Depth first traversal from A: ABCDEF
Breadth first traversal from A: ABCFDEGE

testing connectivity:
for each node:
if the breadth first traversal length is n then graph is connected $O(n^2)$
Shortest path between two nodes in an unweighted graph:

Brute force: depth-first traversal from start node, at each node record path to it and length, after finding all paths return shortest $O(n^2)$.
Shortest path between two nodes in an unweighted graph:

- Breadth First traversal: at each node store the path from the start, when find end, have found shortest path

$O(mn)$ where $m$ is the length of the shortest path

$A \rightarrow D$

$\rightarrow A$

$A \rightarrow B$

$C \rightarrow D$

$A \rightarrow C$

$A \rightarrow B$

$C \rightarrow D$

$B \rightarrow D$

$A \rightarrow D$

$C \rightarrow D$

$AC$

$AC$

$ABD$
Shortest path between two nodes in an weighted graph:

Brute force: depth first traversal from start node, at each node record path to it and length, after finding all paths return shortest

\[ O(n^2) \]
Shortest path between two nodes in an weighted graph:

Dijkstra's algorithm: at each node store the shortest path from the start so far, when find end, have found shortest path

$O(mn)$ where $m$ is the length of the shortest path

Diagram: