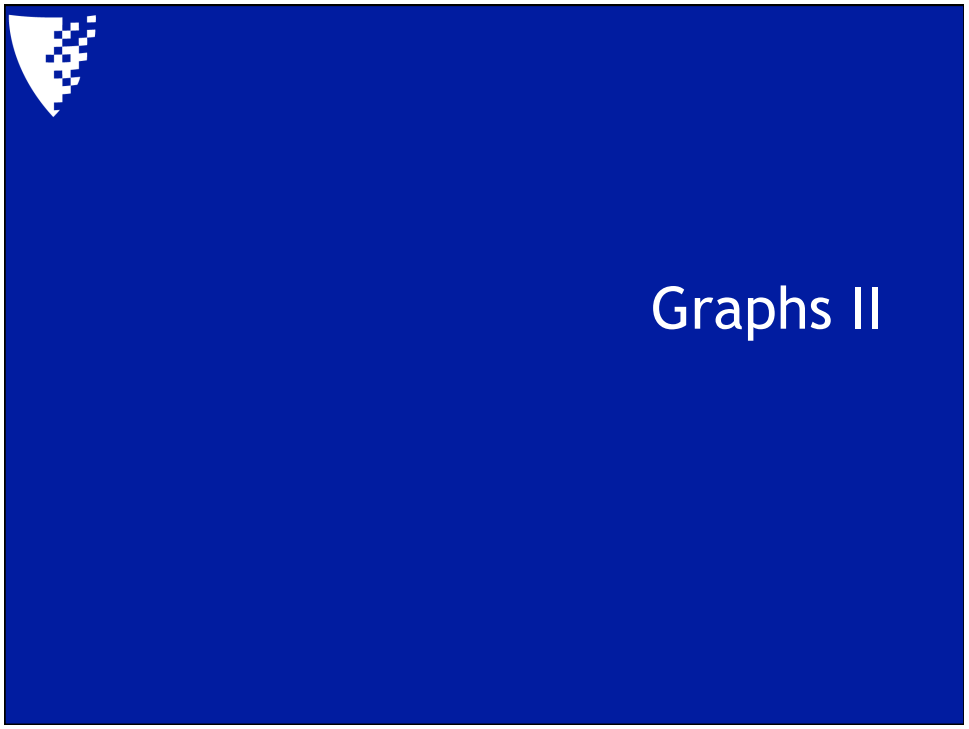
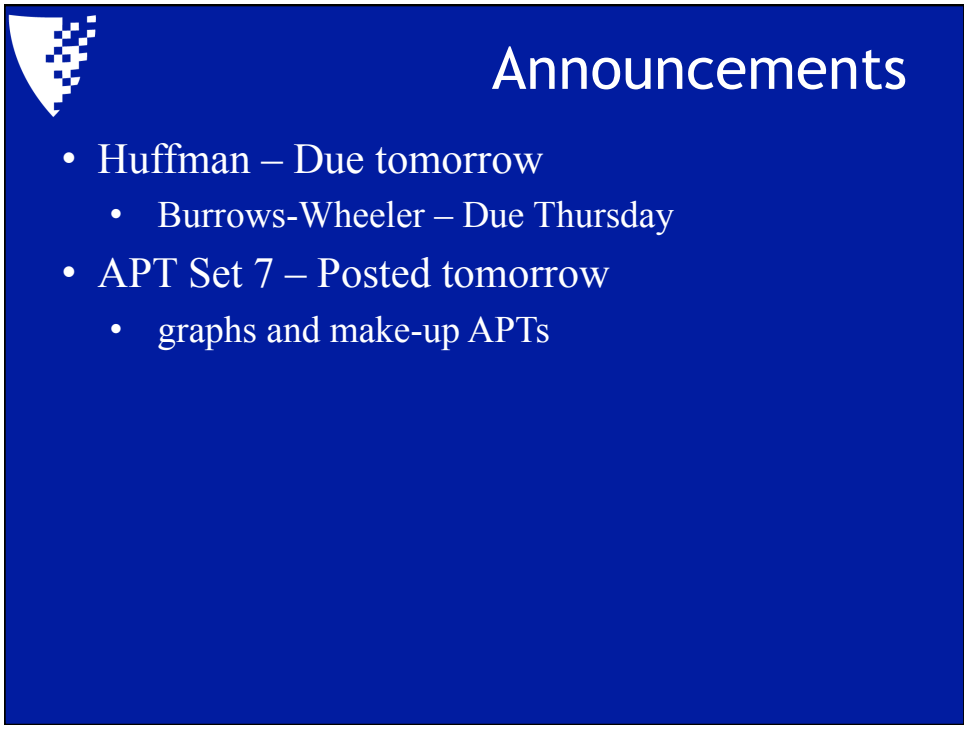

Graphs II


Announcements
• Huffman – Due tomorrow
• Burrows-Wheeler – Due Thursday
• APT Set 7 – Posted tomorrow
• graphs and make-up APTs

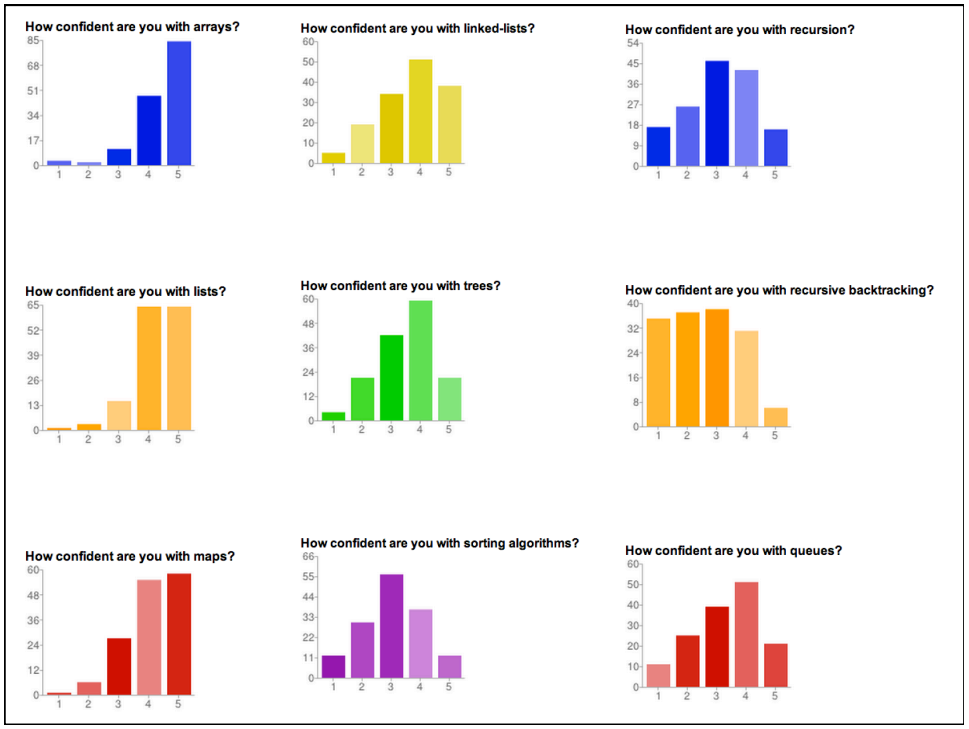
April

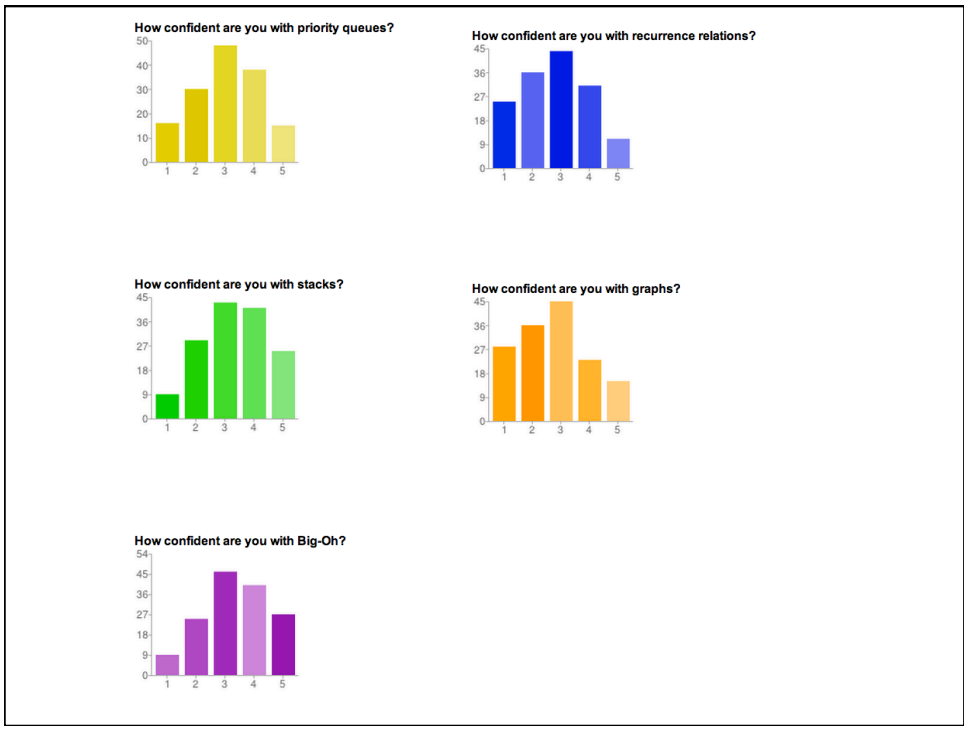
	Monday	Tuesday	Wednesday	Thursday	Friday
Recurrence relations	1 Slides Video	2	3	4 Boggle Due	5
Huffman Coding, Graphs	8 Slides	9 APT Set 6 Due	10 Slides	11	12
Huffman Coding, Graphs	15	16 Huffman Due	17	18 Burrows-Wheeler Extra Credit	19
Performance, Review	22	23 APT Set 7 Due	24 Last day of class	25	26
	29 Exams begin	30	1	2	3 Final Exam 7PM-10PM

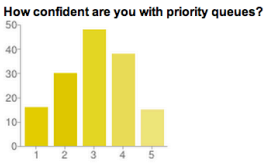
Results

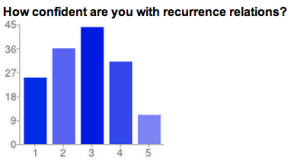
- One of my favorite TV shows

LFP
la liga

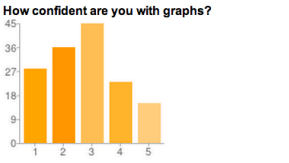

How confident are you with arrays?
How confident are you with linked-lists?
How confident are you with recursion?
How confident are you with lists?
How confident are you with trees?
How confident are you with recursive backtracking?
How confident are you with maps?
How confident are you with sorting algorithms?
How confident are you with queues?

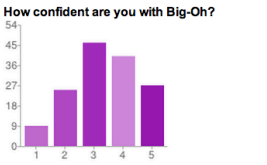

How confident are you with priority queues?
How confident are you with recurrence relations?
How confident are you with stacks?
How confident are you with graphs?
How confident are you with Big-Oh?

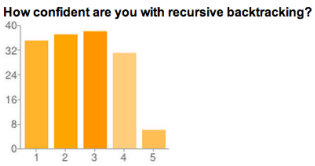

How confident are you with priority queues?
50
40
30
20
10
0
1 2 3 4 5

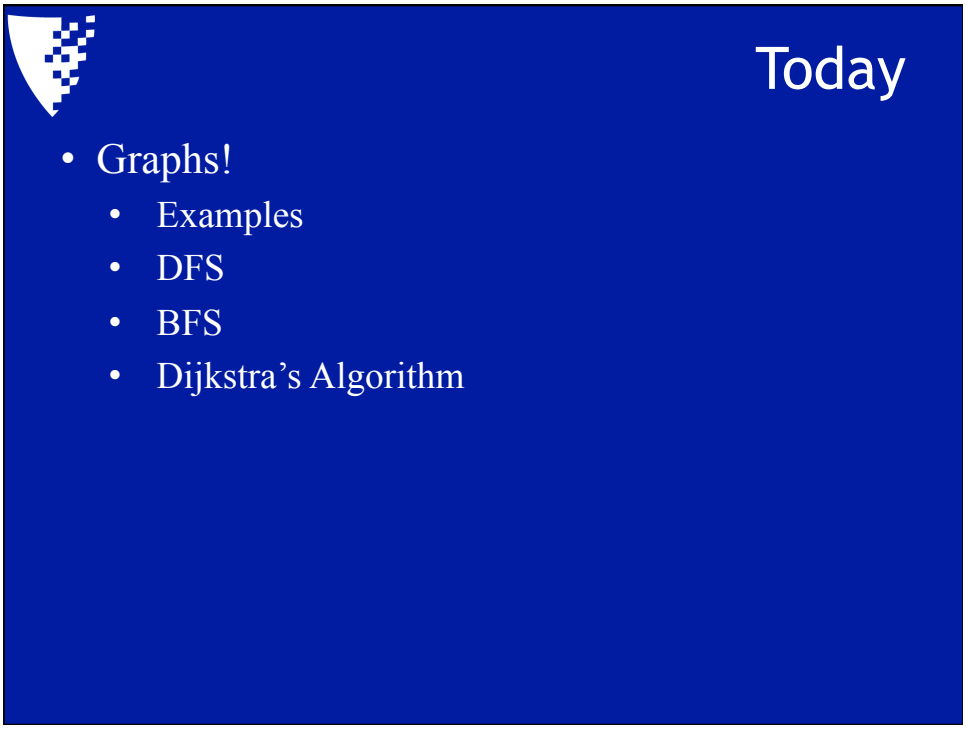

How confident are you with recurrence relations?
45
36
27
18
9
0
1 2 3 4 5


How confident are you with stacks?
45
36
27
18
9
0
1 2 3 4 5


How confident are you with graphs?
45
36
27
18
9
0
1 2 3 4 5


How confident are you with Big-Oh?
54
45
36
27
18
9
0
1 2 3 4 5


How confident are you with recursive backtracking?
40
32
24
16
8
0
1 2 3 4 5

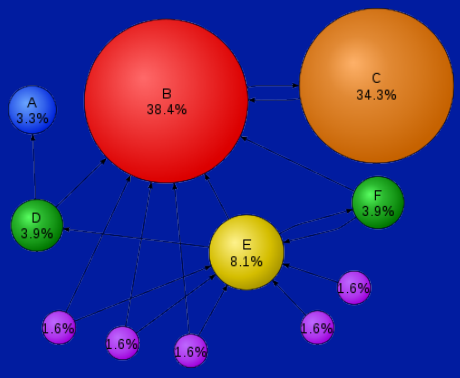

Today
• Graphs!
• Examples
• DFS
• BFS
• Dijkstra's Algorithm

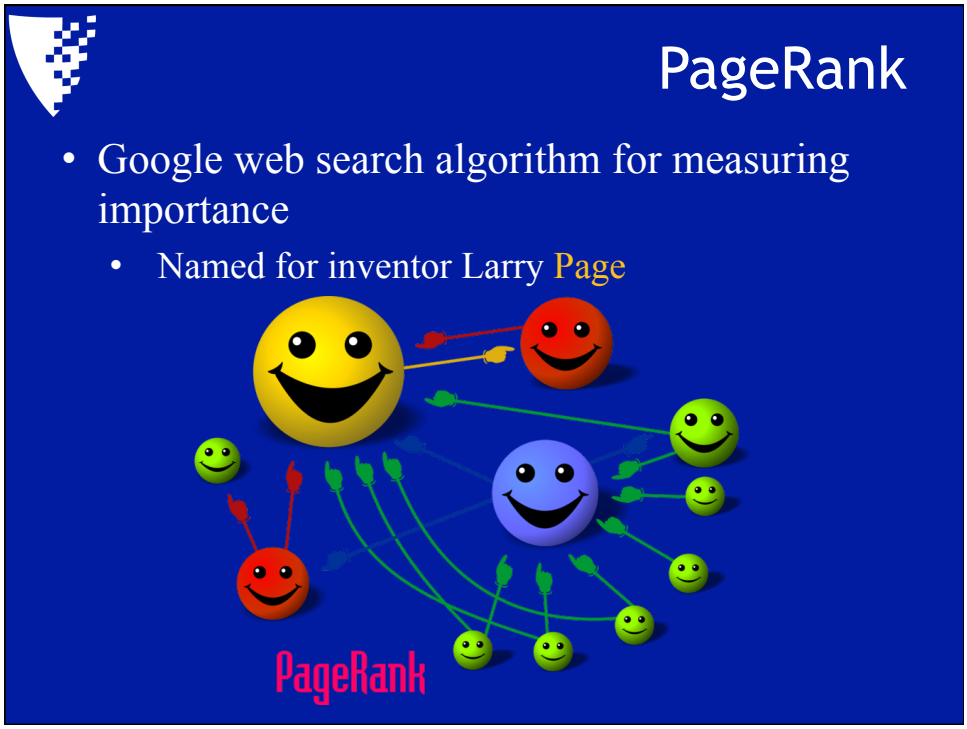
Facebook

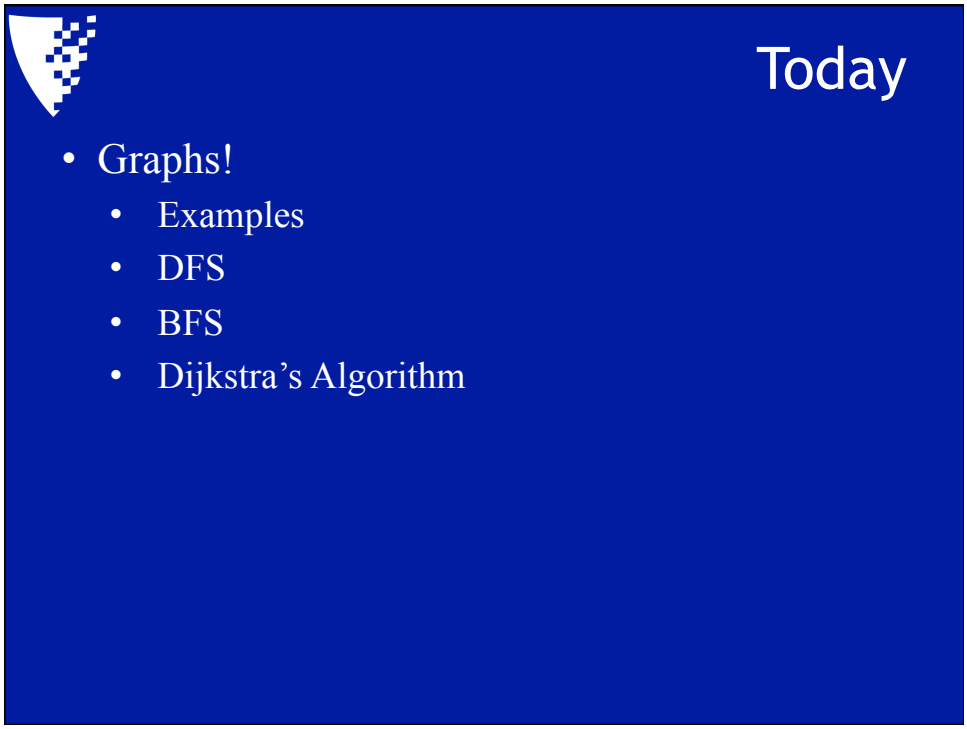
- Graph Search
  - https://www.facebook.com/about/graphsearch

PageRank

- Google web search algorithm for measuring importance

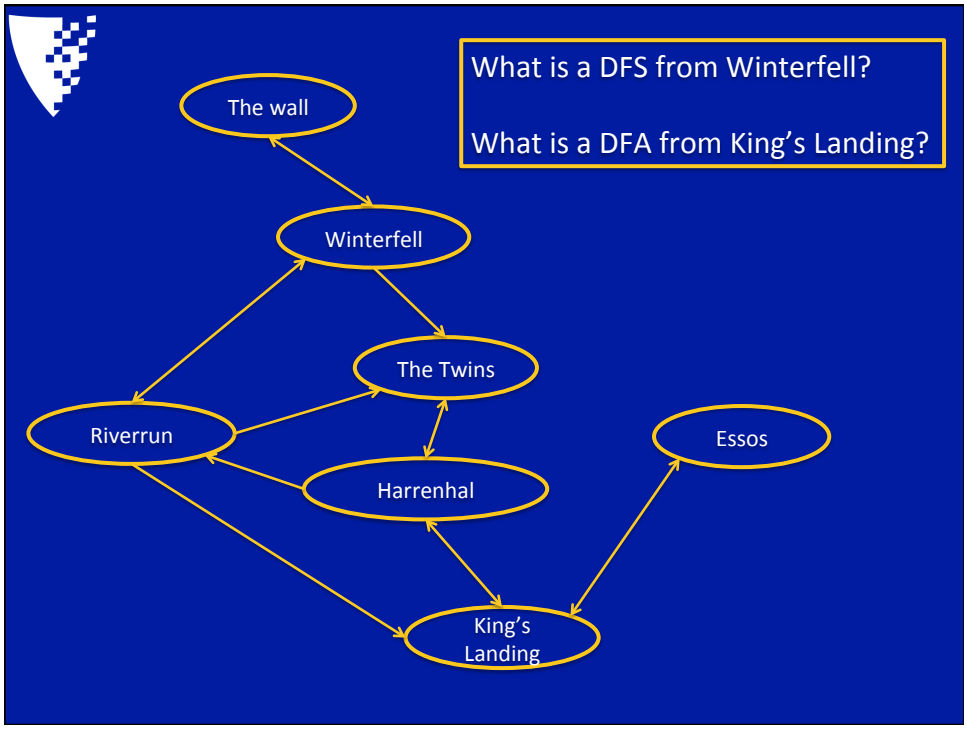



PageRank
• Google web search algorithm for measuring importance
• Named for inventor Larry Page
PageRank


Today
• Graphs!
• Examples
• DFS
• BFS
• Dijkstra's Algorithm

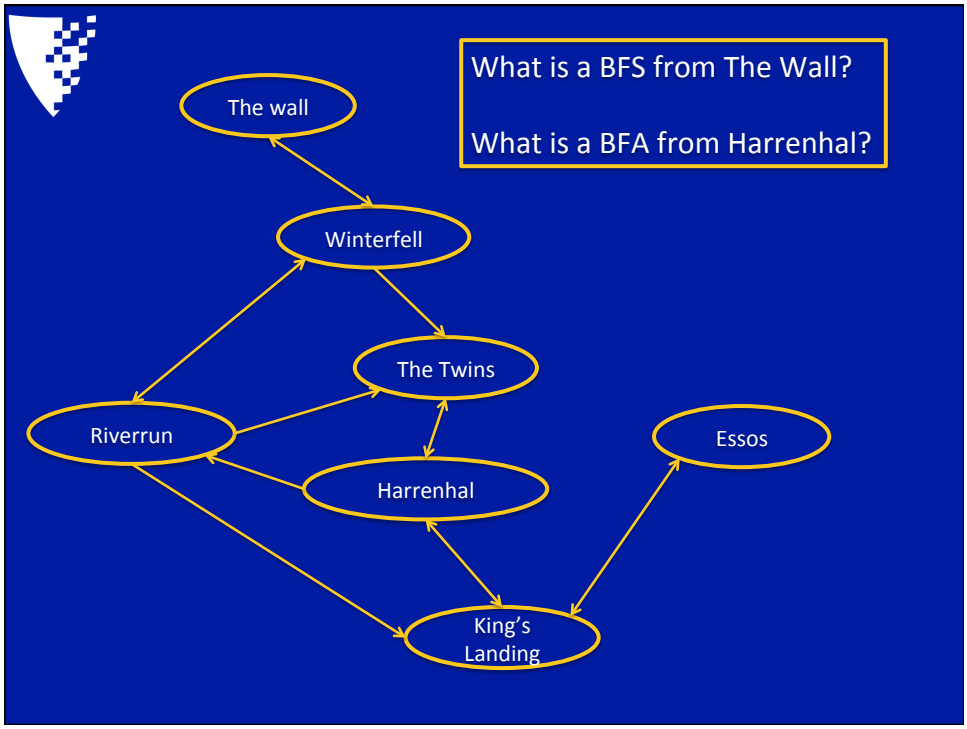
DFS

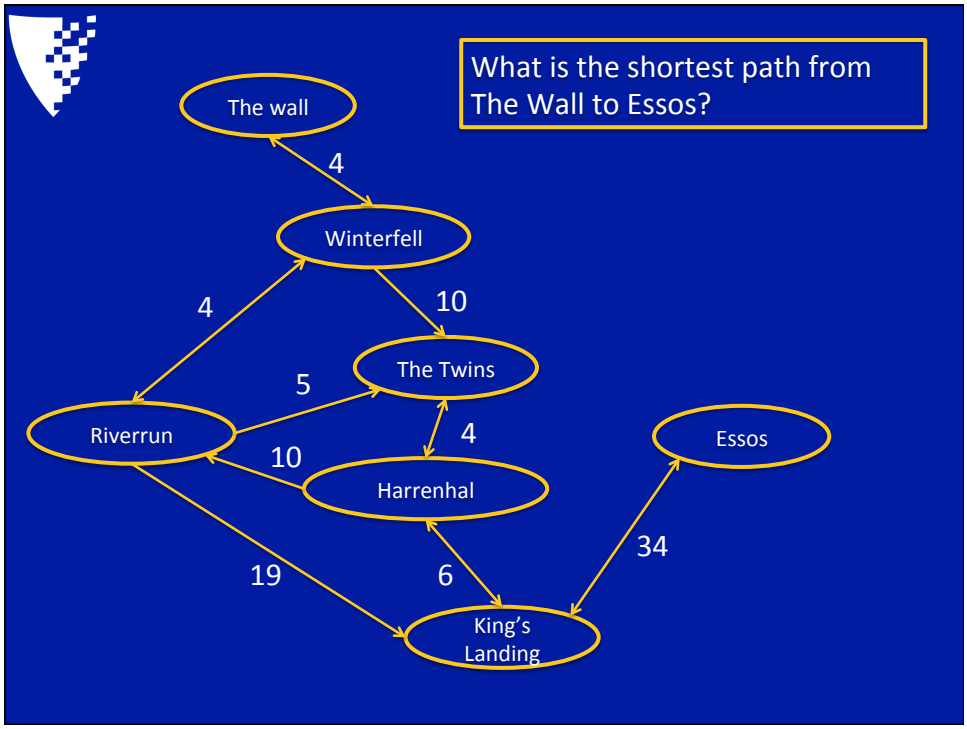
```
1    private void dfs(String vertex,
     Set<String> visited){

2        if(visited.contains(vertex)) return;
3
4        visited.add(vertex);
5
6        System.out.print(vertex + " ");
7
8        for(String adj: myGraph.get(vertex)){
9           dfs(adj, visited);
10       }
11   }
```



BFS

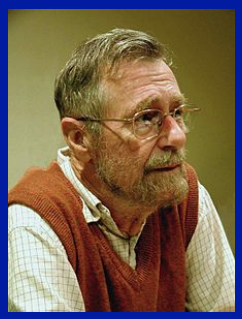
```
1   private void bfs(String vertex, Queue<String> q){
2         Set<String> visited = new
    TreeSet<String>();
3         q.add(vertex);
4         visited.add(vertex);
5
6         while(!q.isEmpty()){
7            String v = q.remove();
8            System.out.print(v + " ");
9            for(String adj: myGraph.get(v)){
10              if(!visited.contains(adj)){
11                 q.add(adj);
12                 visited.add(adj);
13              }
14           }
15        }
16    }
```





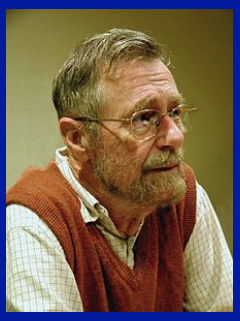
Dijksra's Algorithm

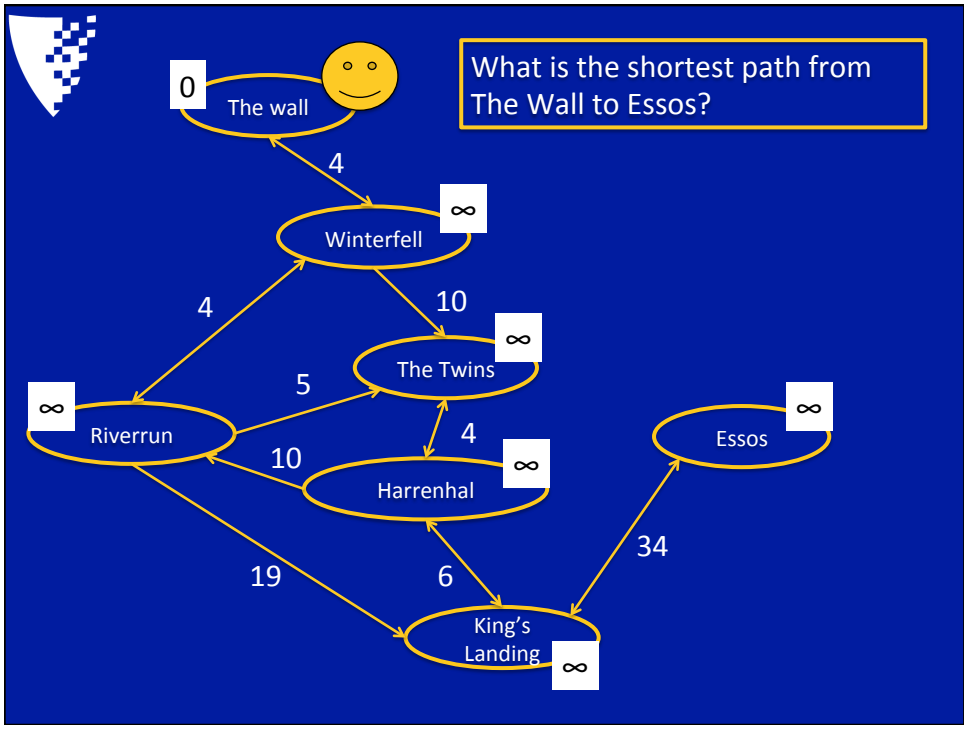
- Solve shortest-path problem from A to B for non-negative path weights.

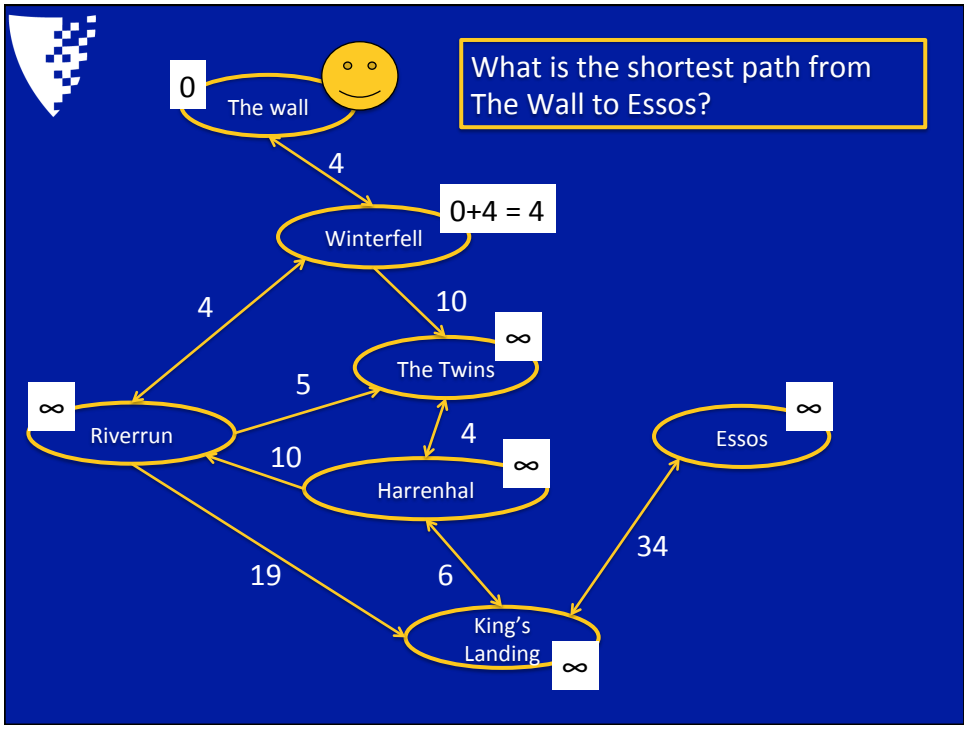


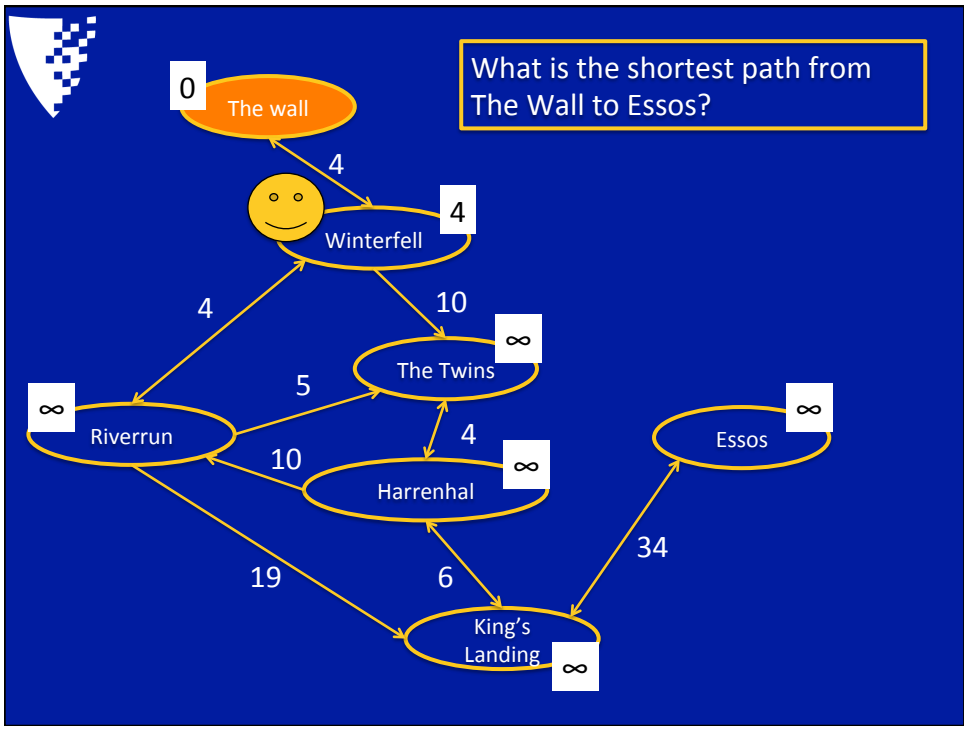
Dijksra's Algorithm

- Solve shortest-path problem from A to B for non-negative path weights.






What is the shortest path from The Wall to Essos?
0
The wall
4
0+4 = 4
Winterfell
4
10
∞
The Twins
5
∞
Riverrun
4
10
∞
Harrenhal
∞
Essos
19
6
34
King's Landing
∞


What is the shortest path from The Wall to Essos?
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The wall
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4
Winterfell
4
10
∞
The Twins
5
∞
Riverrun
4
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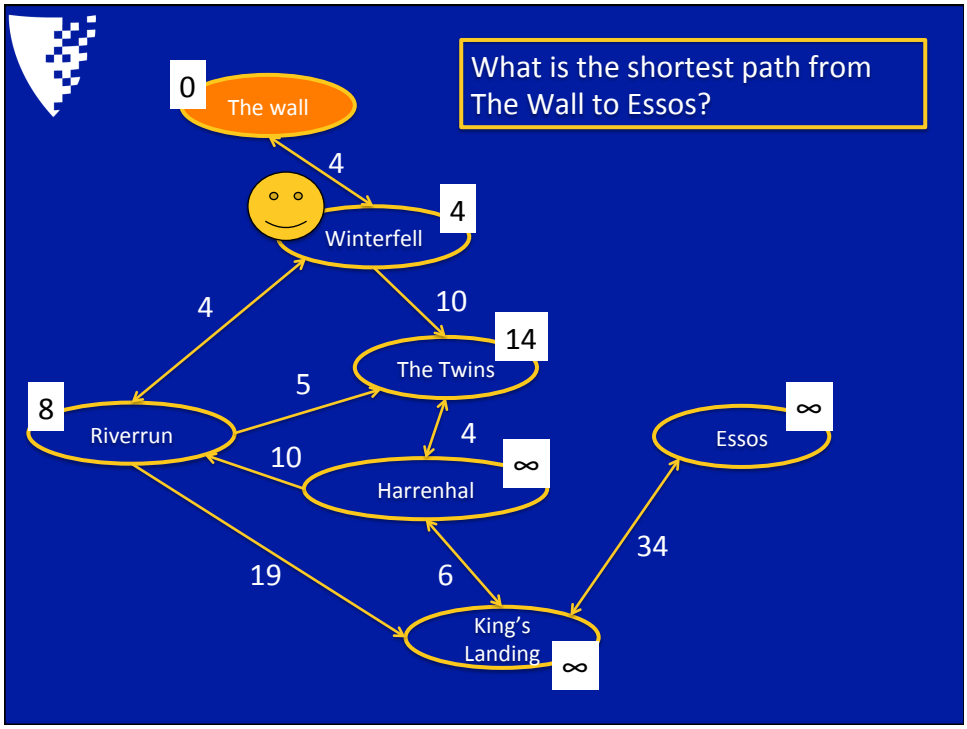
∞
Harrenhal
∞
Essos
19
6
34
King's Landing
∞


What is the shortest path from The Wall to Essos?
0
The wall
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Winterfell
4
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The Twins
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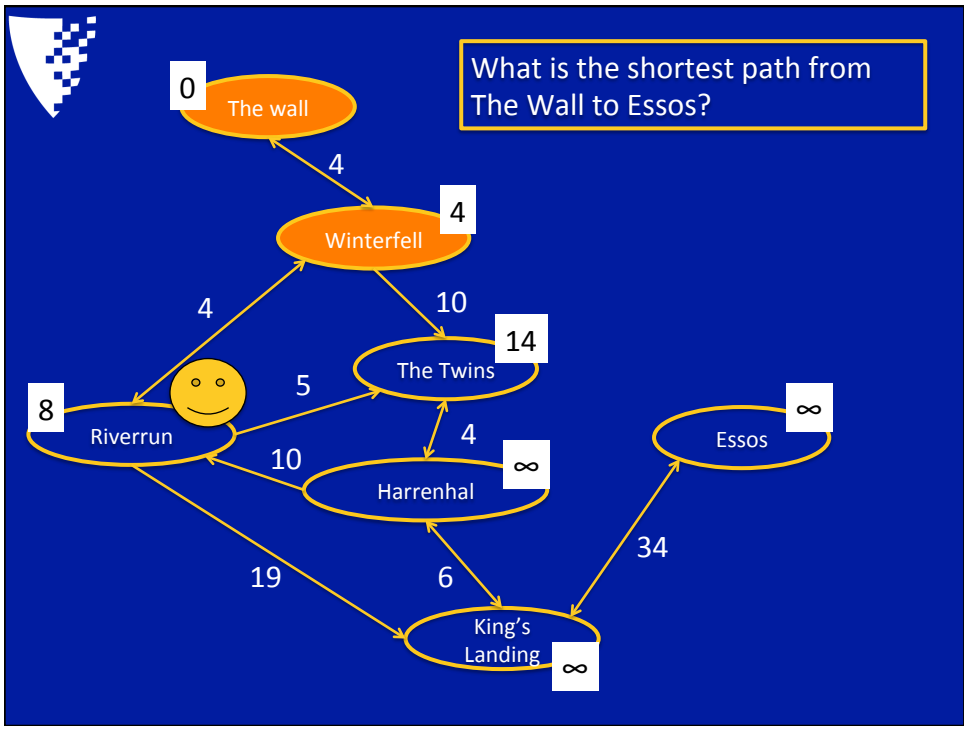
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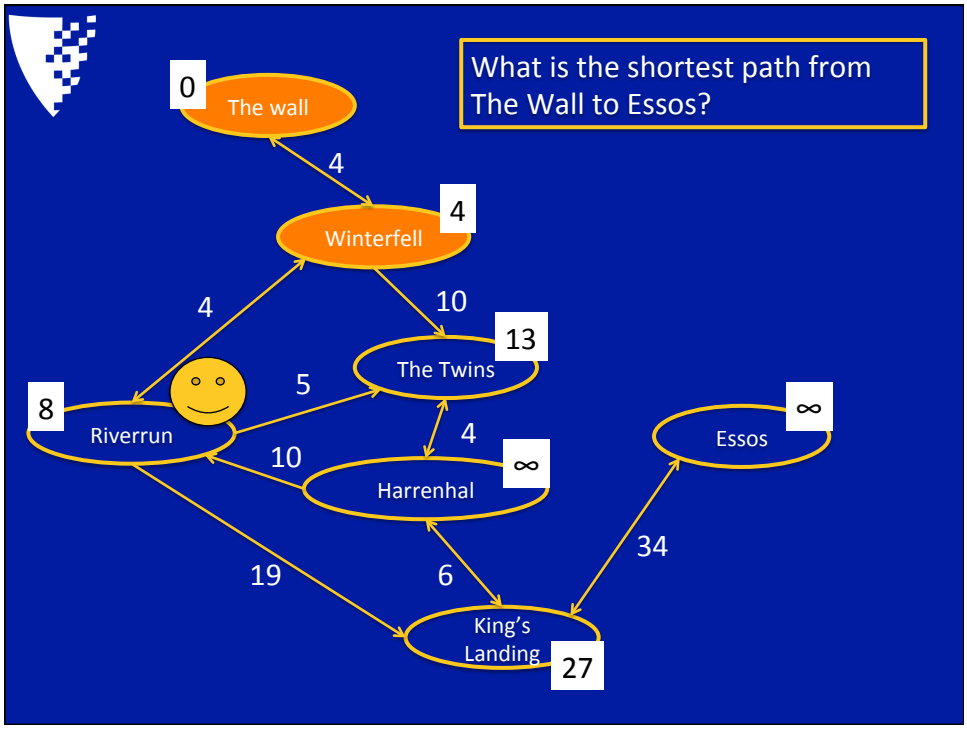
What is the shortest path from The Wall to Essos?
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The wall
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4
Winterfell
4
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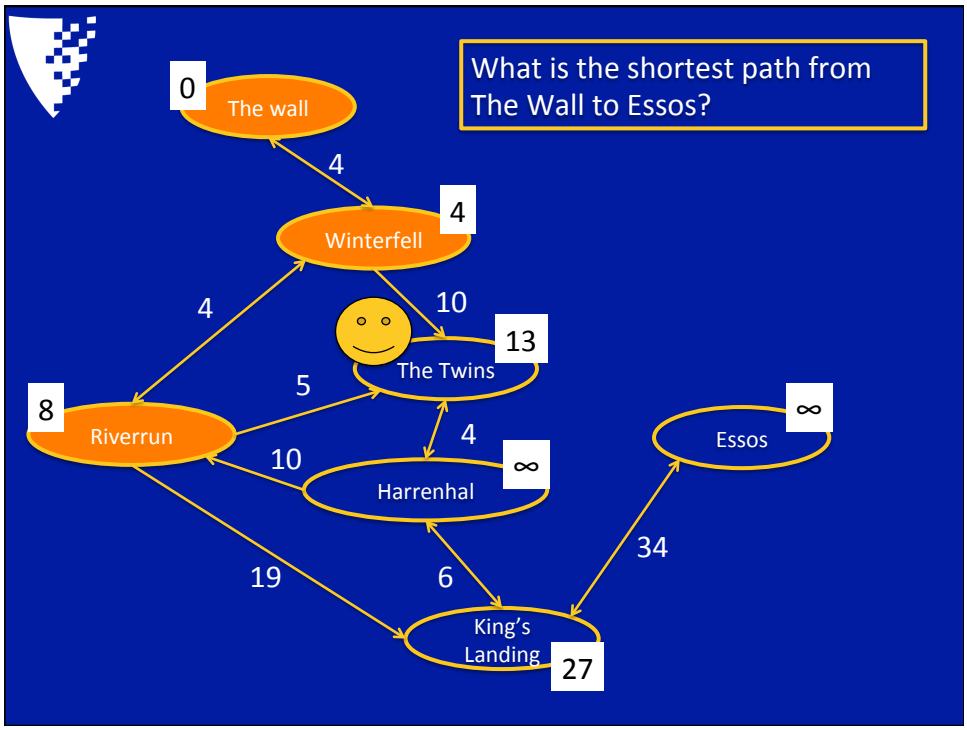
The Twins
5
8
Riverrun
10
4
∞
Harrenhal
∞
Essos
19
6
34
King's Landing
27


What is the shortest path from The Wall to Essos?
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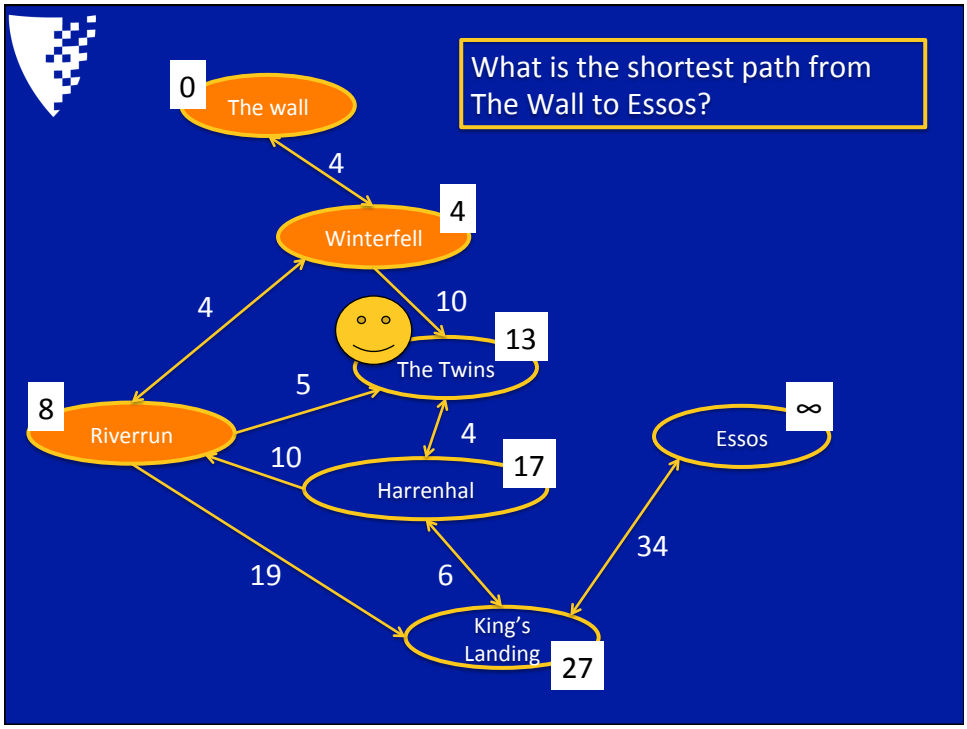
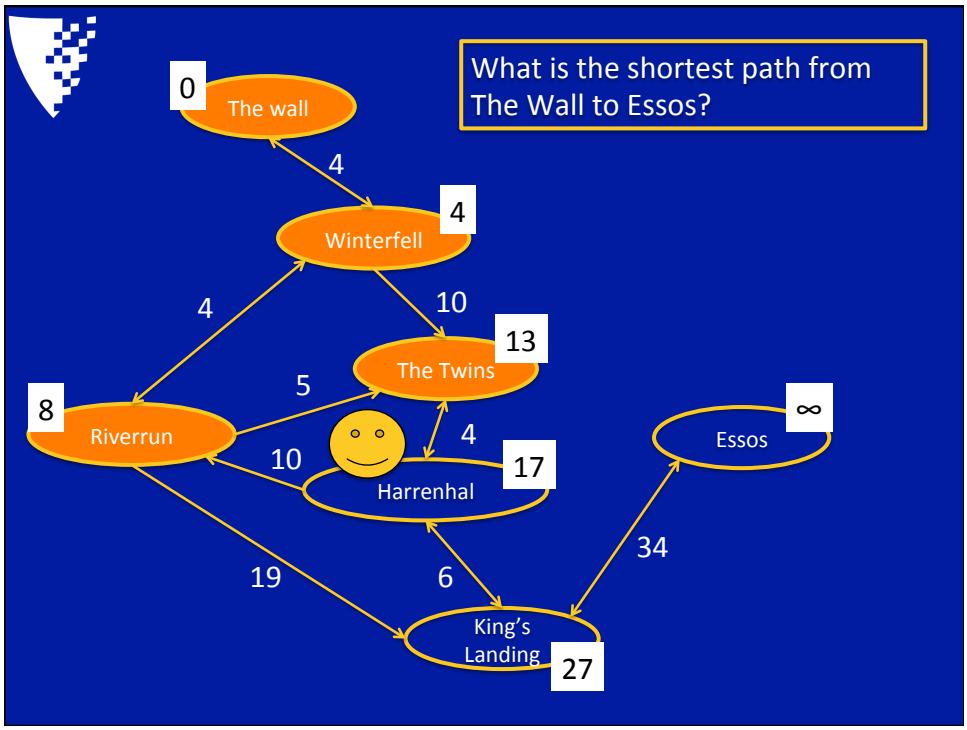
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
10
4
∞
Harrenhal
∞
Essos
19
6
34
King's Landing
27


What is the shortest path from The Wall to Essos?
0
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
10
4
17
Harrenhal
∞
Essos
34
19
6
King's Landing
27


What is the shortest path from The Wall to Essos?
0
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
10
4
17
Harrenhal
∞
Essos
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King's Landing
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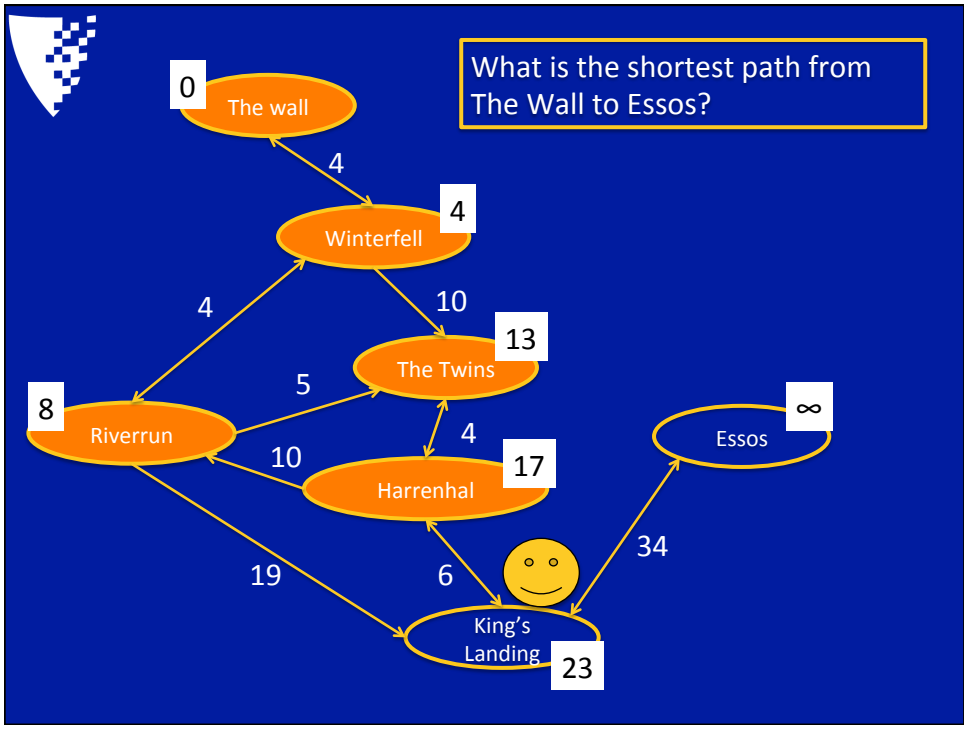
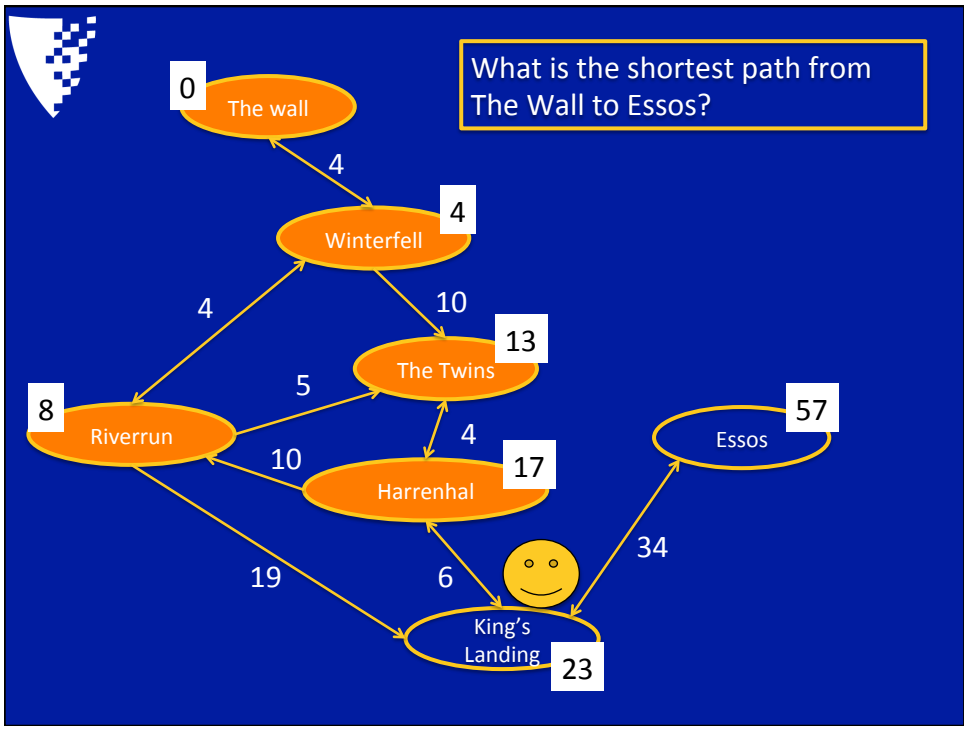
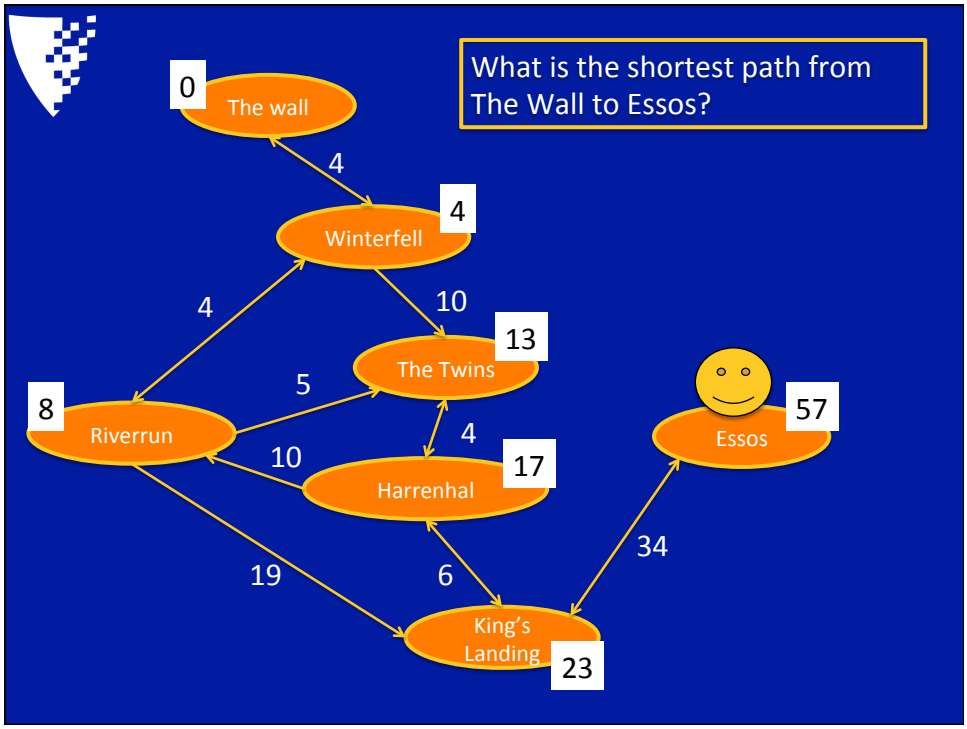

What is the shortest path from The Wall to Essos?
0
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
∞
Essos
4
10
17
Harrenhal
34
19
6
King's Landing
23


What is the shortest path from The Wall to Essos?
0
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
57
Essos
4
10
17
Harrenhal
34
19
6
King's Landing
23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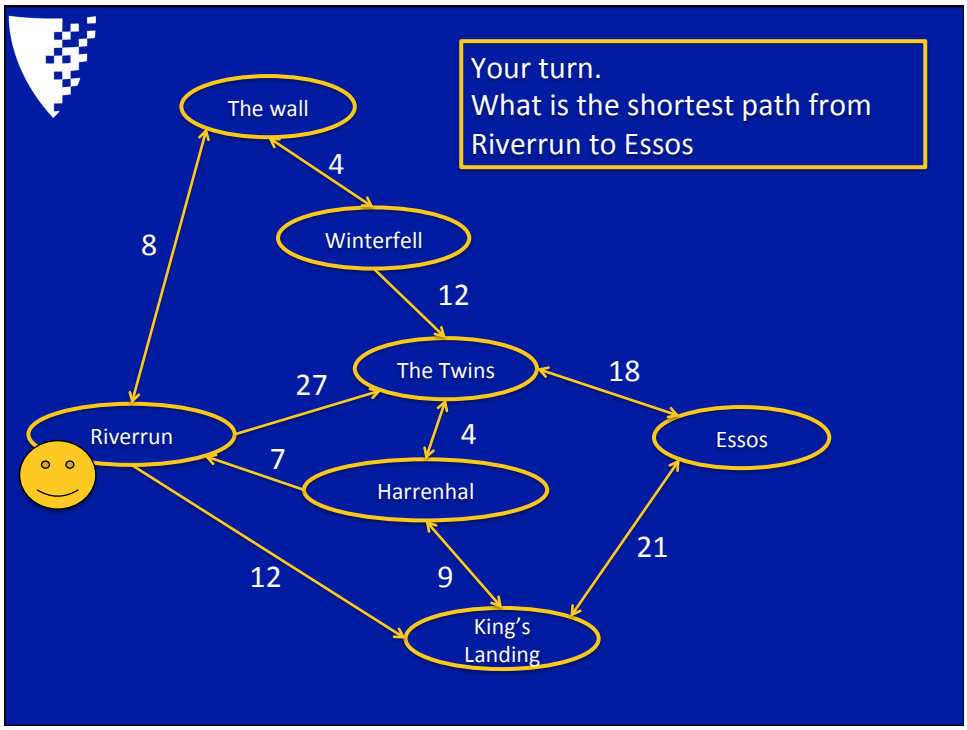
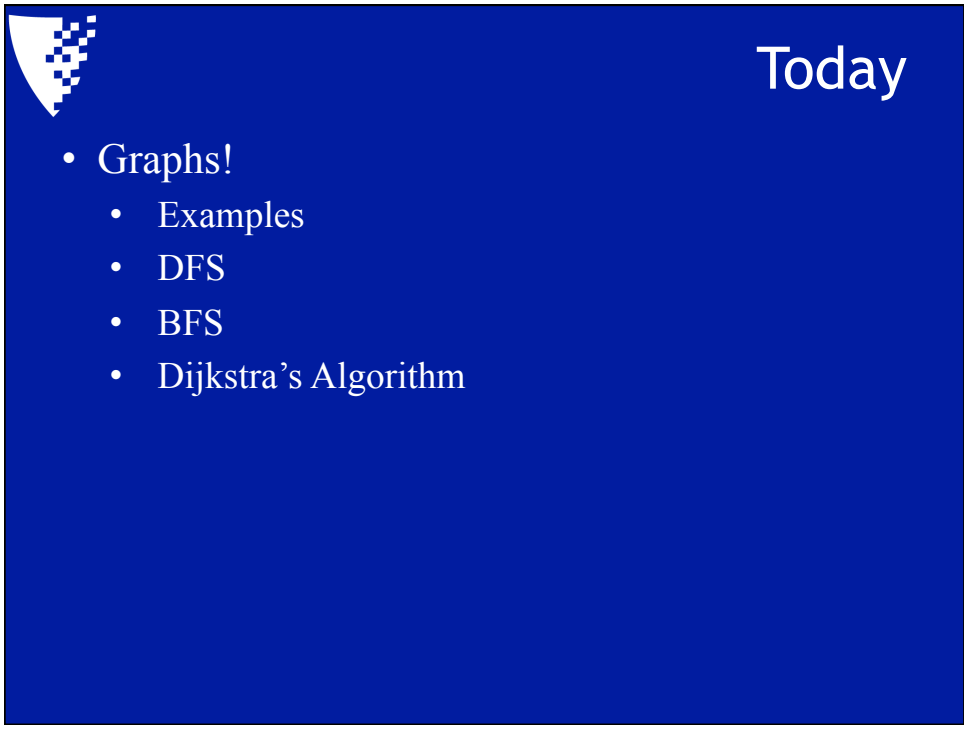
0
The wall
4
4
Winterfell
4
10
13
The Twins
5
8
Riverrun
10
4
17
Harrenhal
57
Essos
19
6
34
King's Landing
23


Your turn.
What is the shortest path from Riverrun to Essos
The wall
4
8
Winterfell
12
The Twins
27
18
Riverrun
4
Essos
7
Harrenhal
12
9
21
King's Landing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