**Question 1:**

*Compare the solution paths found by BFS, DFS, and A. Which algorithm gives the shortest path? Why?*

**Answer:**  
Both **BFS** and **A\*** find the shortest path because BFS explores all states level by level, ensuring the minimum number of steps to the goal, and A\* uses a heuristic that guides the search efficiently while guaranteeing the shortest path if the heuristic is admissible.  
**DFS** does not guarantee the shortest path because it explores deeply along one path first, which can lead to longer or suboptimal solutions.

**Question 2:**

*Which algorithm is more efficient in terms of time and memory: BFS, DFS, or A*\**?*

**Answer:**

* **DFS** uses the least memory since it only stores the current path, but it may take longer and find longer solutions.
* **BFS** uses more memory because it stores all states at each level but guarantees shortest paths.
* **A\*** is usually the most efficient, using heuristics to explore fewer states, making it faster and less memory-intensive than BFS while still finding the shortest path.

### Question 3:

Why does A perform better than BFS in many search problems like the water jug problem?

**Answer:**  
A\* performs better than BFS because it uses a heuristic to estimate the cost to reach the goal from the current state. This helps A\* prioritize exploring the most promising paths first, reducing the number of states it needs to check. In contrast, BFS blindly explores all states at the same depth level without guidance. This makes A\* faster and more memory-efficient in many cases, while still guaranteeing the shortest path if the heuristic is admissible.