Zach Domke
4/12/18
CIS 315
Chris Wilson

1. First we start by picking a random node (ex. A) from our set (ex. A, B, C, D, E). We check the row (out-edges of node) to check if that is all 0. If there is an out-edge, then mark our current node and we check the new node (if we haven't ruled it out yet). We repeat until we find a node with out-degree of 0 (let's say B). If it has less than n-1, then we mark the node as invalid and move to a random available node. However, if our node with out-degree 0 also has in-degree of n-1, then we return it as an endpoint. If all nodes are checked and invalid, we return that there are no endpoints.

2. Create a dictionary and add a node for each wrestler with an additional value of u for "untouched". We run through the list of rivalries and look at the value of each node; 1 of 4 possibilities comes up. If both nodes are u than we set one to h for "heel" and the other to b for "babyface". If only one node is untouched, then we set the other node to the opposite (h if it's b, b if it's h). If one node is h and the other is b, then we move to the next rivalry. Lastly, if both nodes are b or both nodes are h, then the rivalries fail and we break out. If the rivalries worked, then we just print out the dictionary.

3. q(1,16); r(17,20); s(2,7); t(8,15); u(18,19); v(3,6); w(4,5); x(9,12); y(13,14); z(10,11)
   Tree edges: (q,s); (s,v); (v,w); (q,t); (t,x); (x,z); (t,y); (r,u)
   Back edges: (w,s); (z,z); (y,q)
   Forward edges: (q,w)
   Cross edges: (r,y); (u,y)

4. Nodes after Topological Sort: p, n, o, s, m, r, y, v, x, w, z, u, q, t

5. Starting at node 1 and assigning it a value of 0. We then look at every node that 1 points to (Breadth first) and set those values to 1. We repeat this with every node we find and set it to how many steps we have taken. If a node's value is less than the current step plus one, then we will set it to the current step plus one and look at it's children. We repeat this recursive method until we hit node n with the largest possible number. We decide that the path we took to get there is our longest path.