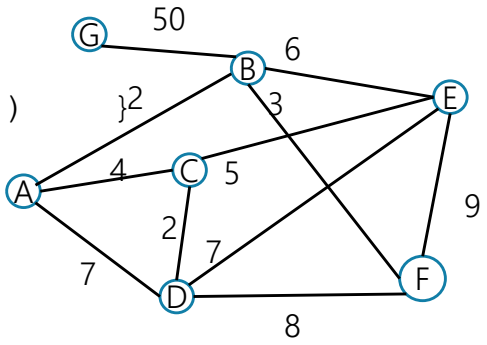
Try it Out

Operation	Worst-case Amortized
MakeSet()	$\Theta(1)$
Union()	$O(\log^* n)$
Find()	$O(\log^* n)$

```
KruskalMST(Graph G)
  initialize each vertex to be a connected component
  sort the edges by weight
  foreach(edge (u, v) in sorted order){
    if(find(u) != find(v)){
      add (u,v) to the MST
      union(find(u),find(v))
  }
```



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P vs. NP

P (stands for "Polynomial")

The set of all decision problems that have an algorithm that runs in time $O(n^k)$ for some constant k.

NP (stands for "nondeterministic polynomial")

The set of all decision problems such that if the answer is YES, there is a proof of that which can be verified in polynomial time.

Claim: P ⊆ NP (do you see why?)

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EXP

EXP (stands for "Exponential")
The set of all decision problems that have an algorithm that runs in time $O(2^{n^k})$ for some constant k.

3-COLOR is in EXP (we just saw why on the last slide)

So is

Claim: NP ⊆ EXP (do you see why?)

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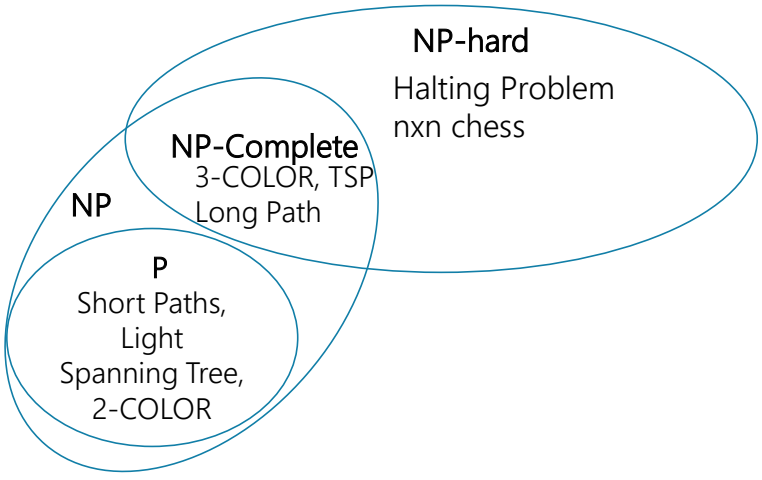
What The World Looks Like (We Think)



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