

Unlock Jack's Phone

Description and rules

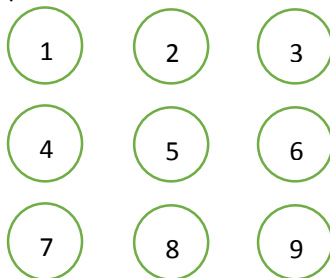
People who use Android phones or tablets may be familiar with the nine-spot lock screen. You should pass several specific spots to unlock the screen. Unlock Jack's Phone invites our users to find the most complicated (longest) unlock screen routes. It is a game for geeks because ordinary people can barely get to the 5th level. The rules are simple:

1. Start from the red ring and end at the green ring. If there is no green circle, it means you can end anywhere;
2. Get the longest route given the situation above.
3. You can pass the spot only if it has been passed before. For the map below, you can go by "2->3->1" instead of "1->3->2" because you have to pass "2" before come to "3".

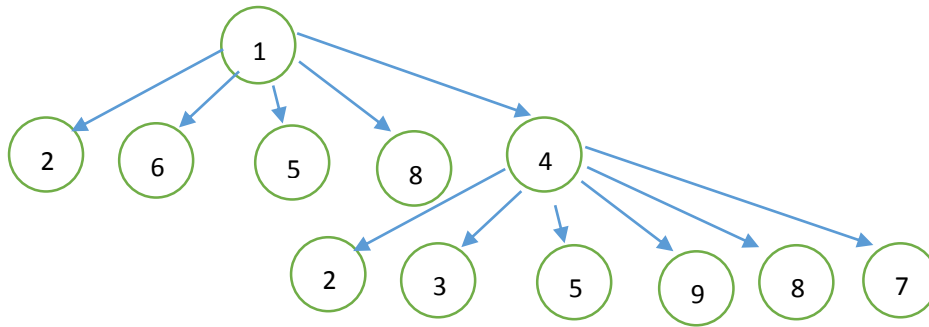


Problem solving

If the map has N spots, there are at most N factorial possible routes. However, obviously there are much less possibilities because routes such as "1->3->2" cannot exist as is mentioned above. We use a tree to describe all the possible states. The leaves of each branch is the next possible spot to pass. For instance:



Given the map above, the next possible move from spot 1 is 2,4,5,6 and 8 but 9 is also concerned if 5 has been passed.



We use BFS (breadth-first search) in this problem, and you should store the length of the current route at each node during the searching. Additionally, we use some optimized techniques to speed up the searching process. When it comes to the last level (level 9 for the 3x3 map above), we only store the longest route at present because we only care about the maximum solution. Thus it can save lots of memory consumption.

About the game

The game is developed by Zhang ChiYu from Tsinghua University in October, 2013. You can use your mouse to draw the unlock screen routes. Remember to start from the **red** ring and end at the **green** ring. You can get “unlocked” only when your solution gives the longest route. You can observe your current length from the text block on the left side. If you find it too hard, just press “Help me” and click “CLICK HERE” to watch every single step in order. You cannot skip the level if you has not passed it yet. There are 7 levels in total. The map is 3x3 from level 3 and 3x4 from level 6. It would be very impressive if one can pass level 4 or 5 and level 6 and 7 are almost impossible for a human brain.