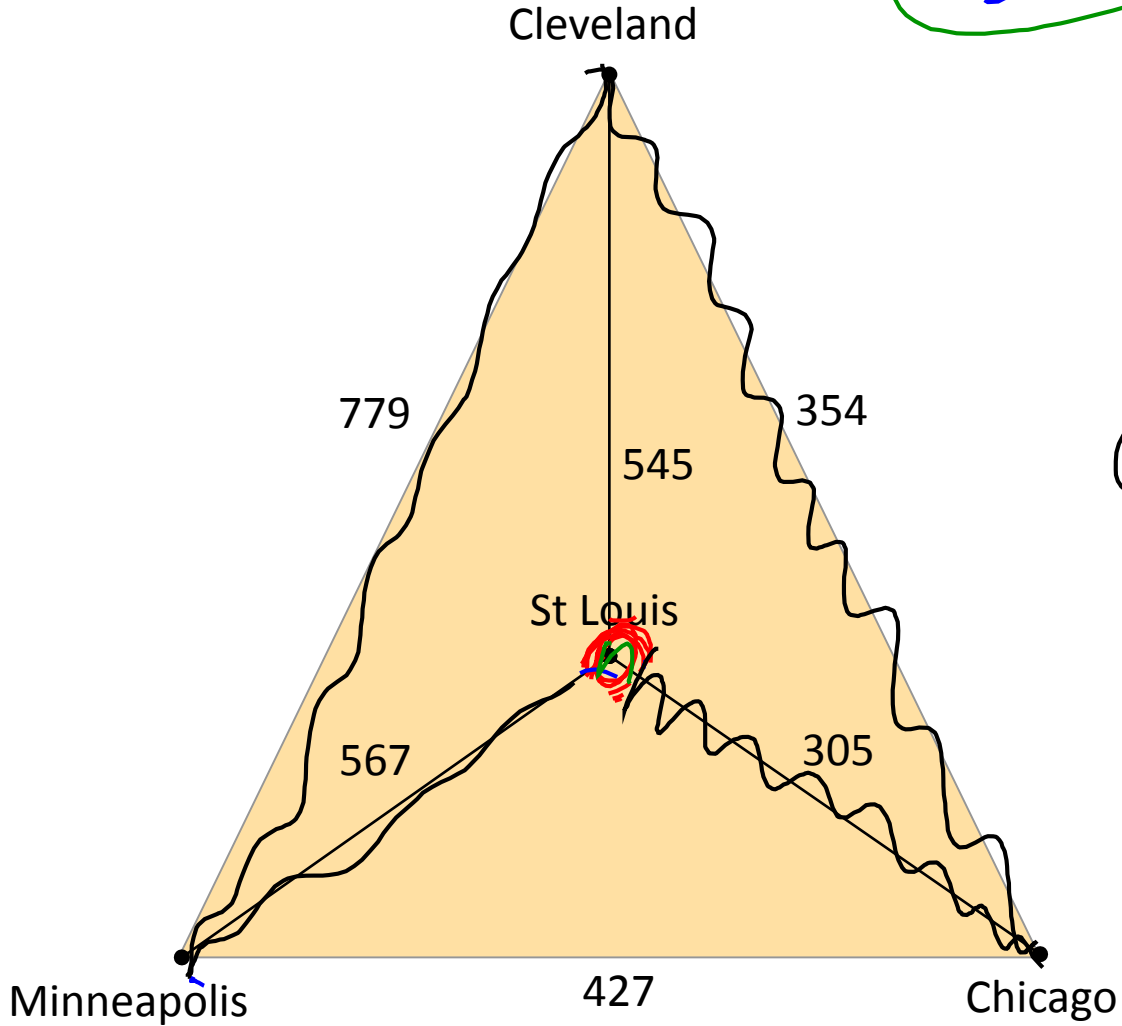


**Think, Pair share**



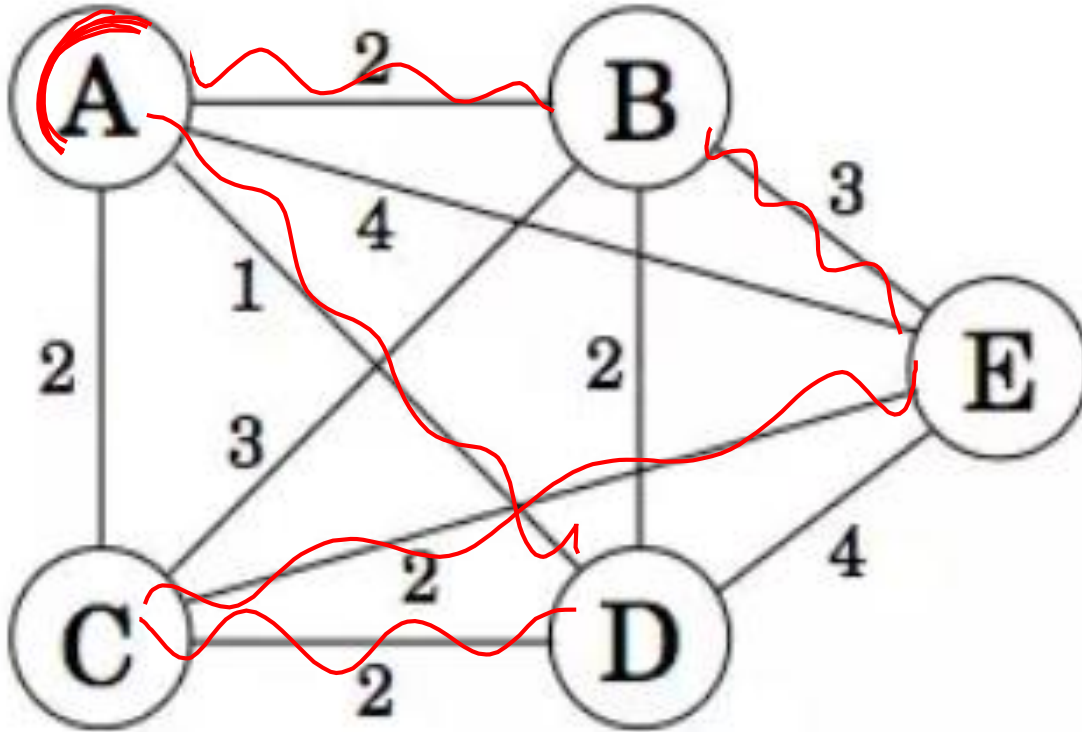
# Hamiltonian Circuits

Traveling Salesman



Greedy Algorithm

# Hamiltonian Circuits



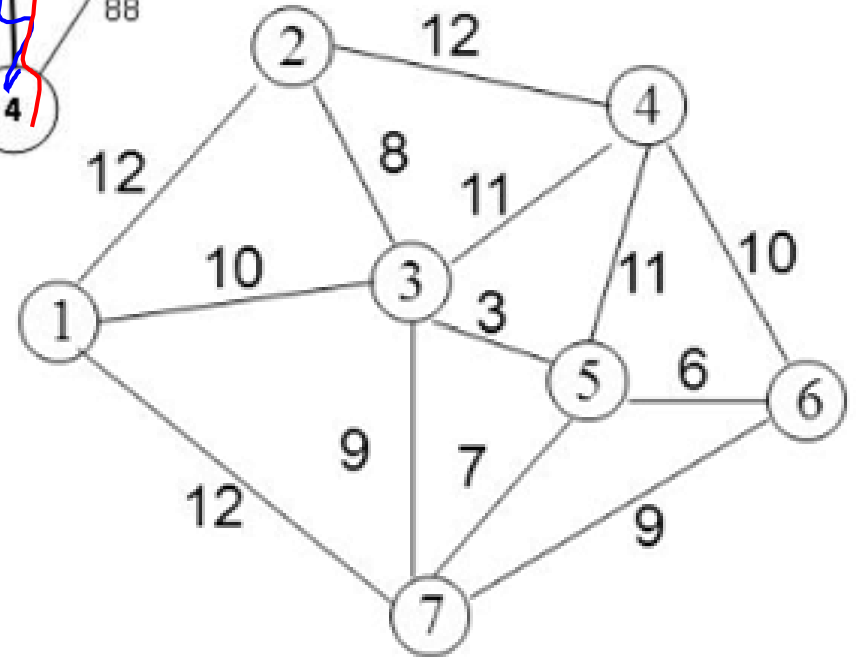
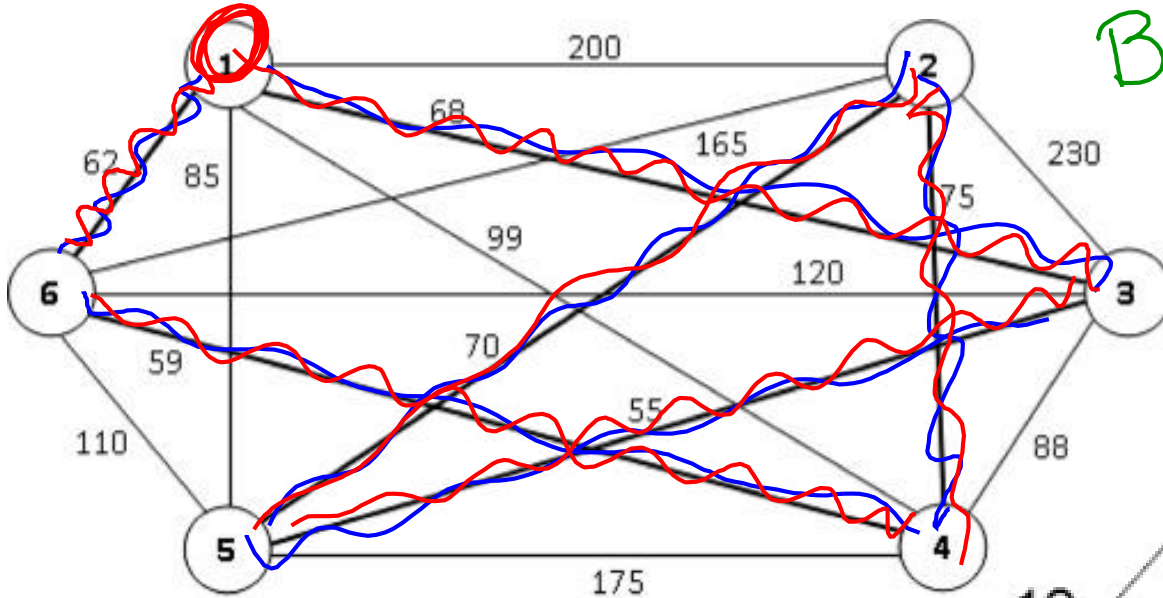


# Hamiltonian Circuits

Sorted Edges

Nearest Neighbor

Brute Force



# Getting Ready for Create Task

Calculates a GPA

HS  
AP  
not AP  
blocked  
math

College  
|  
hours

