✅ **Congratulations! You passed!**
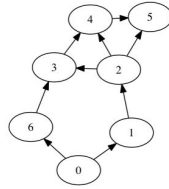
| **Grade received** 100% | **Latest Submission Grade** 100% | **To pass** 80% or higher | [Go to next item] |

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1. Consider the graph shown below.   1 / 1 point

Suppose we perform a depth first search (DFS) starting from node 0. Every time we consider adjacent nodes, we do so in the increasing order of their node ids.
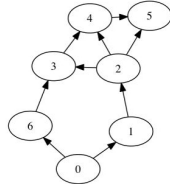
In which order will our DFS visit the nodes?

- ◉ $[0, 1, 2, 3, 4, 5, 6]$
- ○ $[0, 6, 3, 4, 5, 1, 2]$
- ○ $[0, 1, 6, 2, 3, 4, 5]$
- ○ $[0, 1, 6, 3, 2, 5, 4]$

> ✓ **Correct**
> Correct

2. Consider again the graph shown below.   1 / 1 point

Suppose again that we perform a depth first search of the tree, starting from node 0.

Select all the edges that belong to the DFS tree. Make sure edges not belonging to the tree are not selected.

- ☑ $0 \rightarrow 6$

> ✓ **Correct**
> Correct

- ☐ $2 \rightarrow 4$
- ☐ $2 \rightarrow 5$
- ☑ $0 \rightarrow 1$

> ✓ **Correct**
> Correct

- ☐ $5 \rightarrow 6$
- ☑ $2 \rightarrow 3$
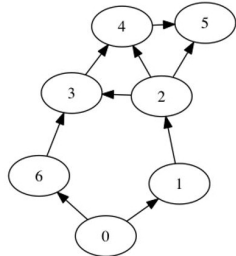
> ✓ **Correct**
> Correct

- ☑ $3 \rightarrow 4$

> ✓ **Correct**
> Correct

- ☐ $6 \rightarrow 3$

3. Consider again the graph shown below.   1 / 1 point

Suppose we run a breadth first search (BFS), starting from the node 0. When BFS explores the adjacent nodes for a given node, it does so in increasing order of the node IDs.

Select all the edges that belong to the BFS tree. Make sure no other edges are selected.

- ☑ $1 \rightarrow 2$

> ✓ **Correct**
> Correct

- ☐ $3 \rightarrow 4$
- ☑ $2 \rightarrow 4$

> ✓ **Correct**
> Correct

- ☑ $2 \rightarrow 5$

> ✓ **Correct**
> Correct

- ☑ $0 \rightarrow 6$

✓ **Correct**
Correct

☑ $0 \to 1$

✓ **Correct**
Correct

☐ $2 \to 3$

☑ $6 \to 3$
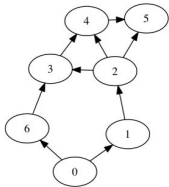
✓ **Correct**
Correct

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4. This question concerns the graph shown below: **1 / 1 point**

Suppose we perform a depth first search starting from node 0 and for any node, visit the children in increasing order of their node IDs. Select all the correct facts about the DFS tree from the list below. It may help to draw the DFS tree first.

☑ There are no back edges in the DFS tree.

✓ **Correct**
Correct.

☑ The edge $2 \to 5$ is a forward edge in the DFS tree.

✓ **Correct**
Correct. 2 will be an ancestor of 4 in the DFS tree which has the edges 2-> 3, 3 -> 4 and 4 -> 5.

☑ The edge $2 \to 4$ is a forward edge in the DFS tree.

✓ **Correct**
Correct. 2 will be an ancestor of 4 in the DFS tree which has the edges 2-> 3 and 3 -> 4.

☐ The edge $6 \to 3$ is a forward edge in the DFS tree.

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5. Suppose we carried out a DFS on a mystery graph starting from node 1 and obtained the following discovery   **1 / 1 point**
   and finish times for the nodes.

Node ID	Discovery Time	Finish Time
1	1	14
2	2	13
3	3	8
4	4	5
5	6	7
6	9	12
7	10	11

Note that the table above corresponds to the following sequence of dfsVisits and returns.

dfsVisit(1) -> dfsVisit(2) -> dfsVisit(3) -> dfsVisit(4) -> return(4) -> dfsVisit(5) -> return(5) -> return(3) -> dfsVisit(6) -> dfsVisit(7) -> return(7) -> return(6) -> return(2) -> return(1)

Assume this is a single DFS run, and there is no outer loop that starts a new DFS from each node.

Select all the correct facts we can deduce about the graph from the given information. It helps to sketch the edges that DFS takes pictorially before attempting the questions below.

☑ The edge $1 \to 2$ definitely belongs to the graph.

✓ **Correct**
Yes it does since DFS goes from edge 1 to edge 2.

☐ The edge $6 \to 7$ does not belong to the graph.

☑ The edge $5 \to 6$ cannot belong to the graph.

✓ **Correct**
Correct. If it did then DFS visit for 5 would be immediately followed by a visit to 6. Instead DFS backtracks all the way back to 3 before visiting 6.

☑ The edge $4 \to 2$ may belong to the graph and if so it would be a backedge of the DFS.

✓ **Correct**
Correct.

☐ The node 7 has no outgoing edges in the graph.

☐ The graph has 7 nodes in total.

☑ The nodes that are reachable by a path starting from node 1 (other than 1 itself) are nodes $2, 3, 4, 5, 6$ and 7.

✓ **Correct**
That is correct.