Traversal

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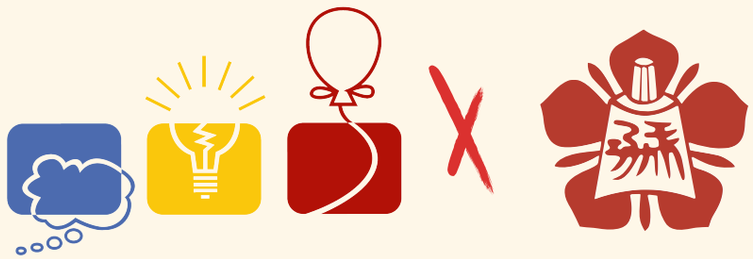

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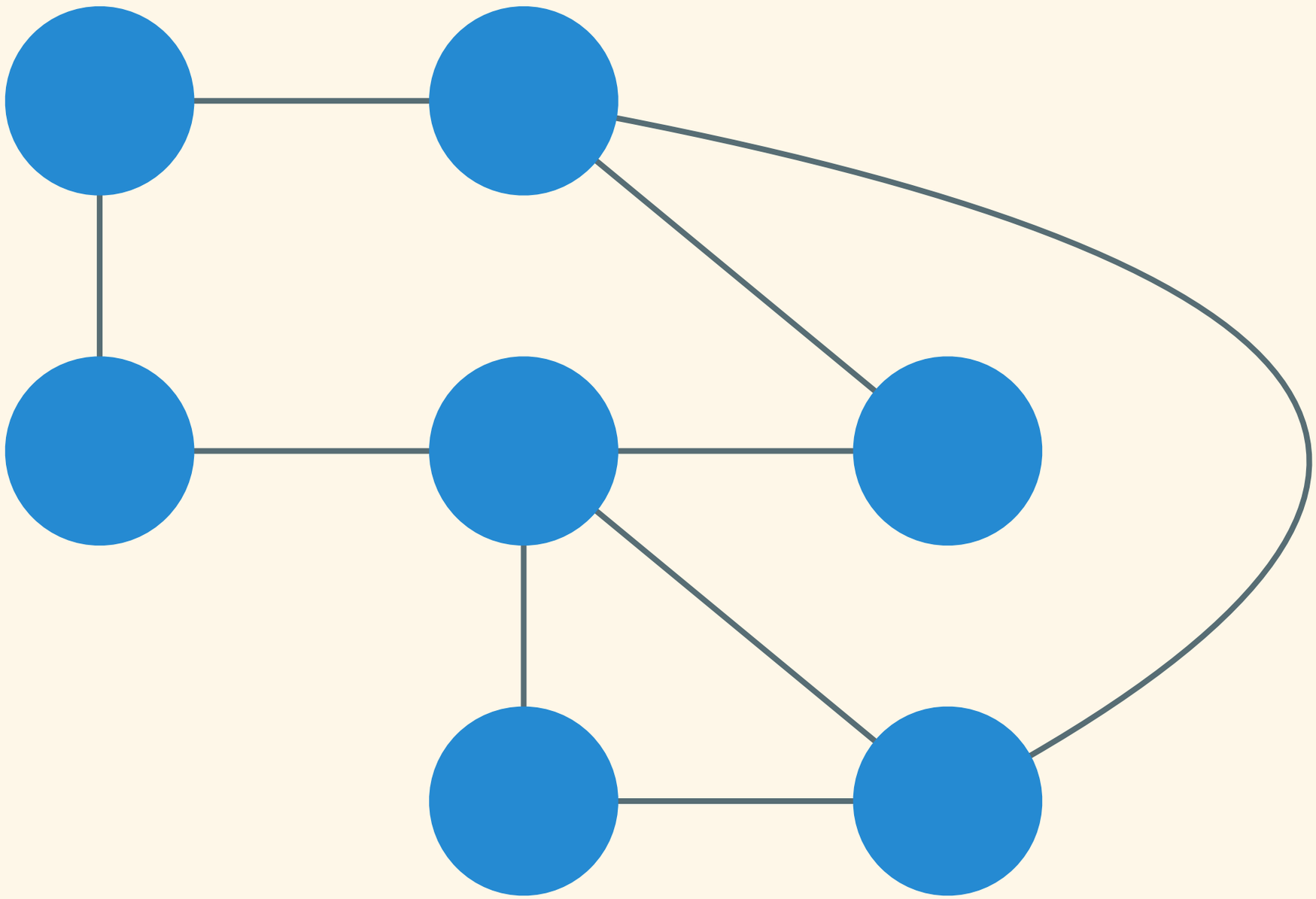
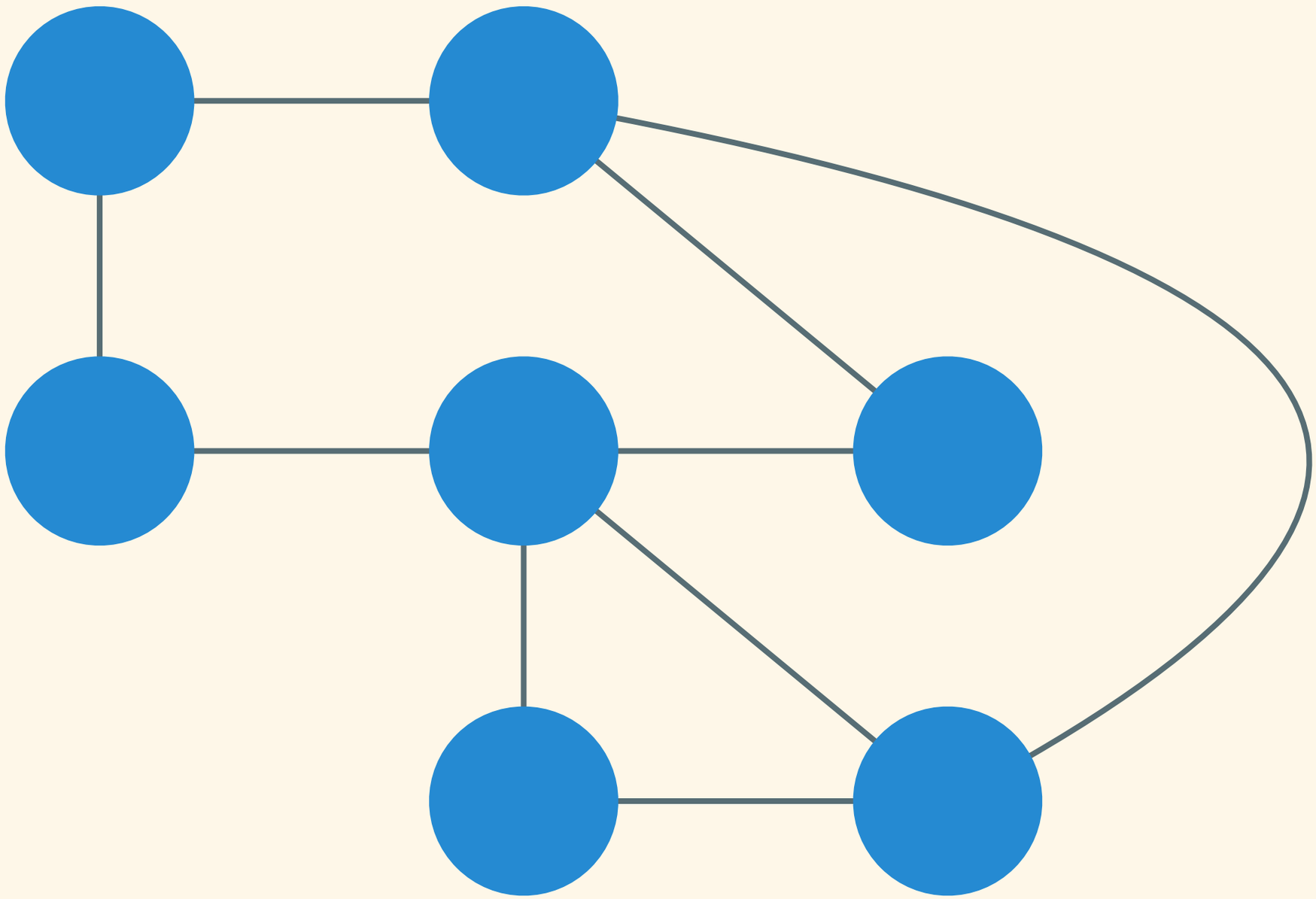
Latest update: Mar 13, 2013

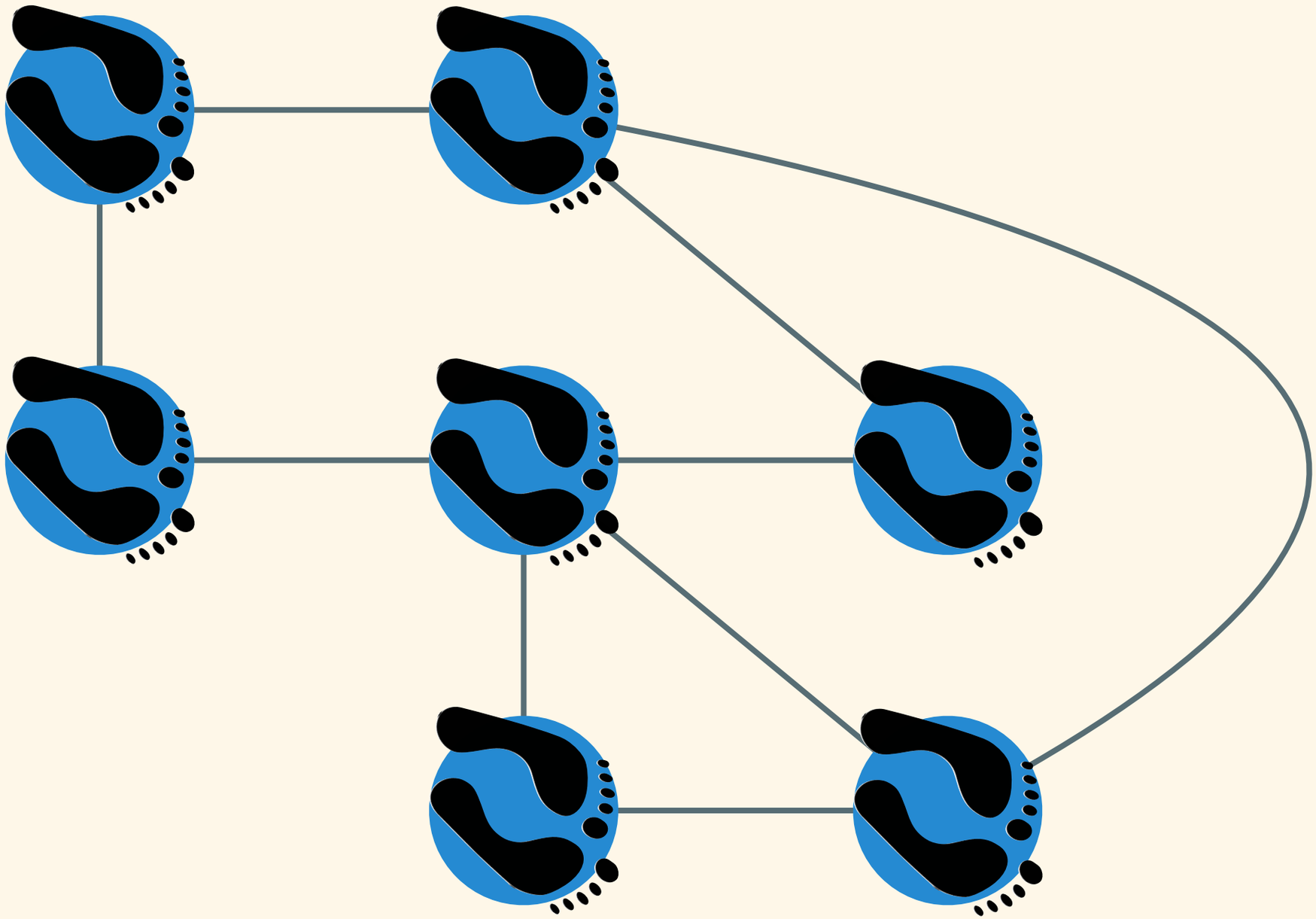
Graph



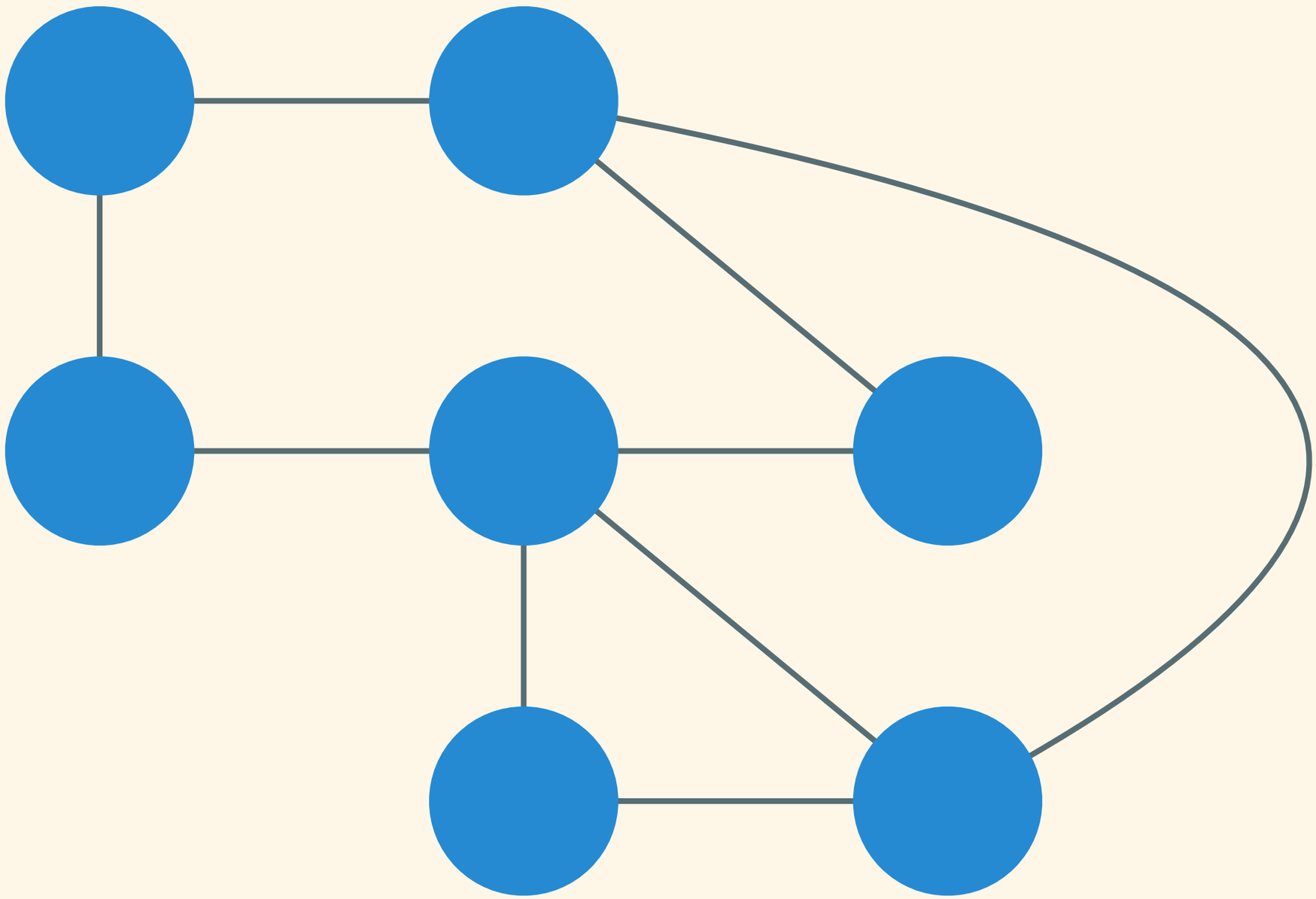
Traversal



Traversal



DFS (Depth-First Search)



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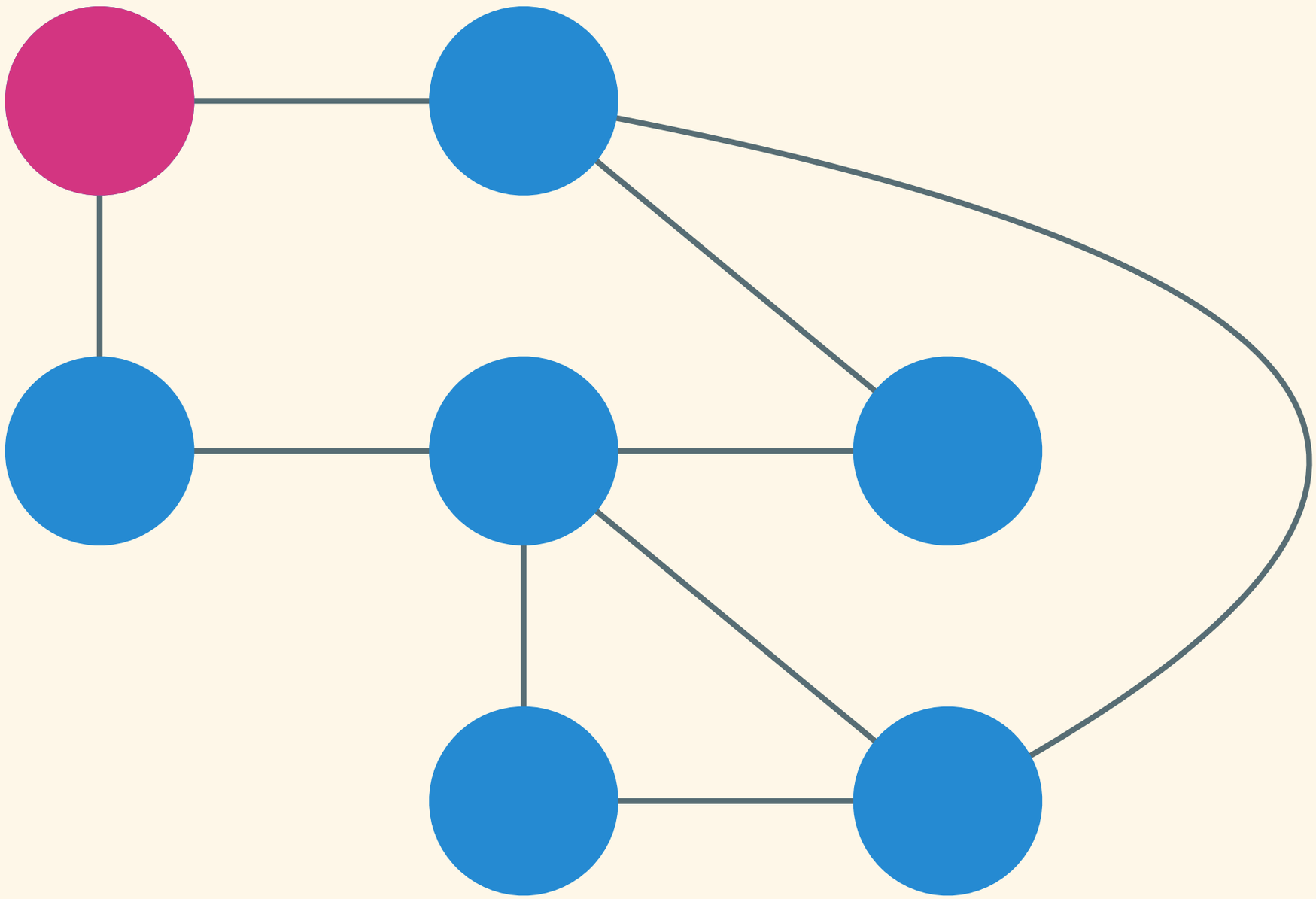

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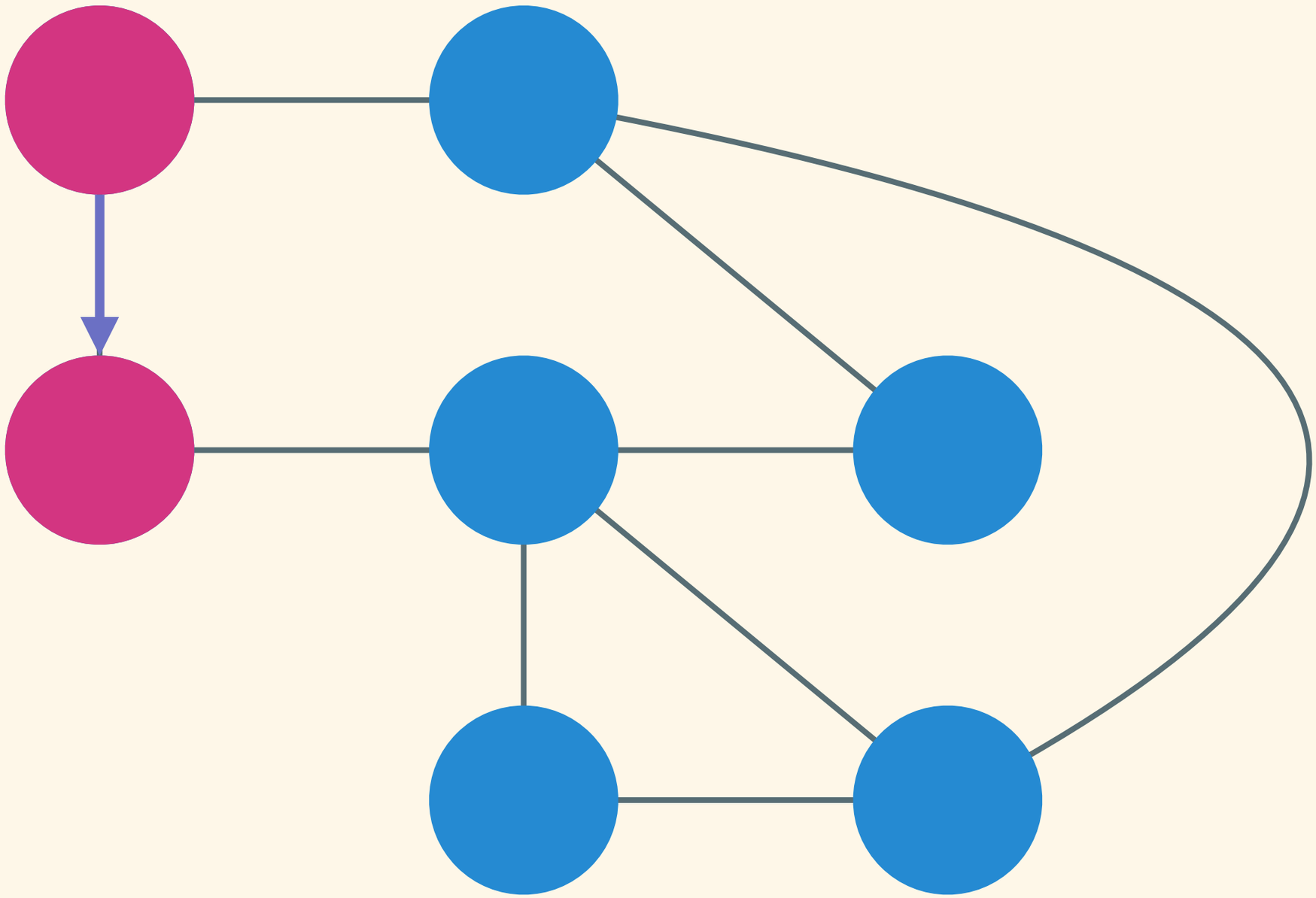

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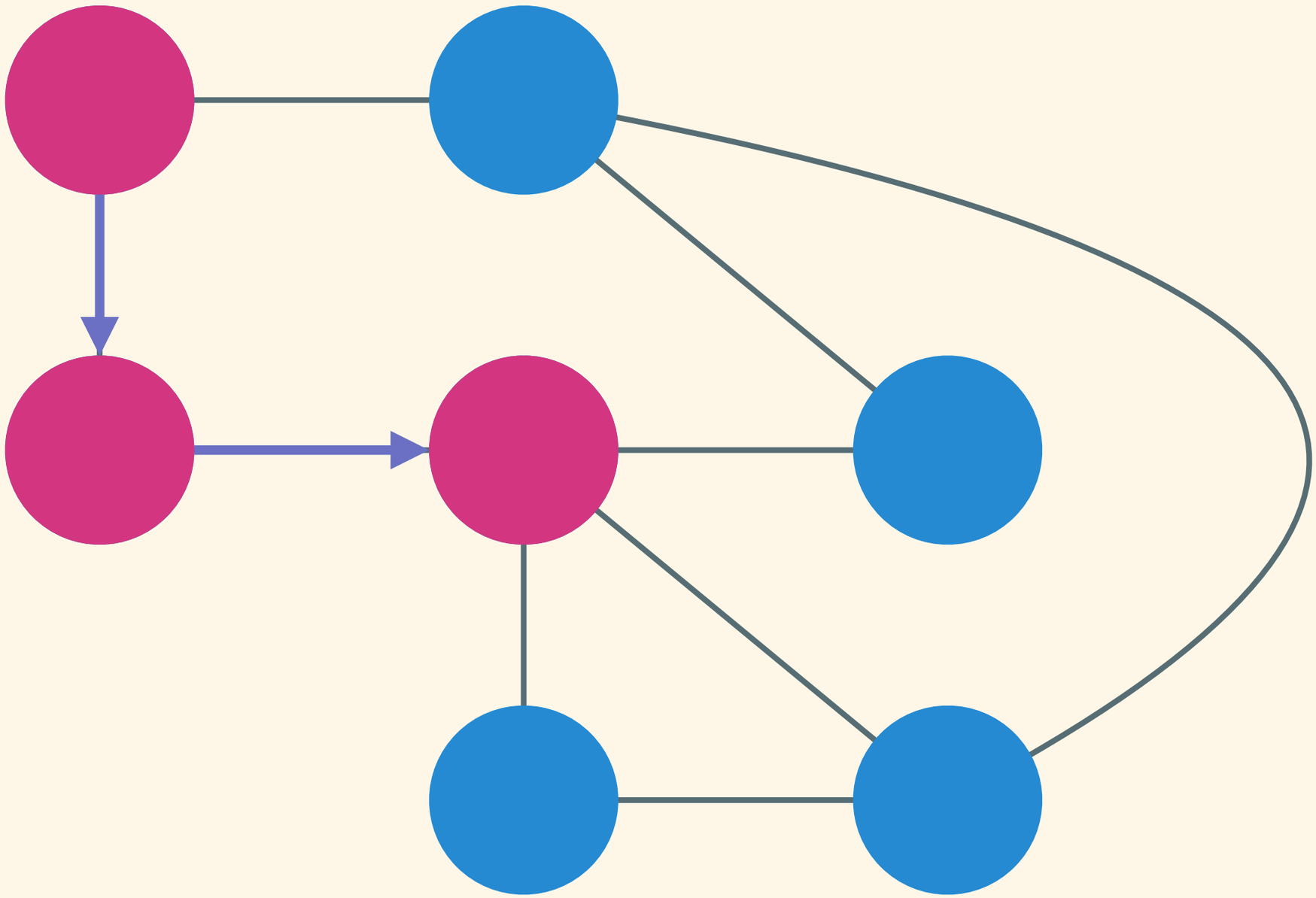

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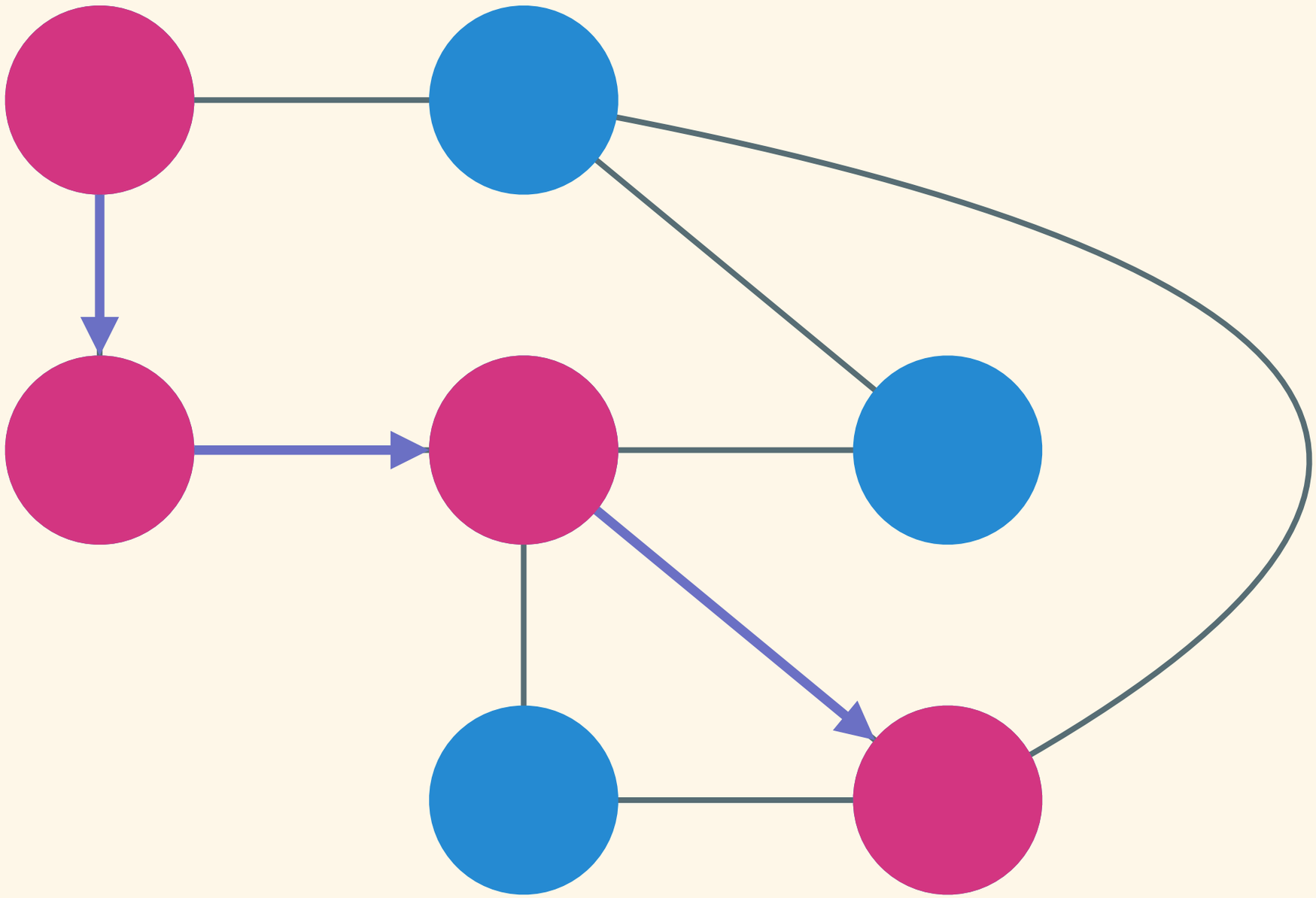

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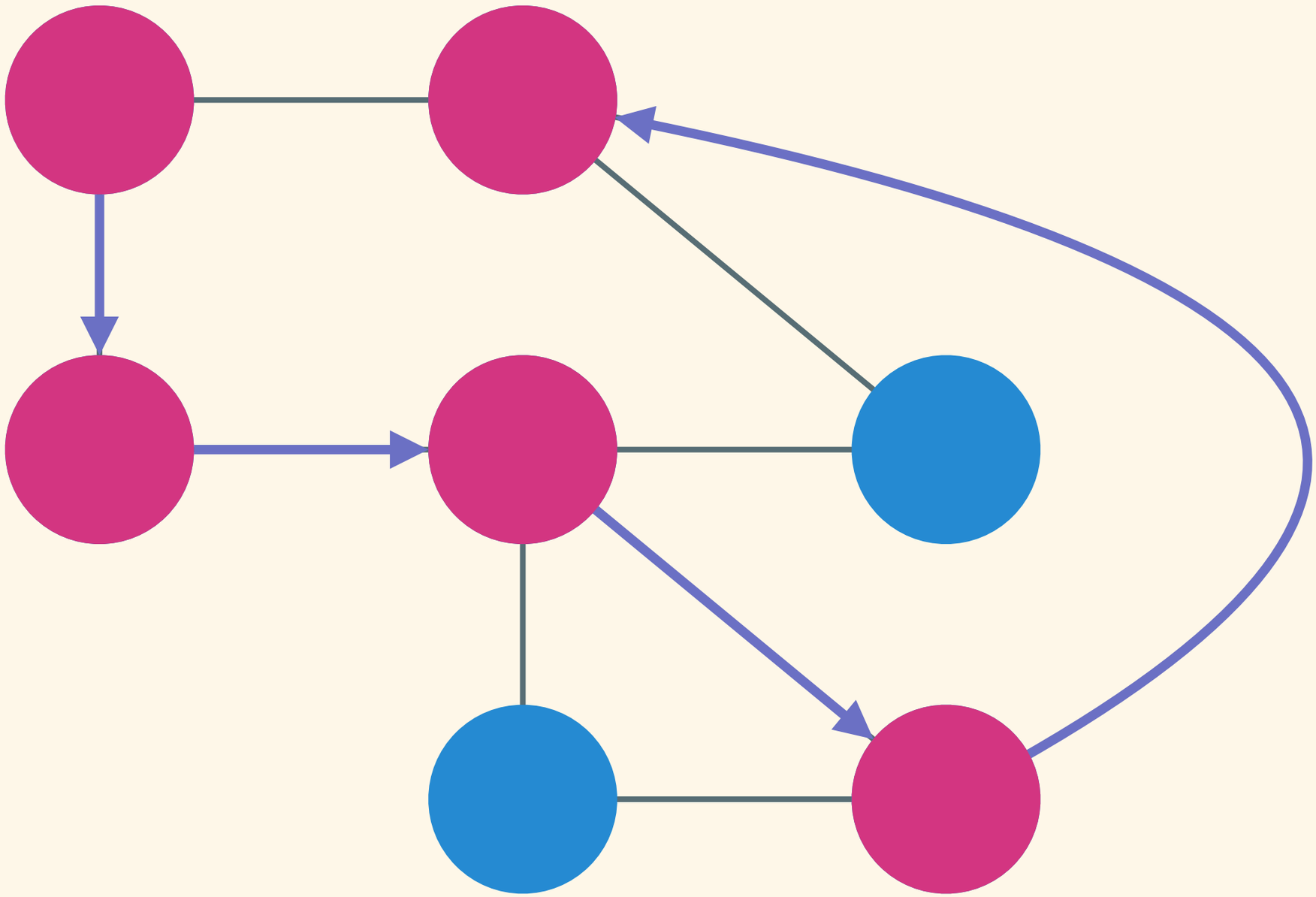

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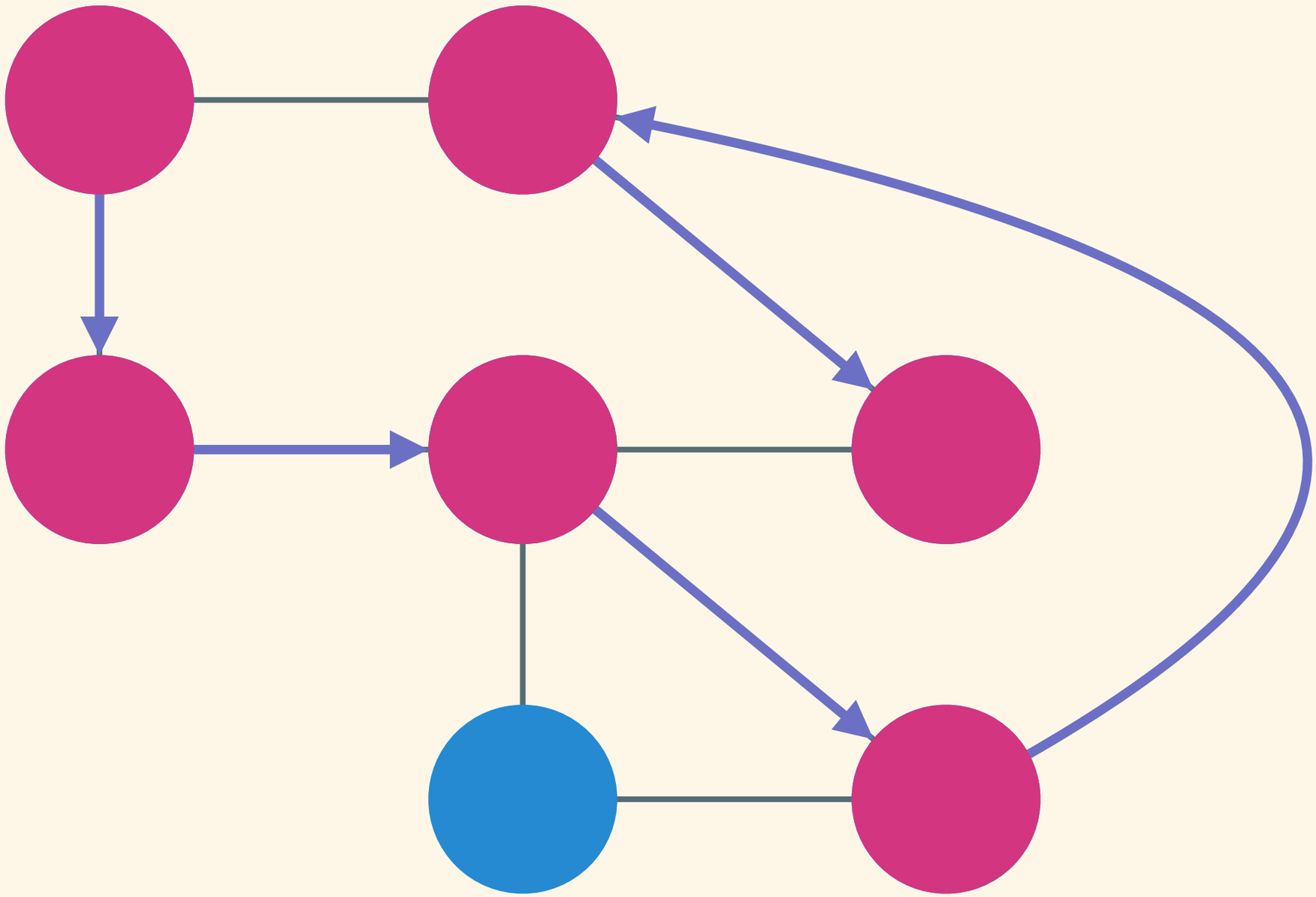

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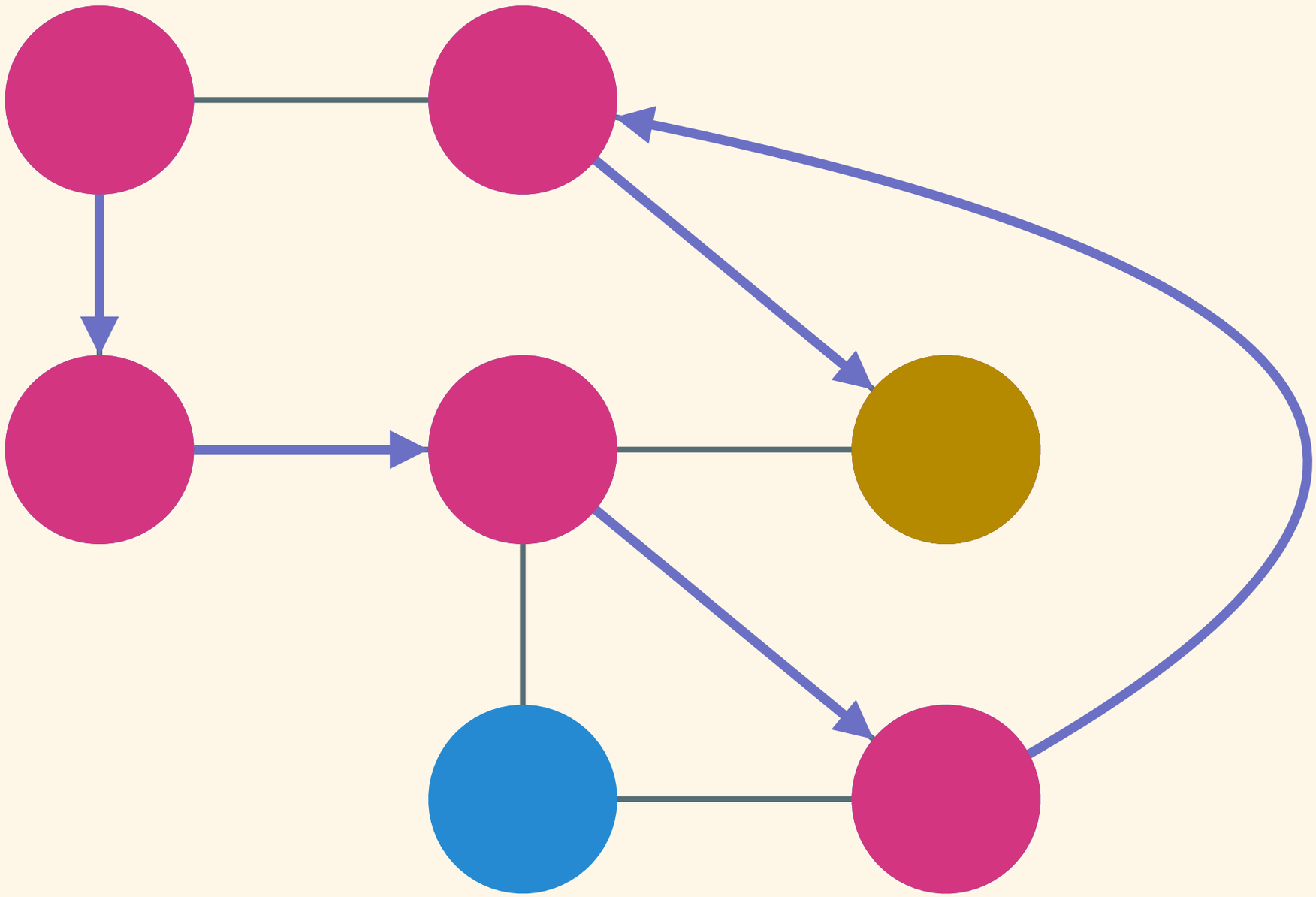

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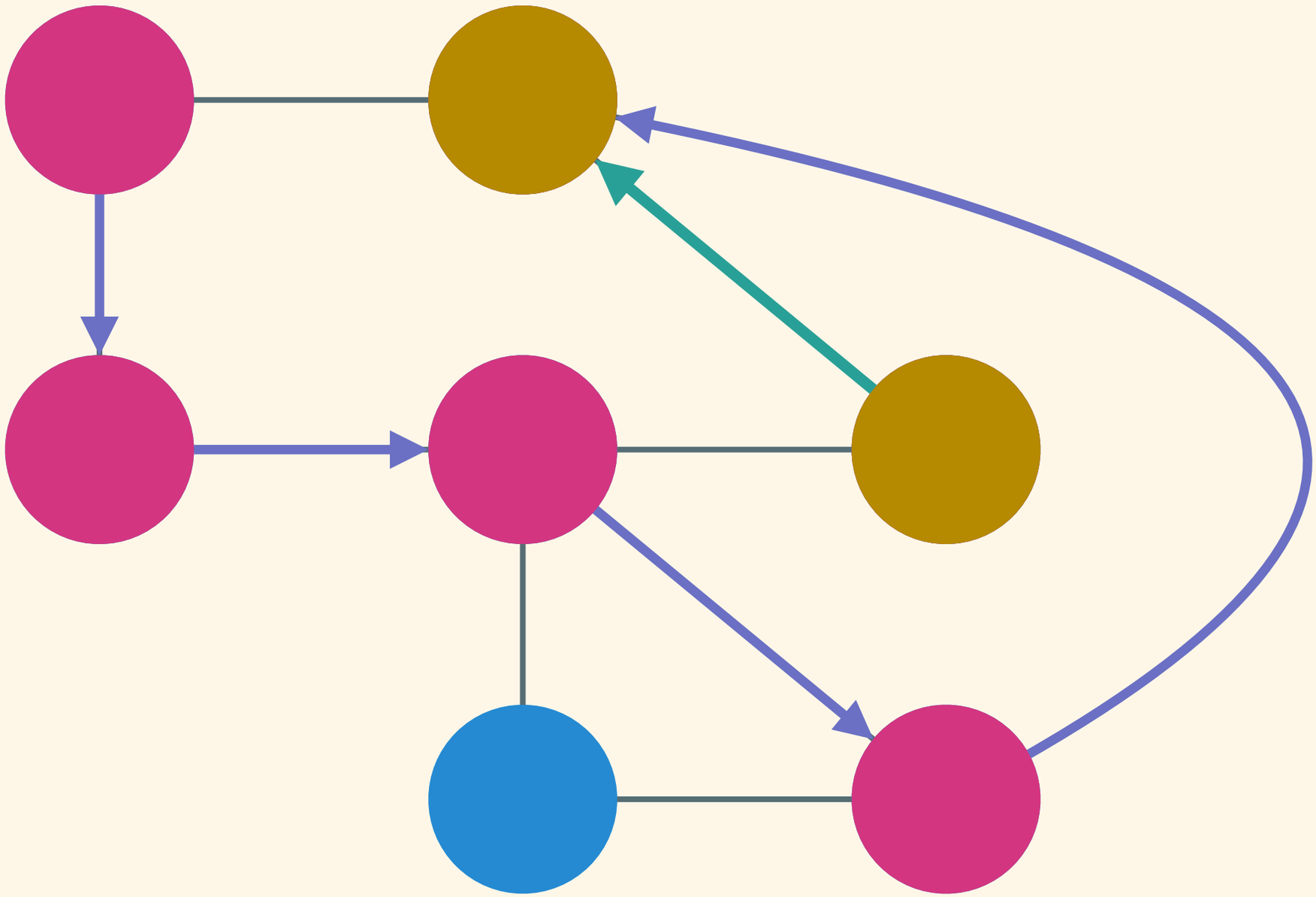

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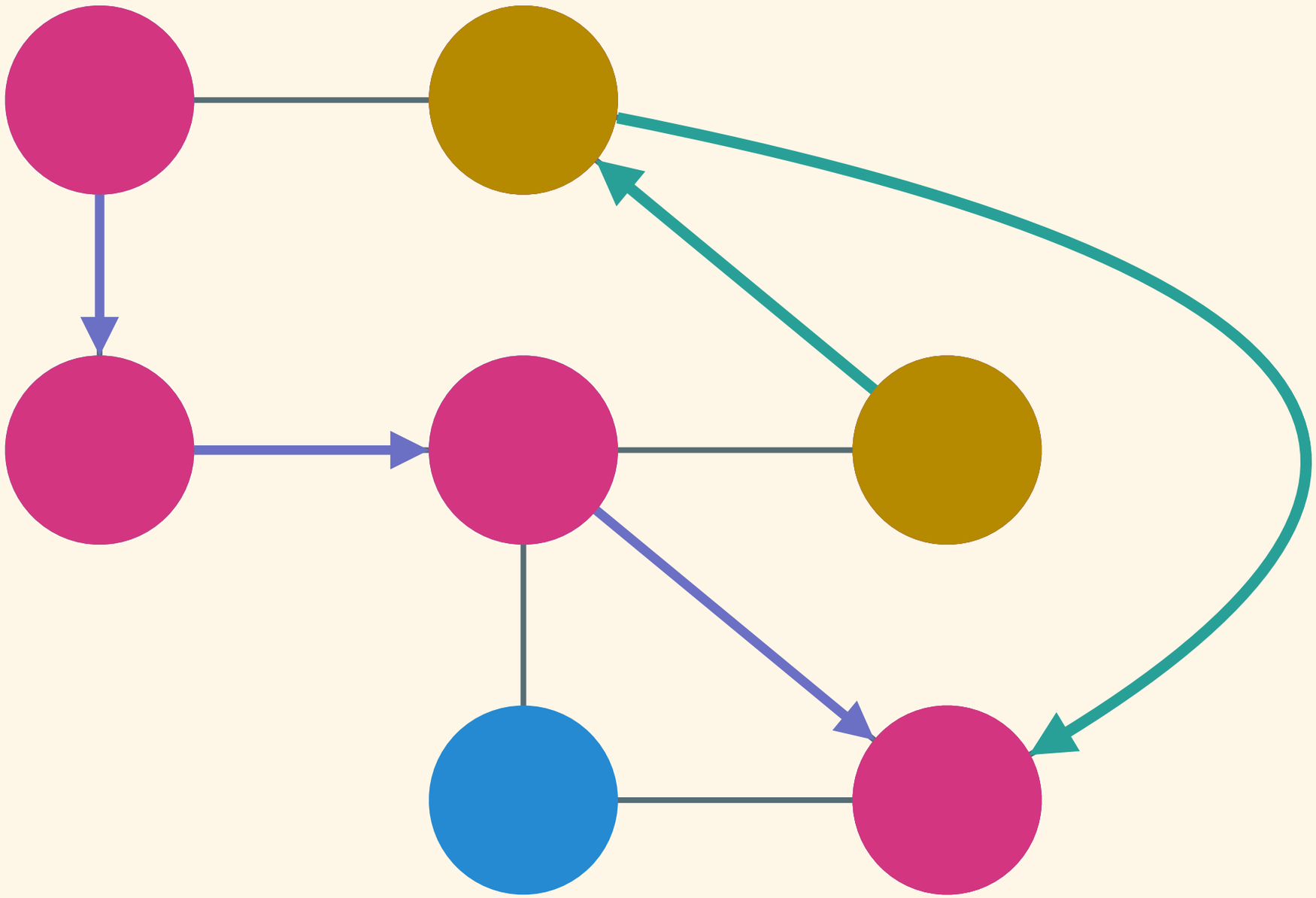

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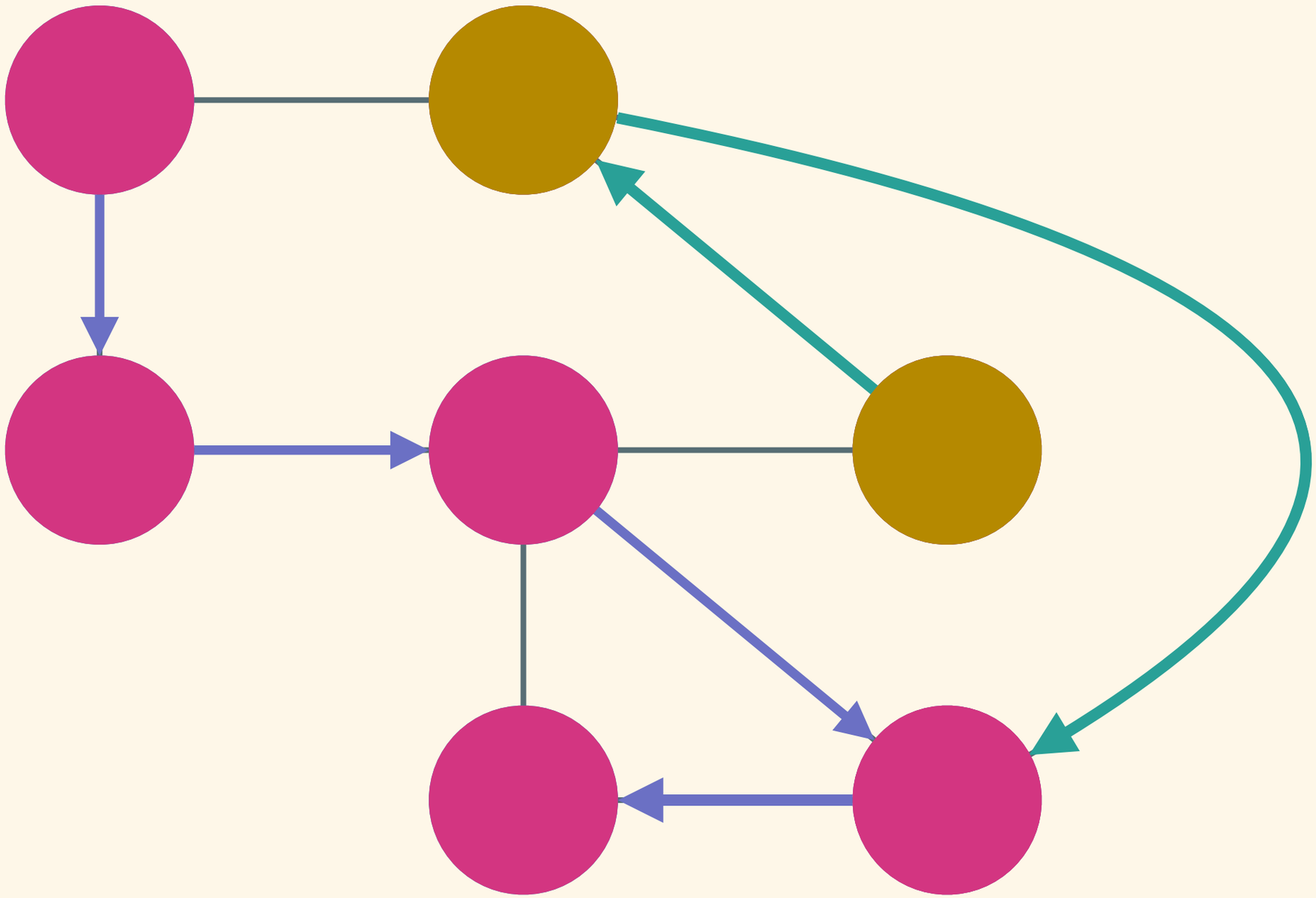

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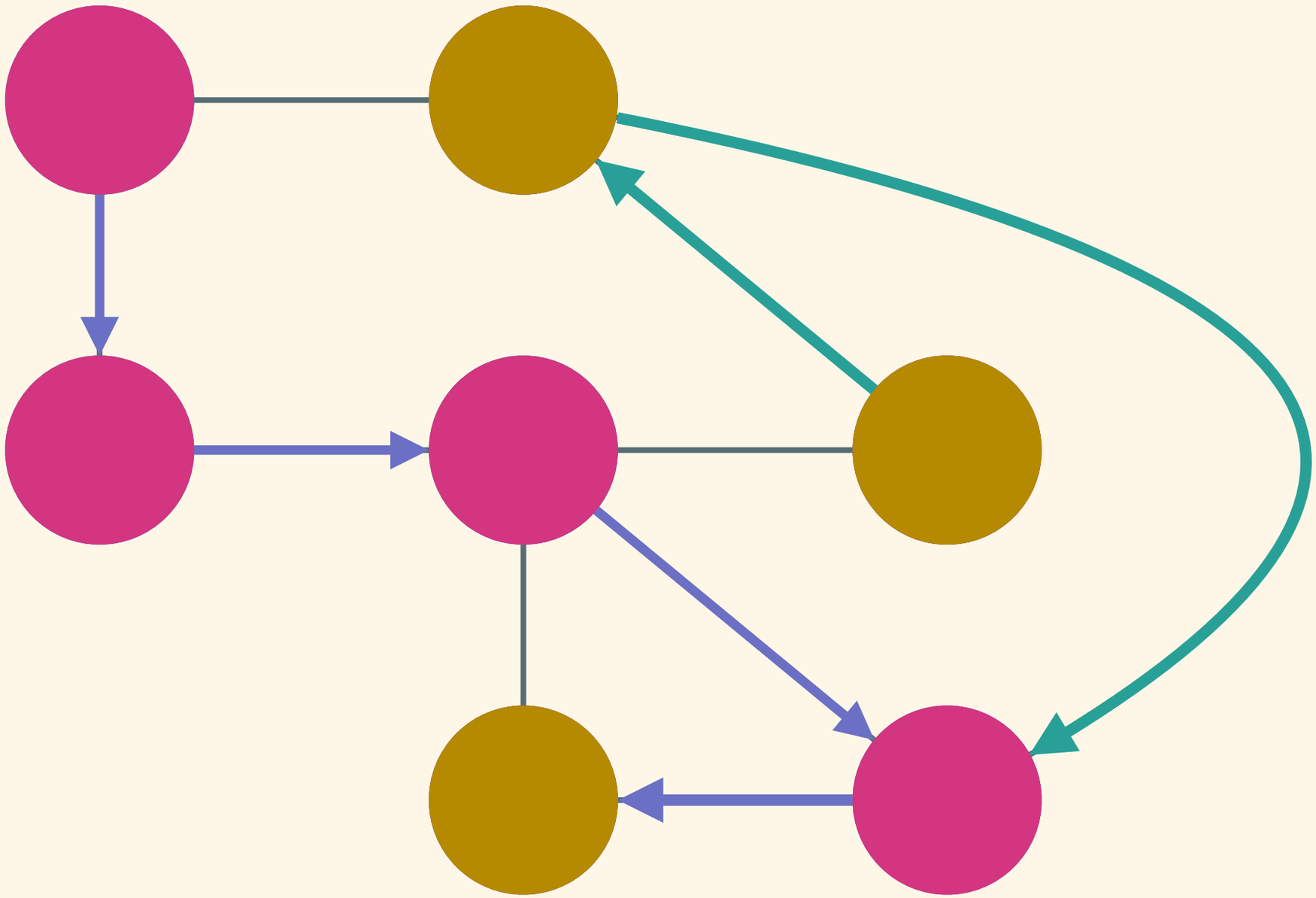

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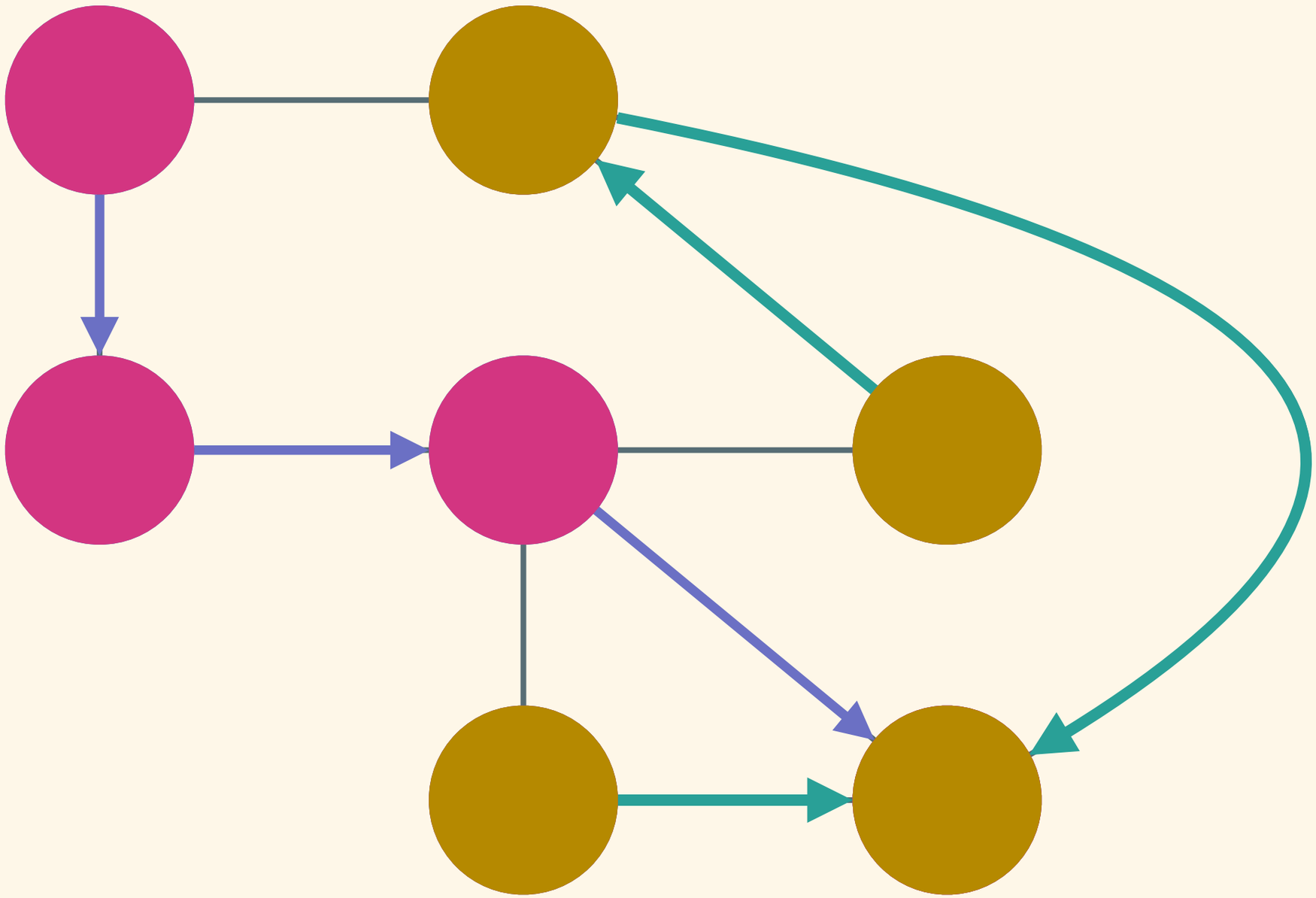

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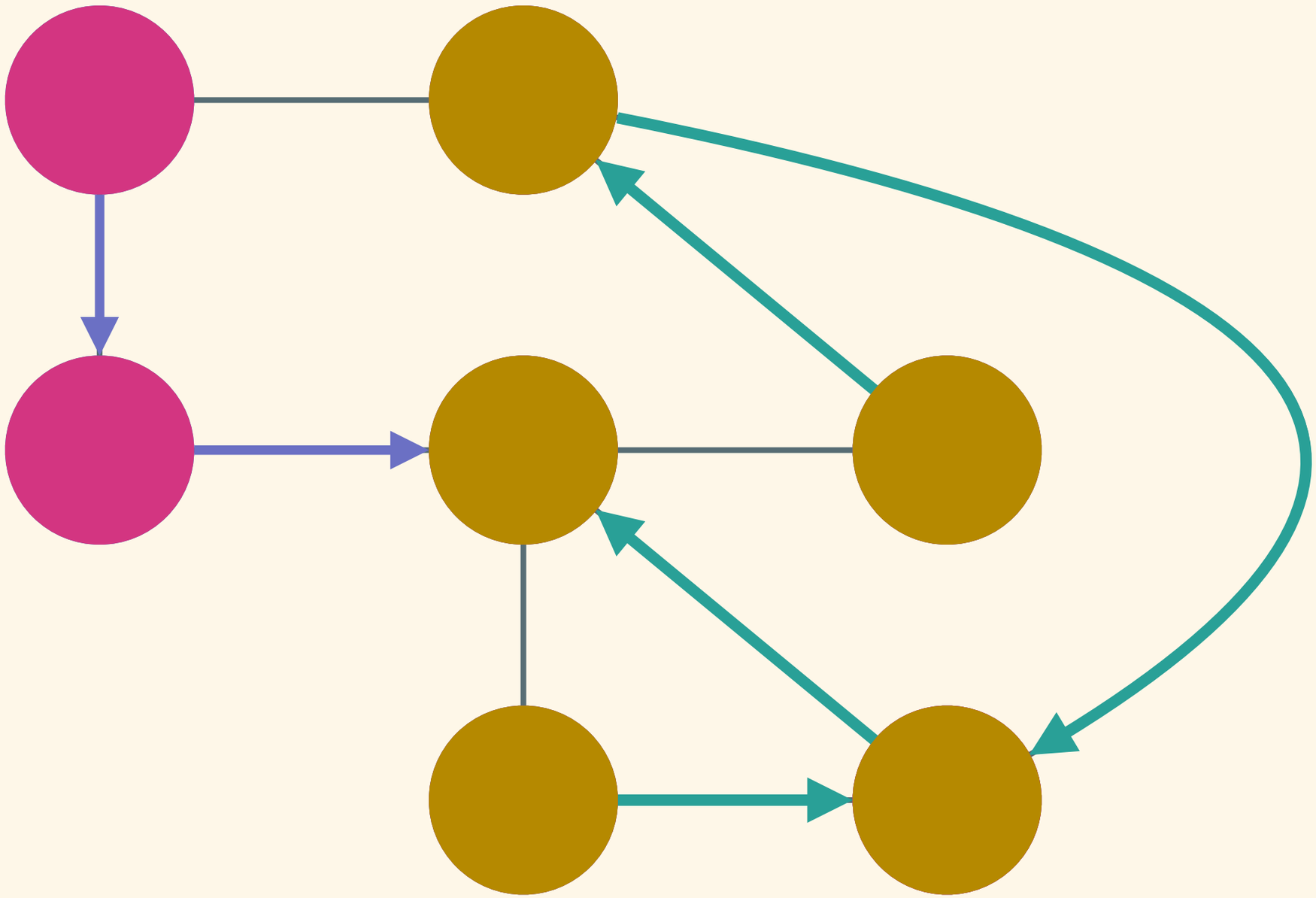

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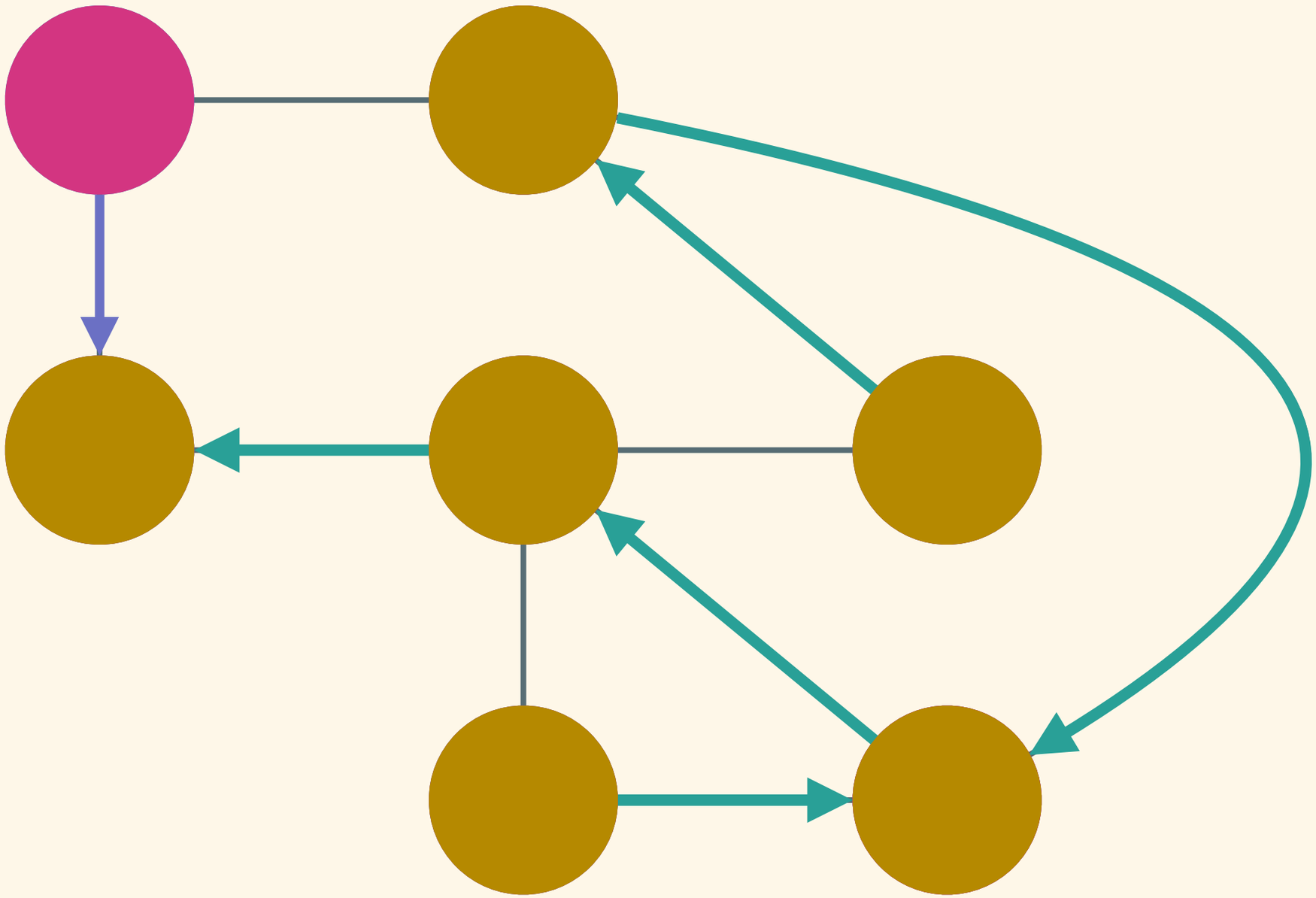

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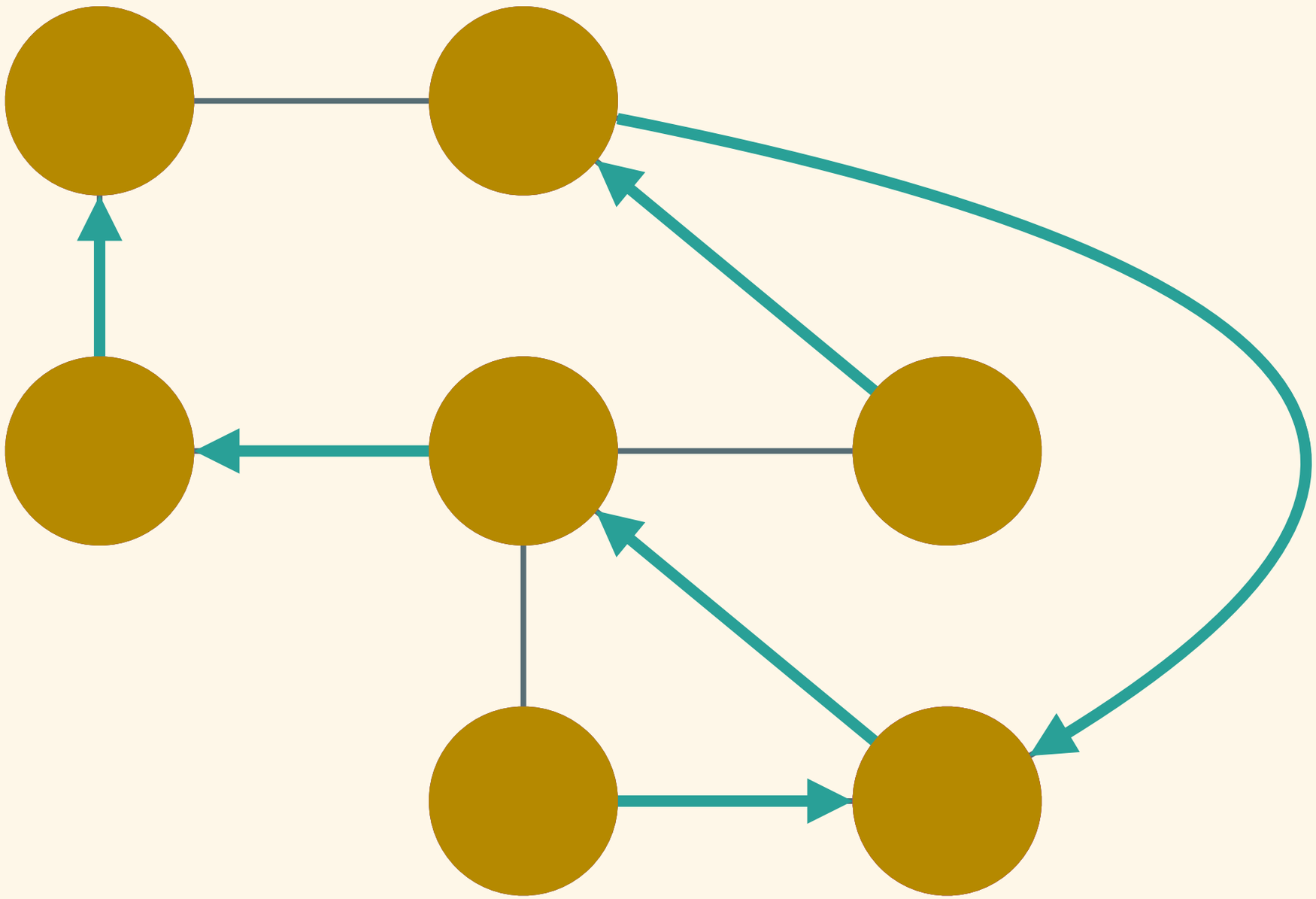
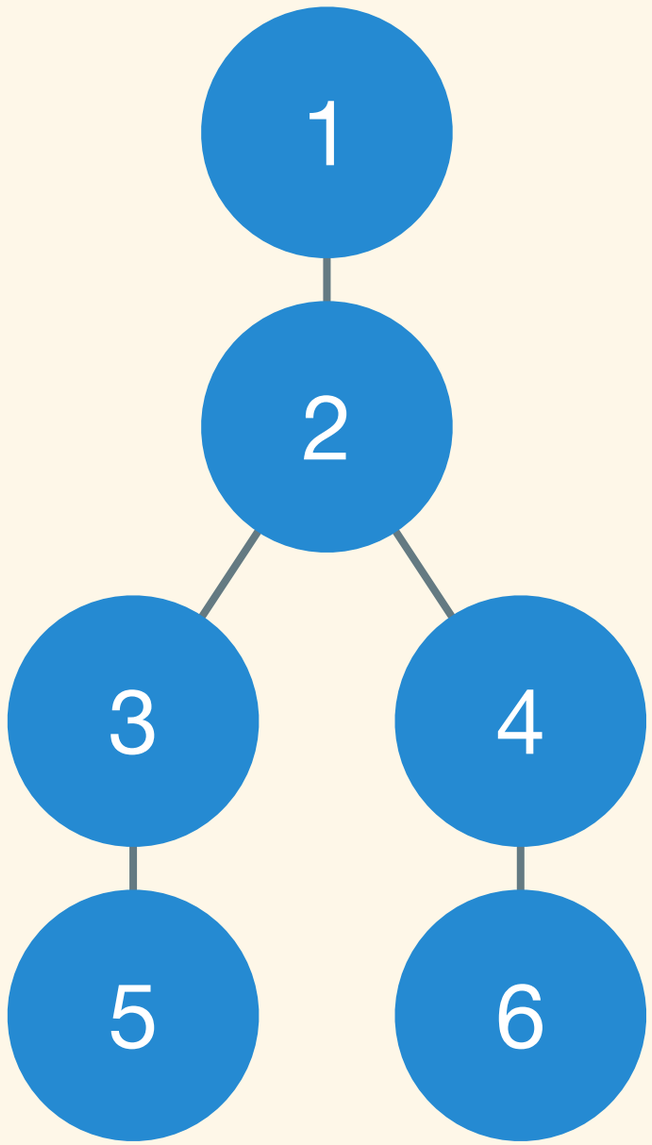
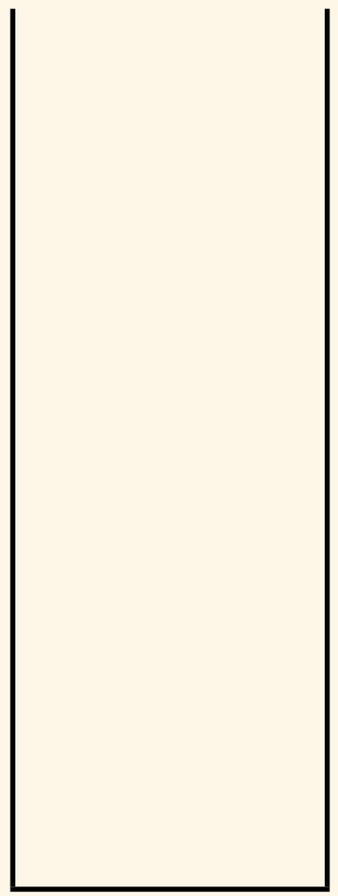


DFS & stack





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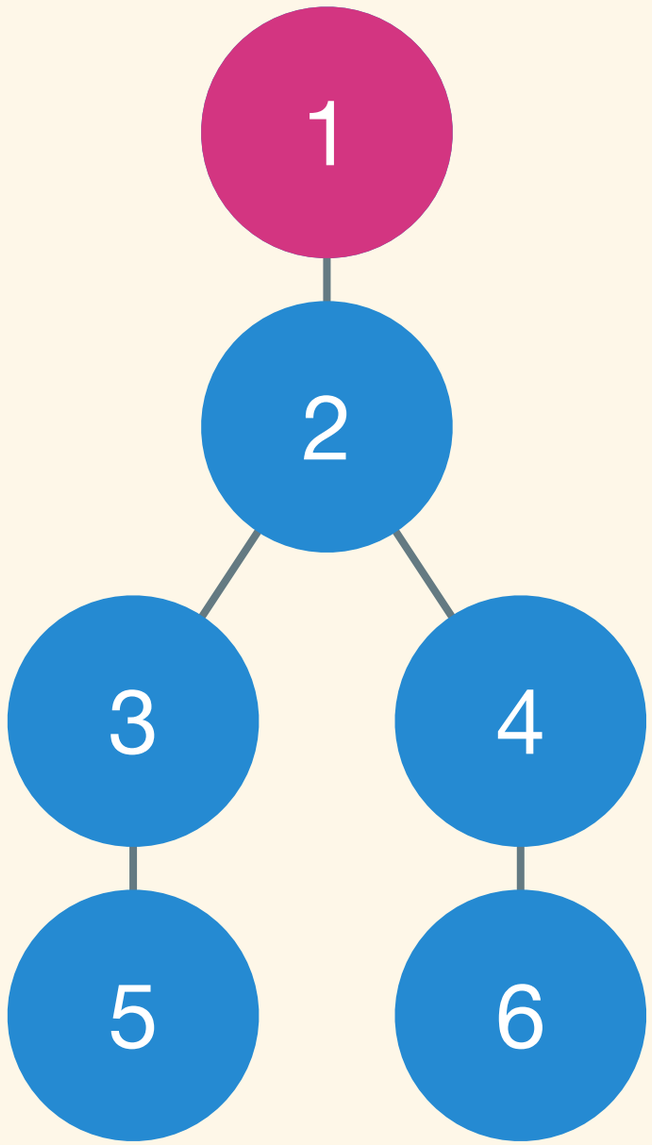

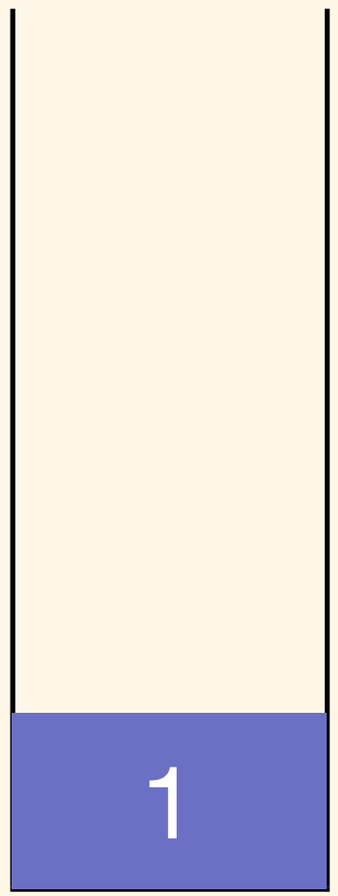

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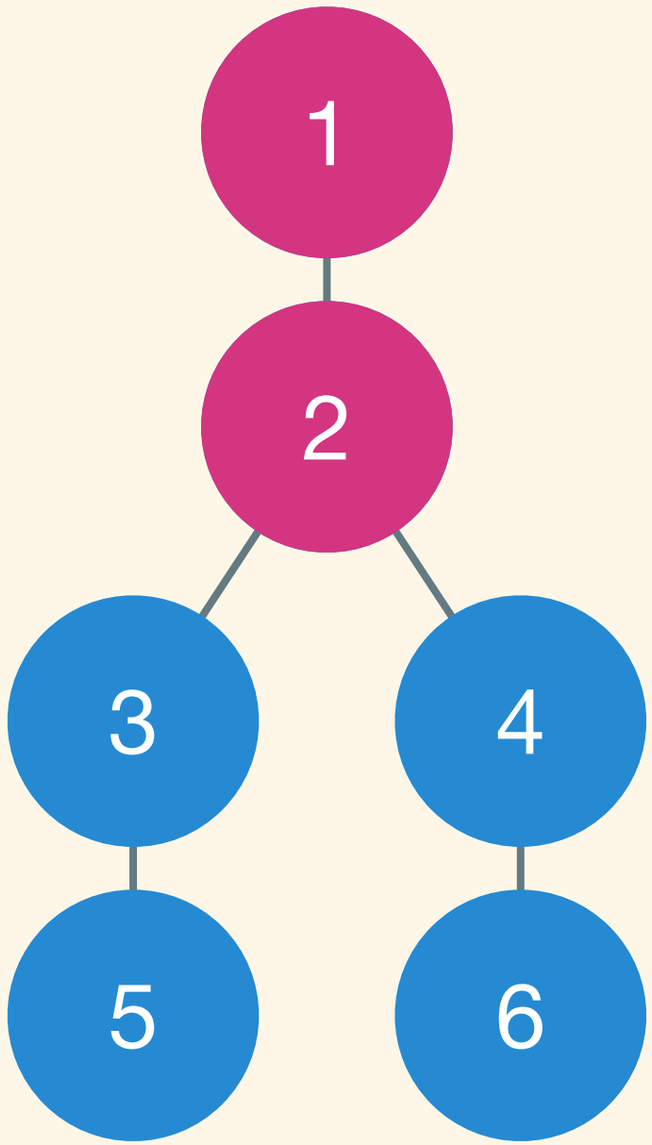

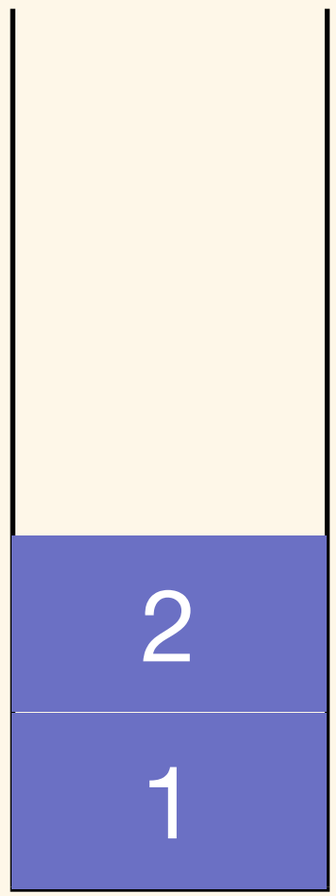

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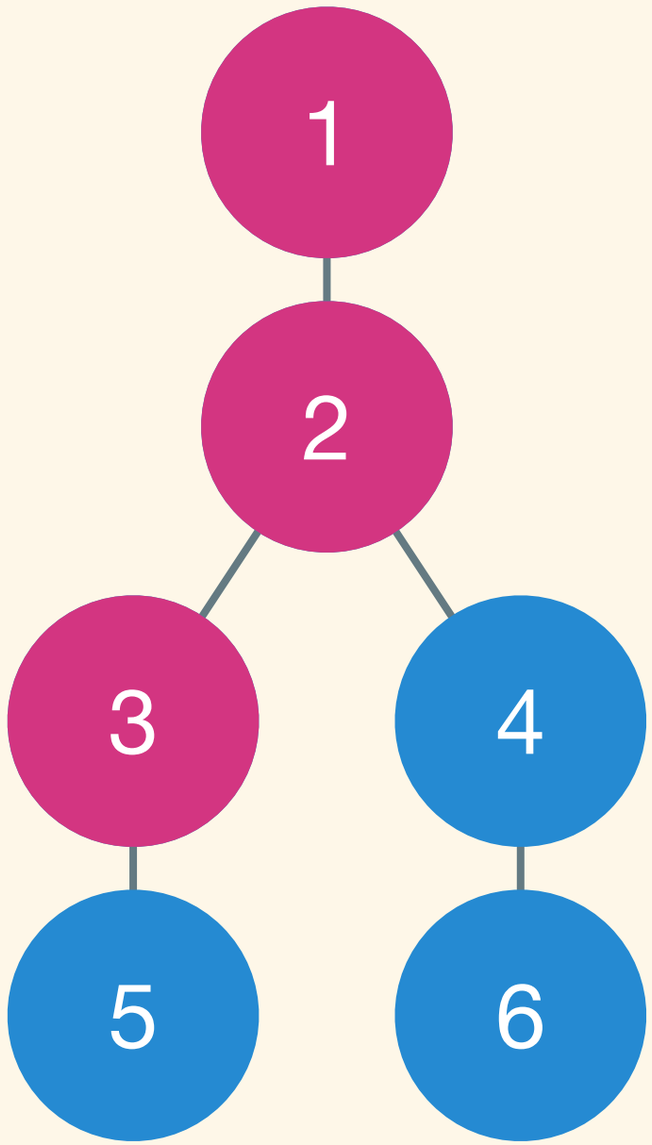

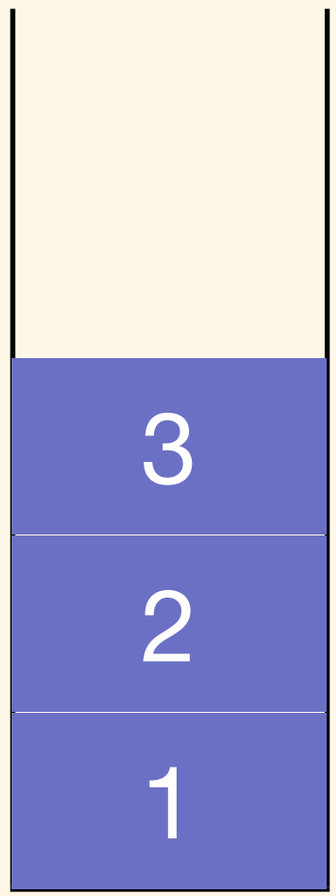

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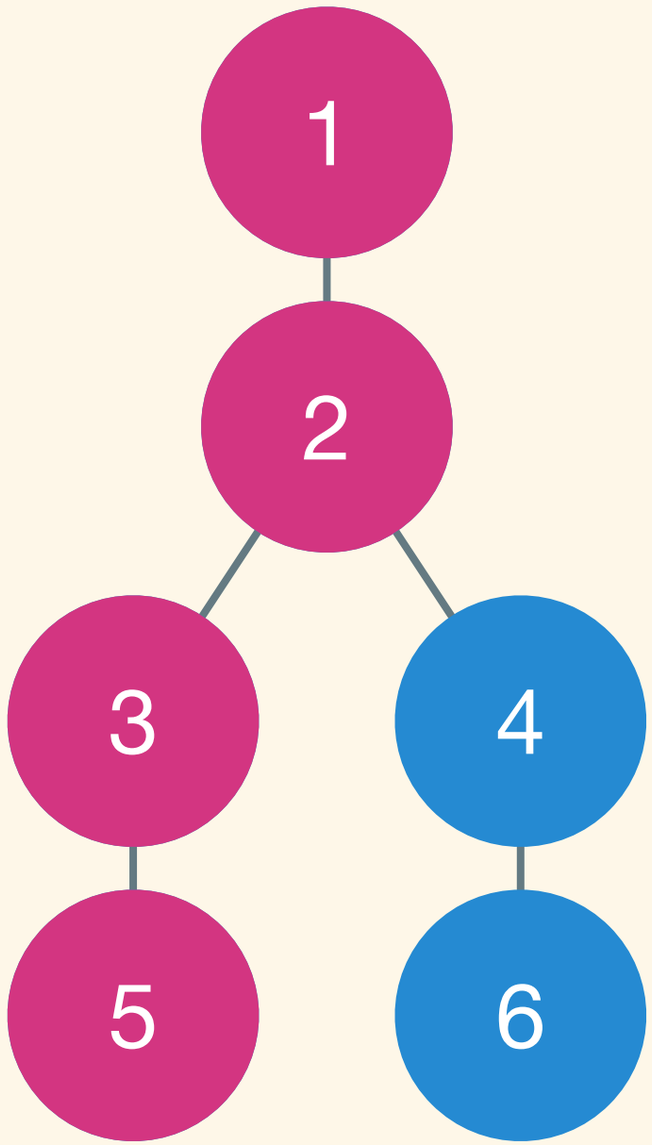

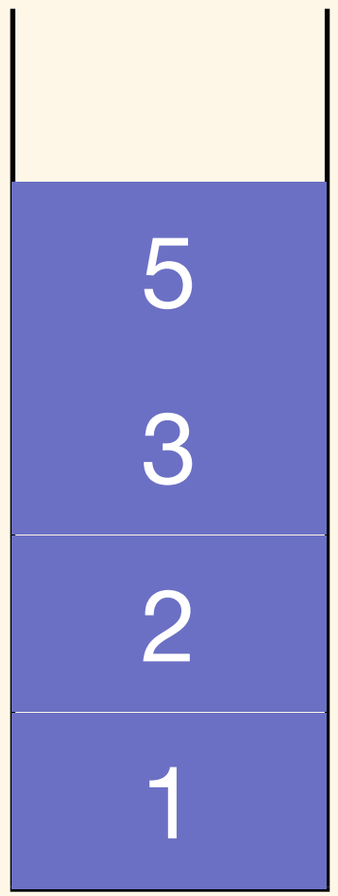

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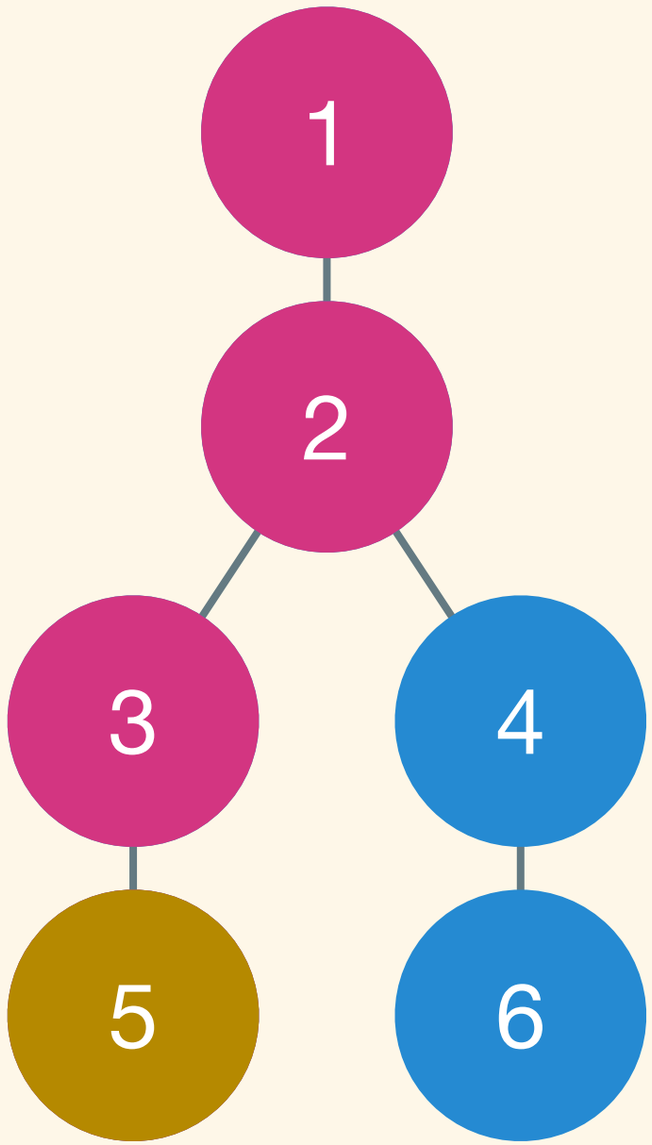

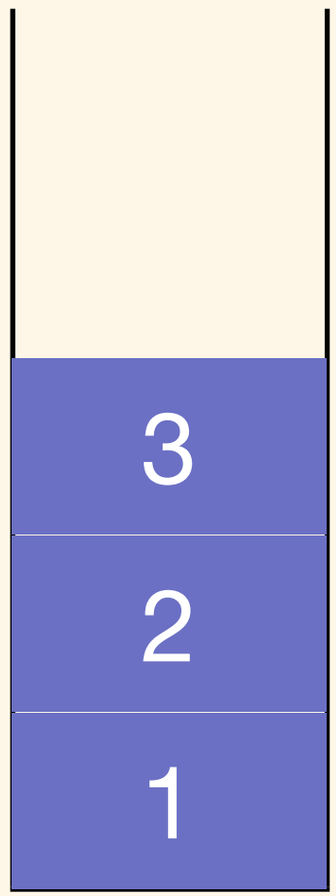

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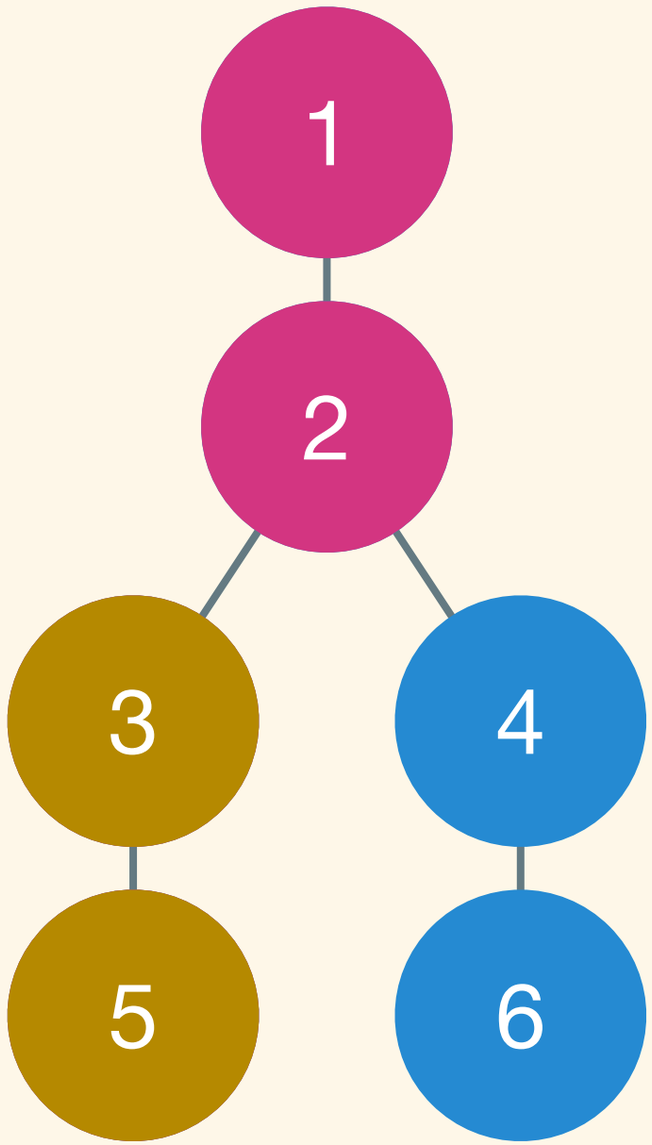

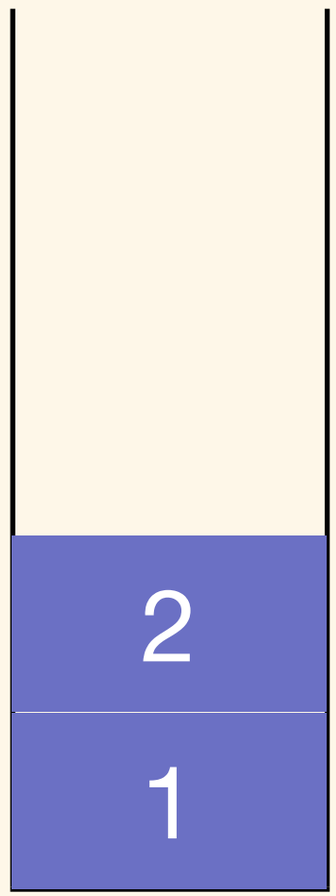

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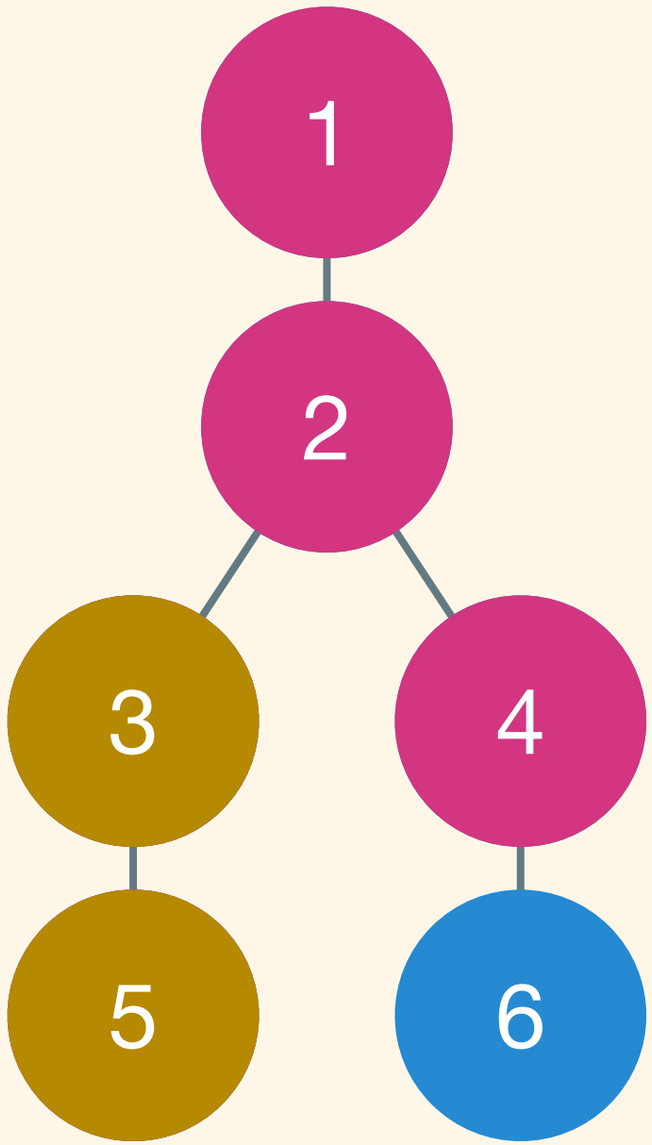

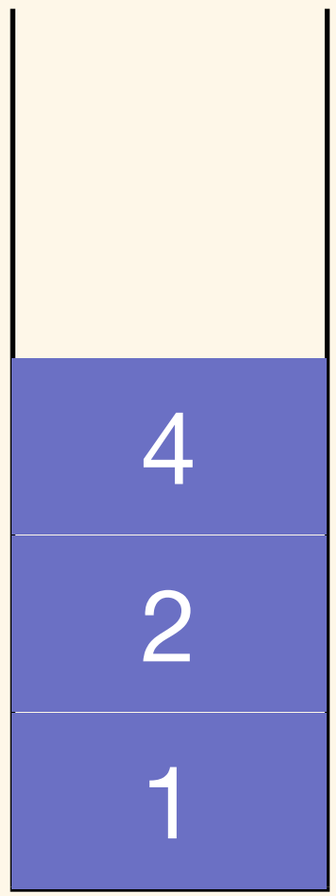

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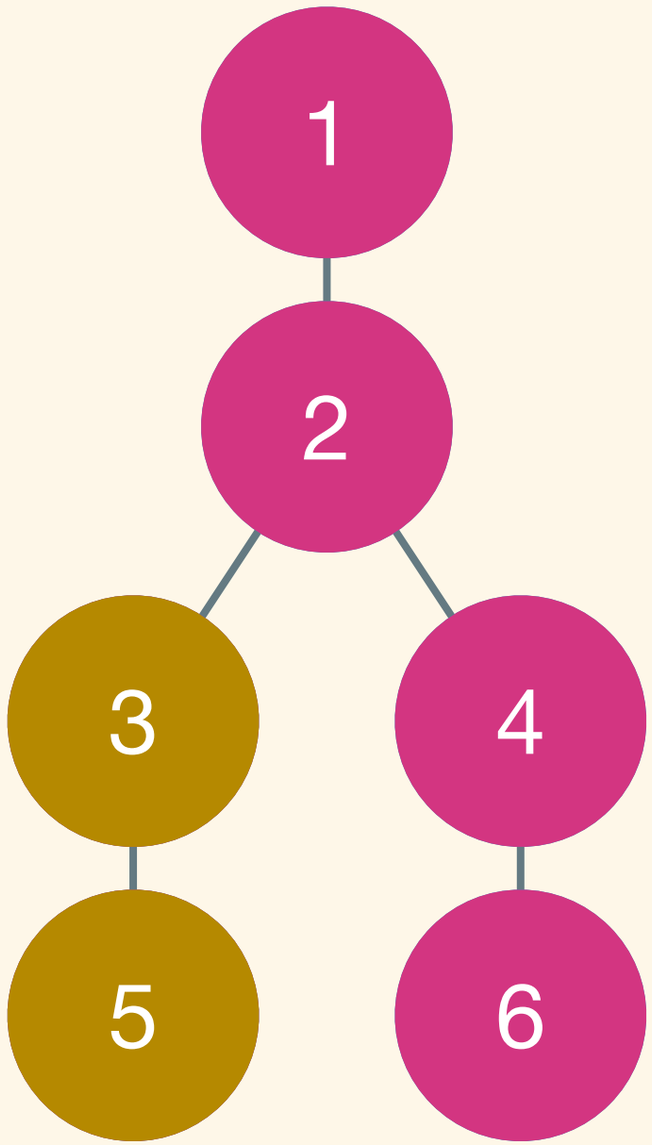

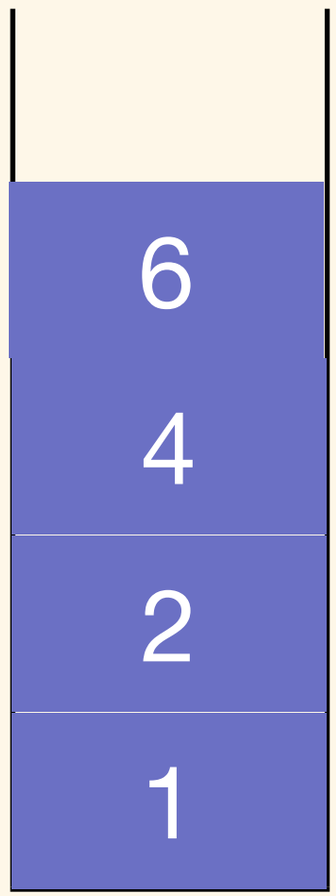

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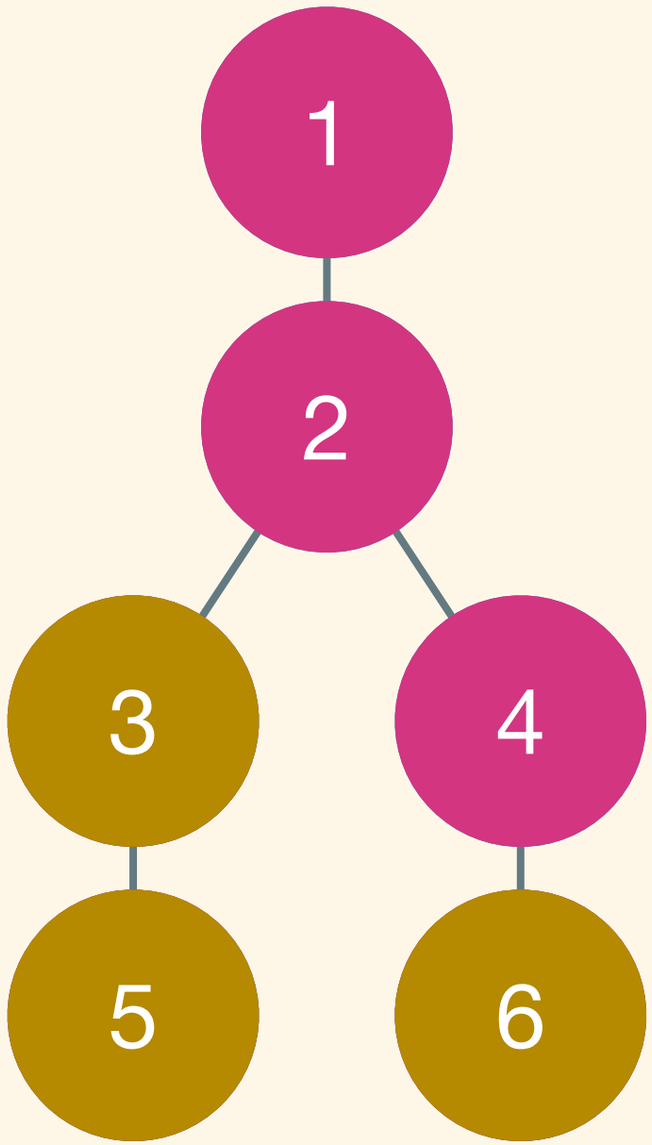

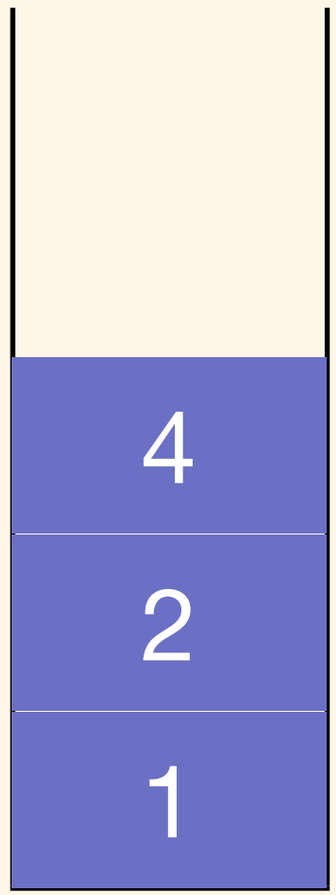

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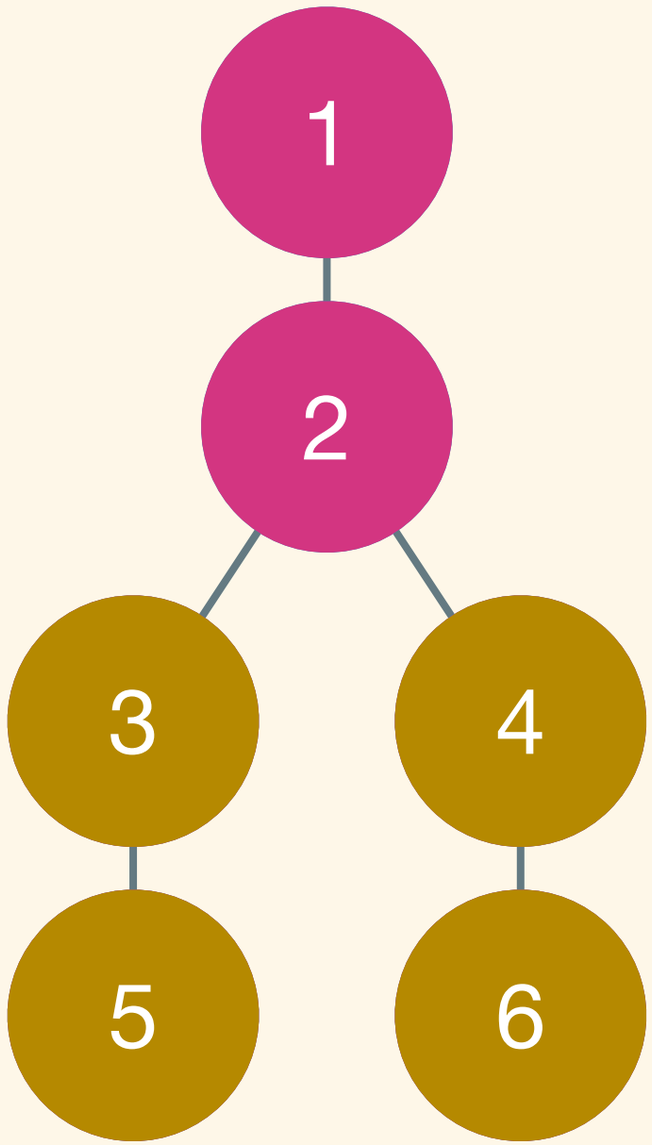

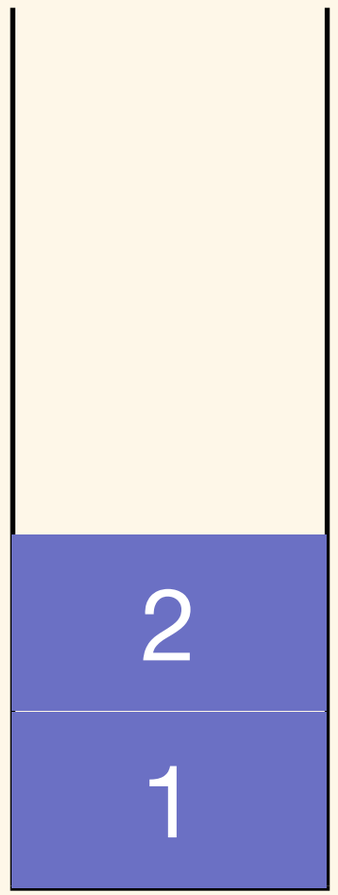

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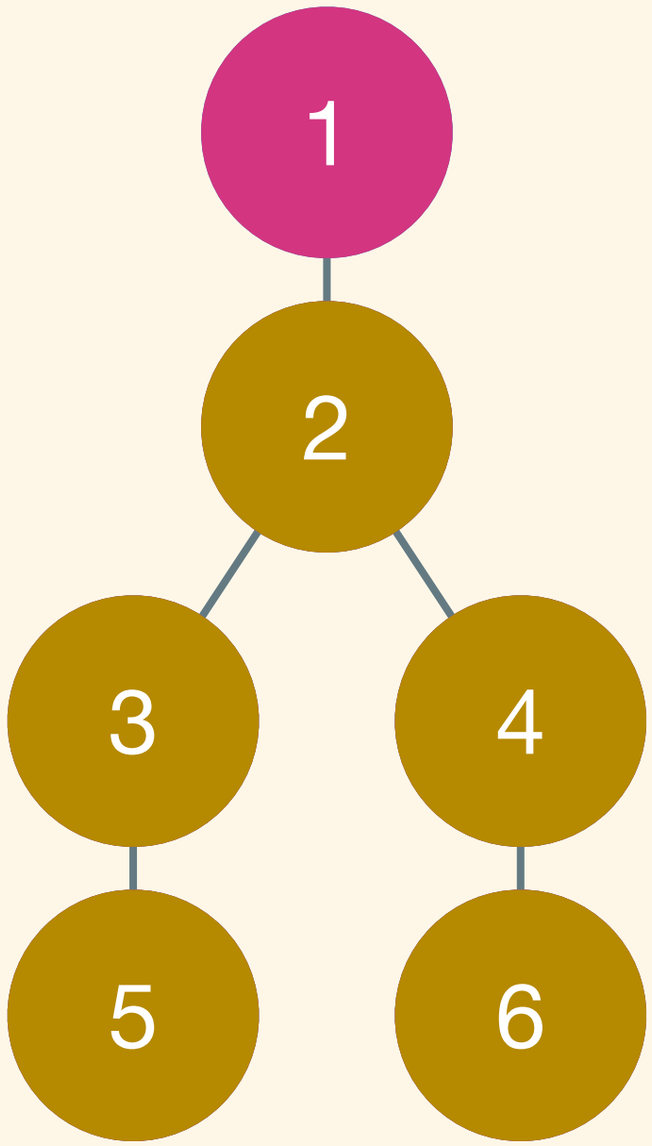

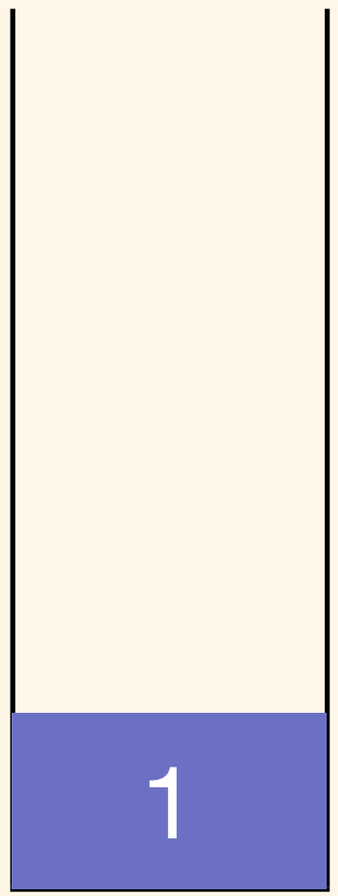

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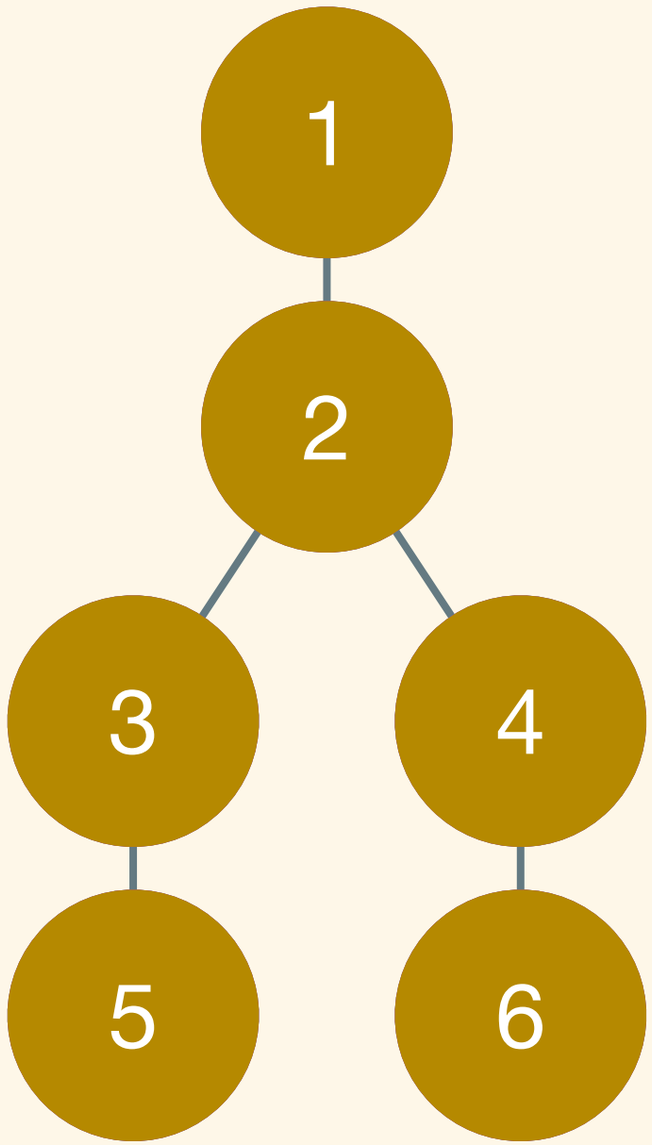
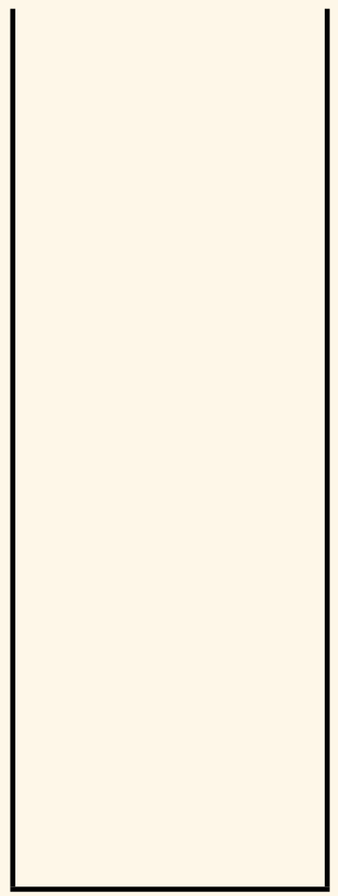




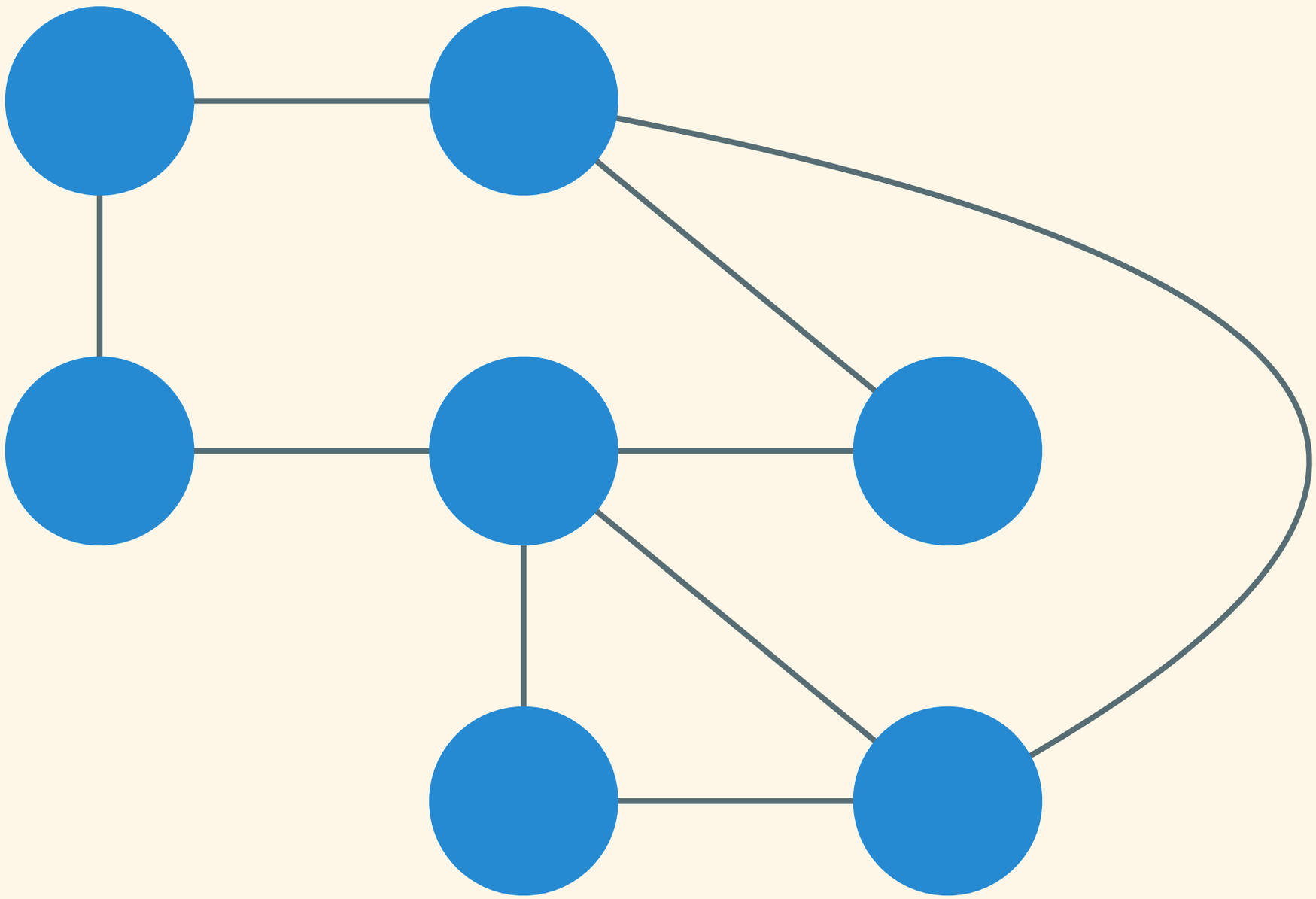
Source Code

```
// There are n nodes.
// g is an adjacent matrix.

void DFS( int now ) {
  if ( visited[ now ] == true )
    return;
  visited[ now ] = true;
  for ( int i = 0; i < n; ++i ) {
    if ( g[ now ][ i ] == true )
      DFS( i );
  }
  return;
}
```

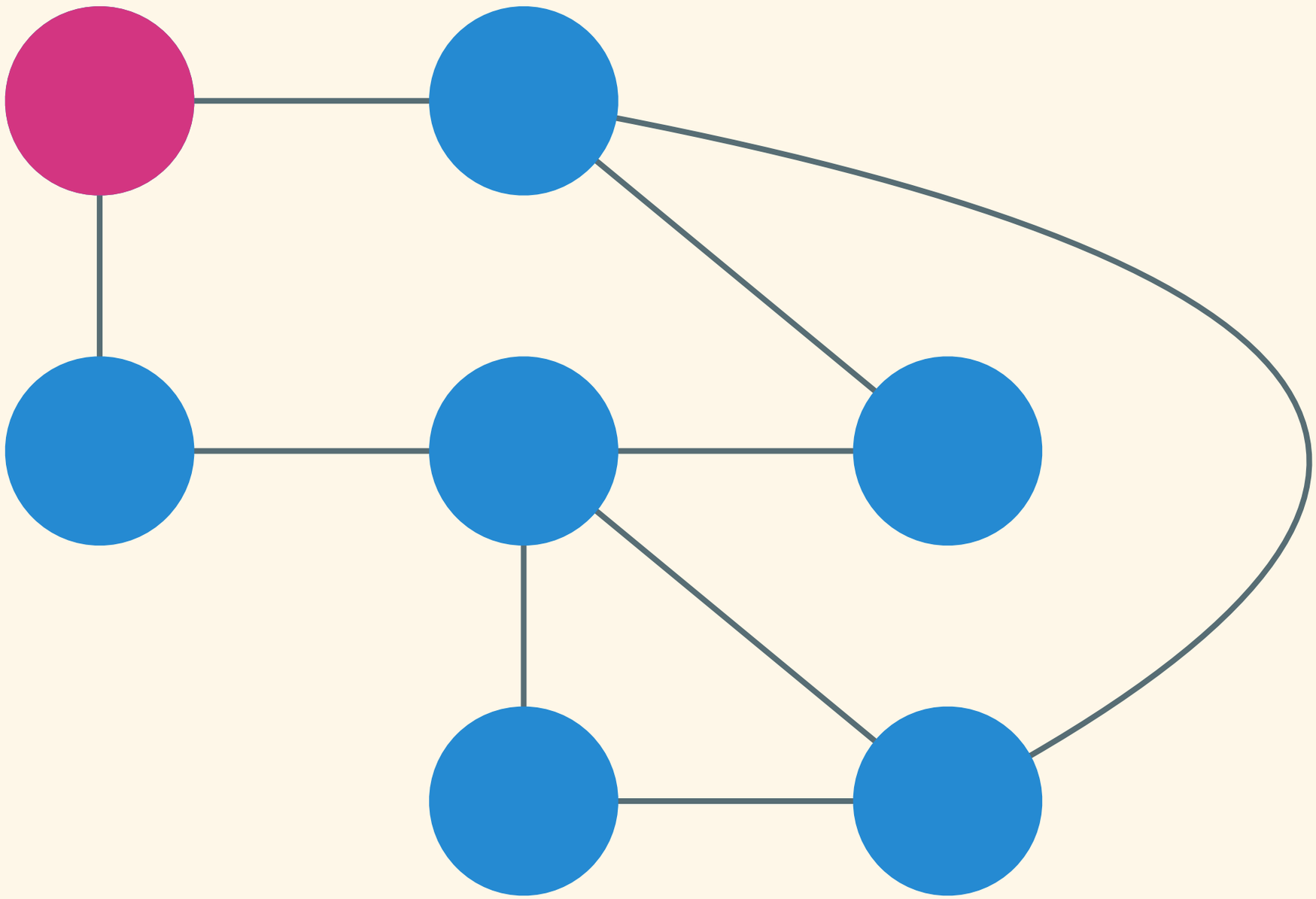
Source Code

```
// There are n nodes.
// g is an adjacent matrix.

void DFS() {
   stack< int > stk;
   stk.push( 0 );
   while ( stk.empty() != true ) {
      int now = stk.top();
      visited[ now ] = true;
      bool noleaf = true;
      for ( int i = 0; i < n; ++i )
         if ( g[ now ][ i ] == true && visited[ i ] != true ) {
            stk.push( i );
            noleaf = false;
            break;
         }
      if ( noleaf == true )
         stk.pop();
   }
}
```

BFS (Breadth-First Search)



BFS (Breadth-First Search)



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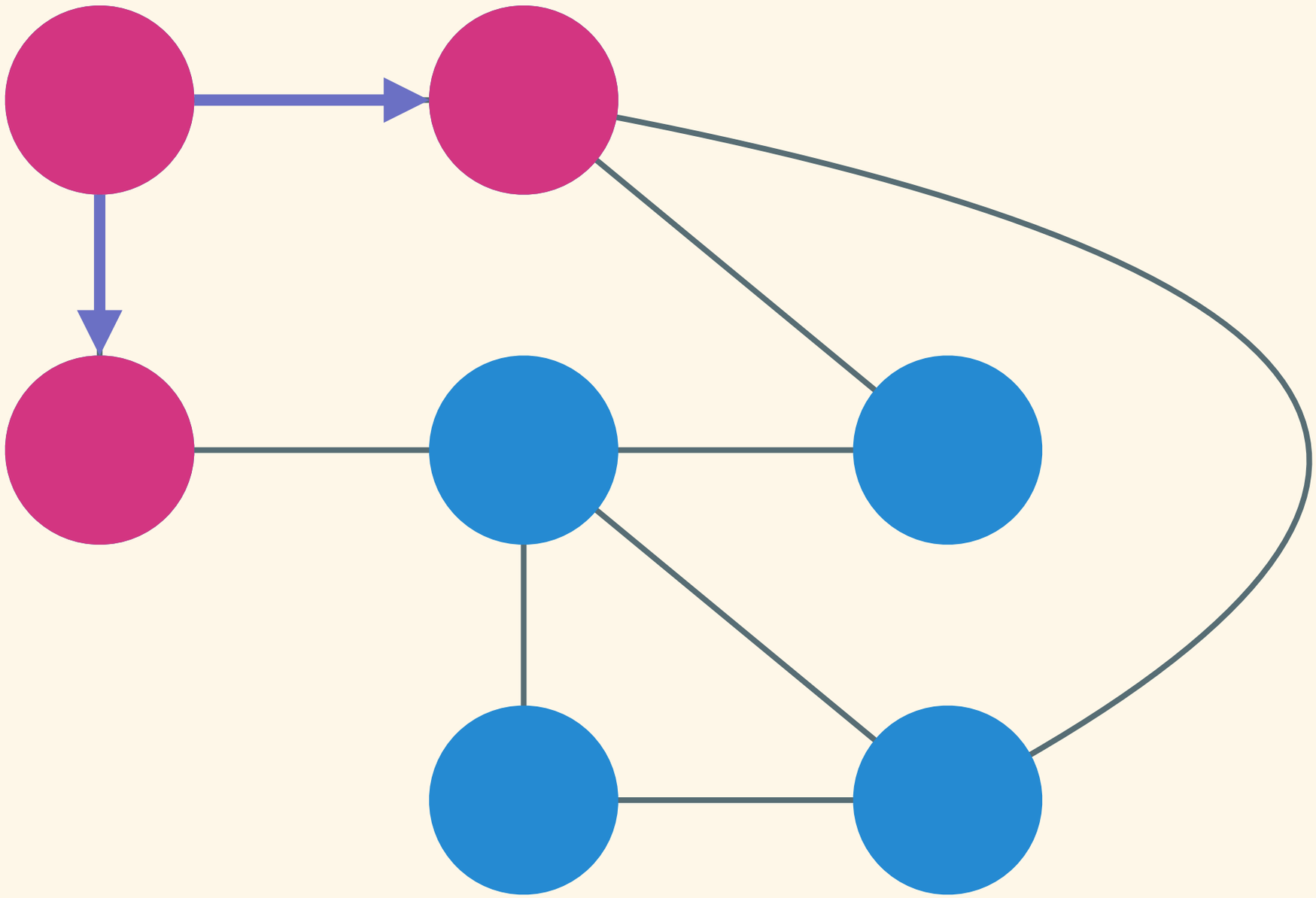

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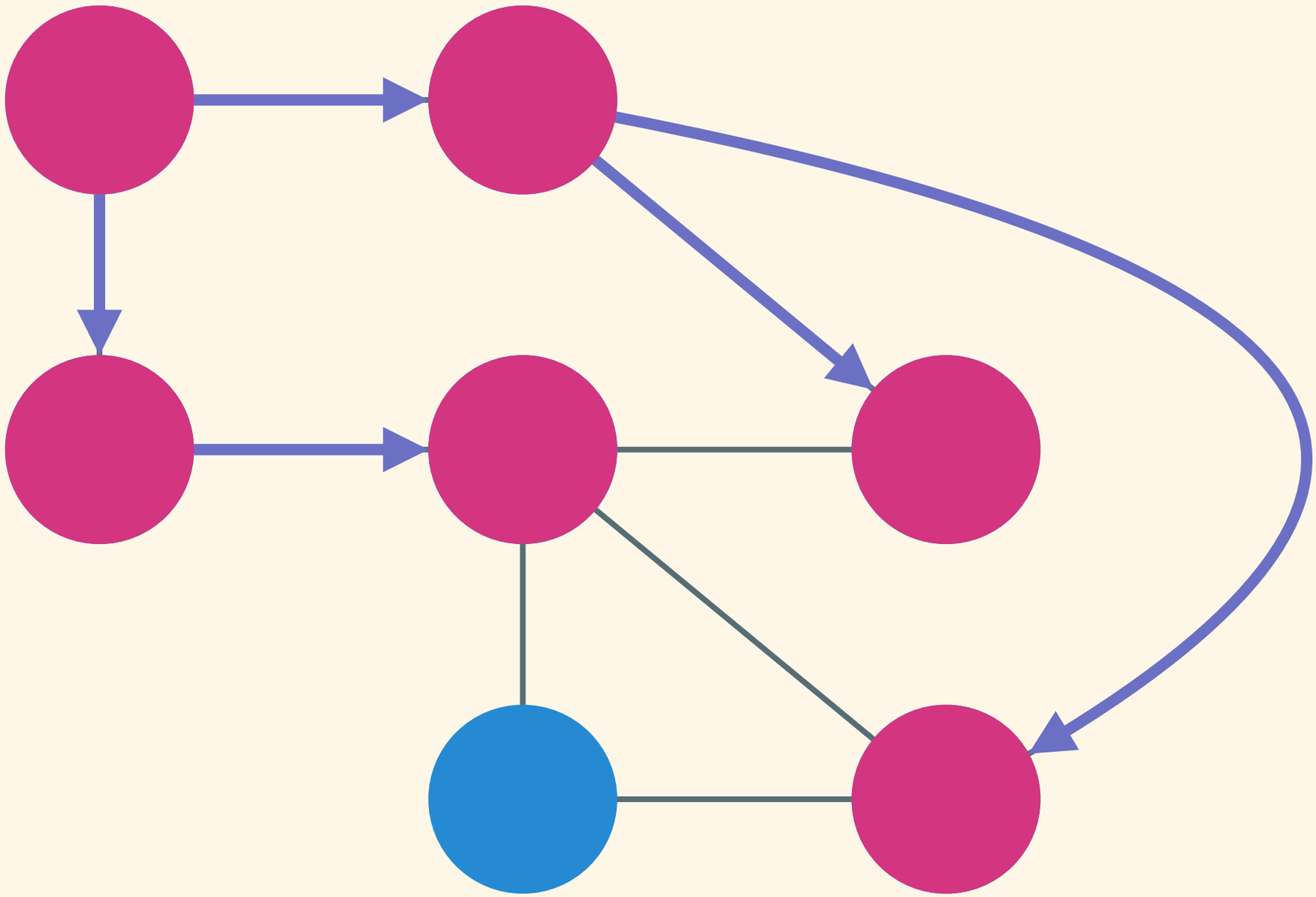

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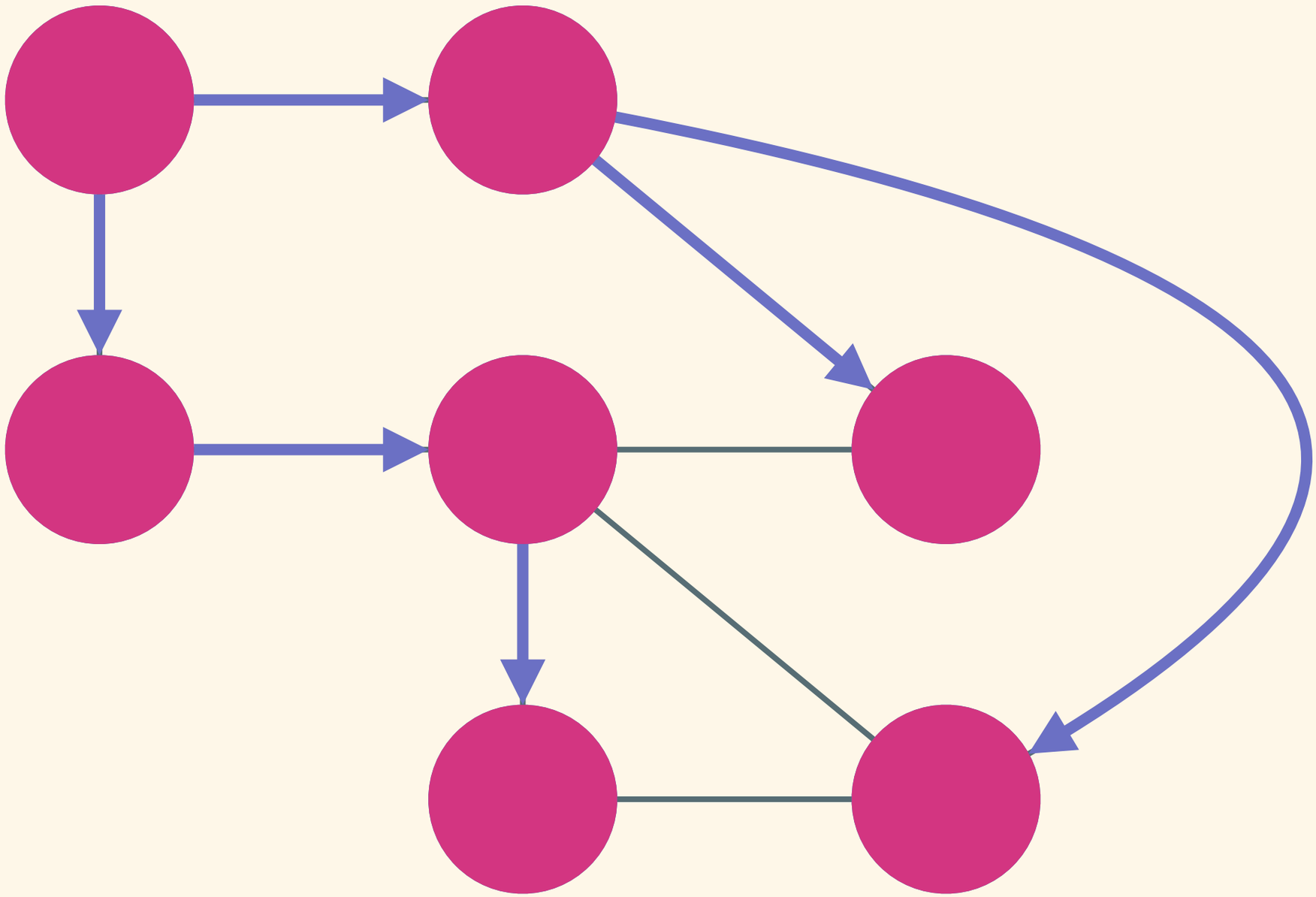
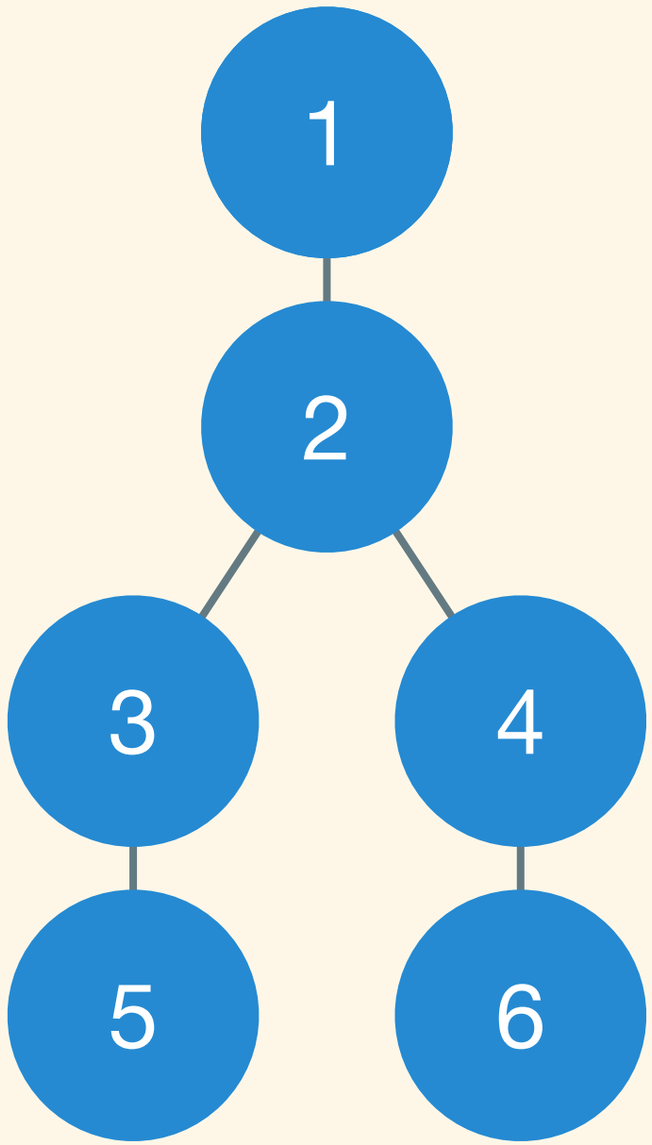
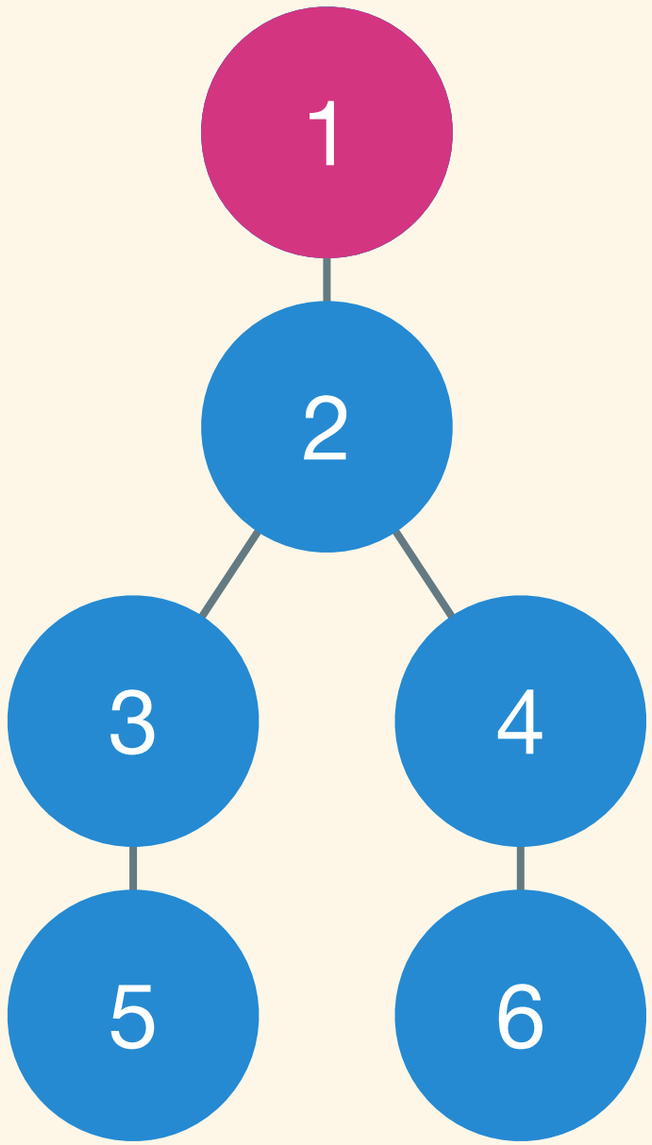
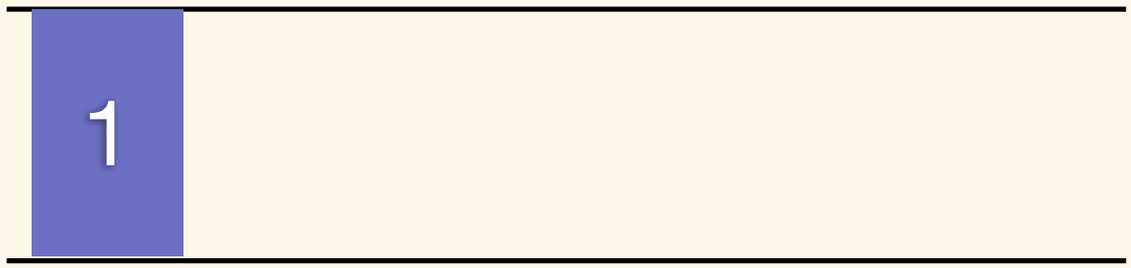


BFS & queue

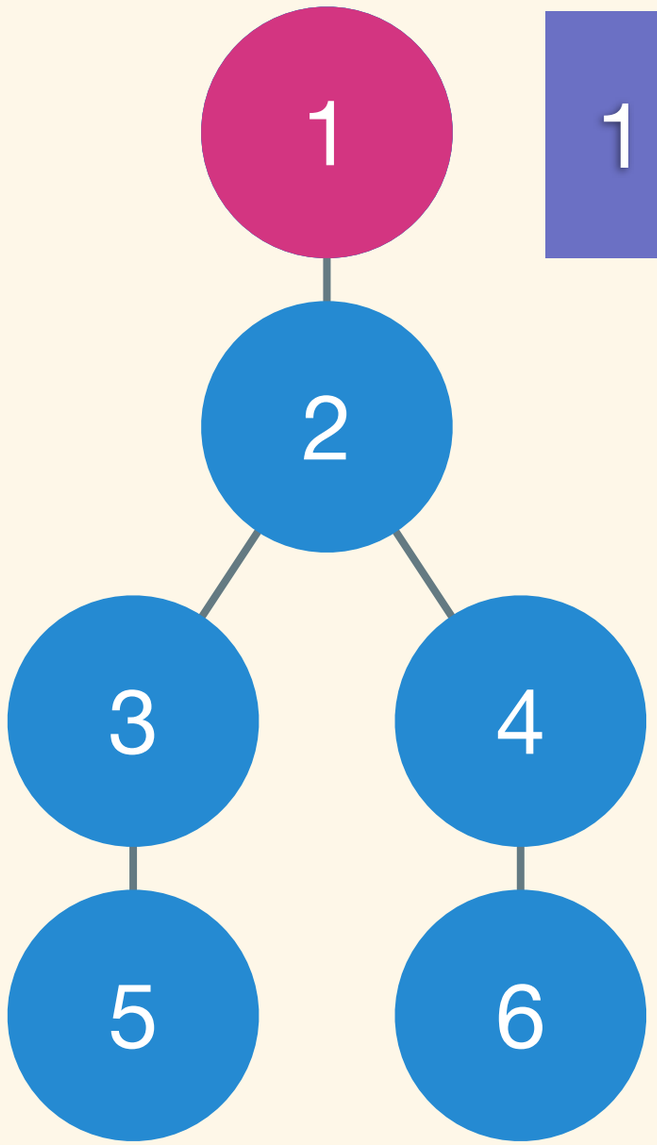


BFS & queue





BFS & queue



1

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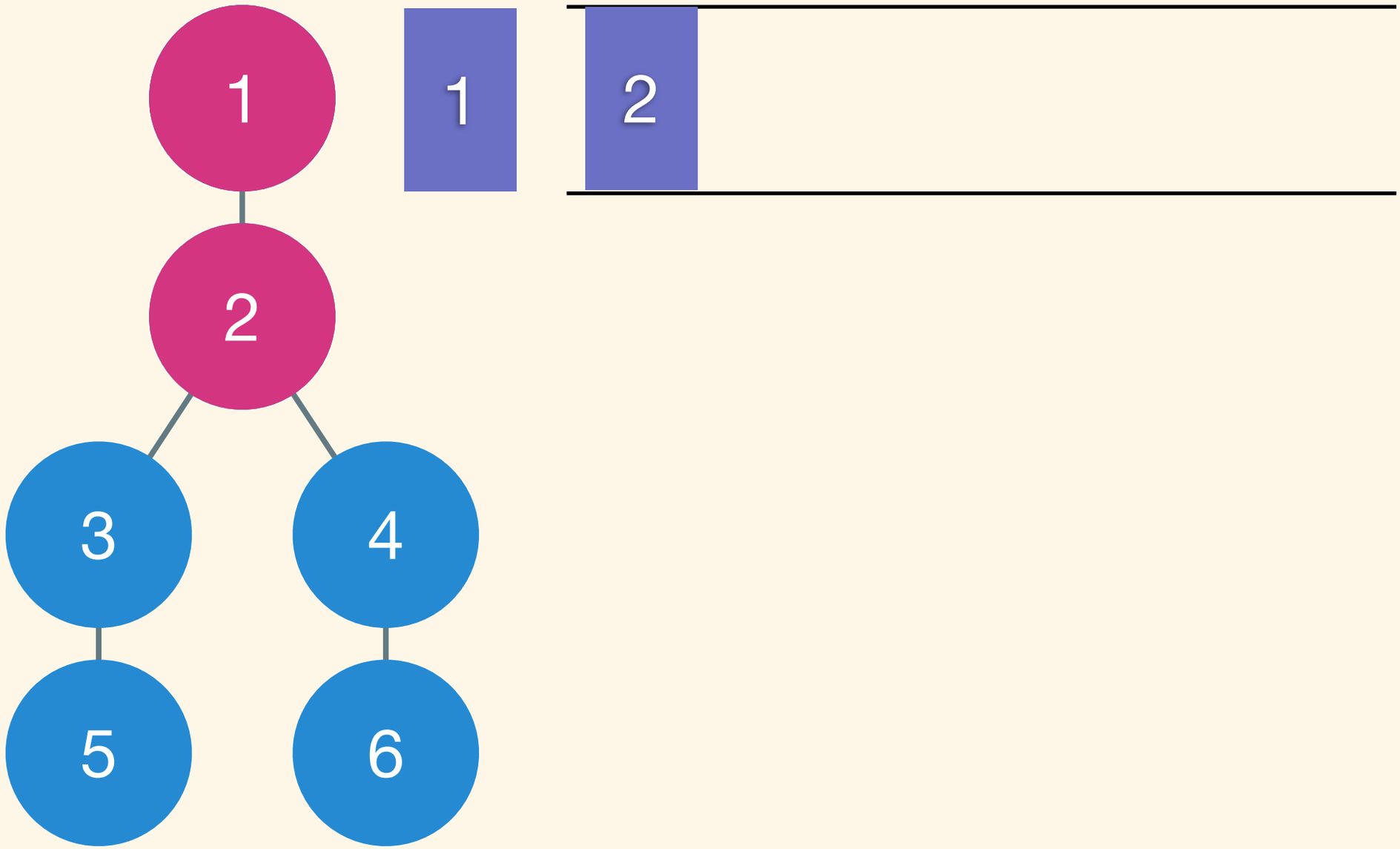

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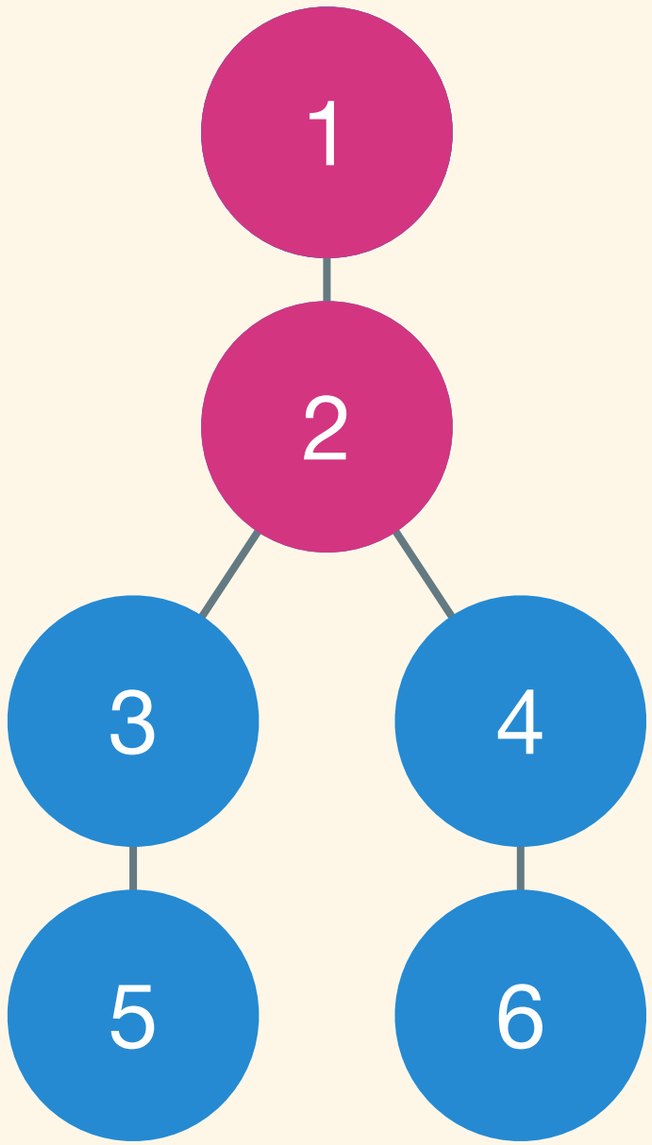

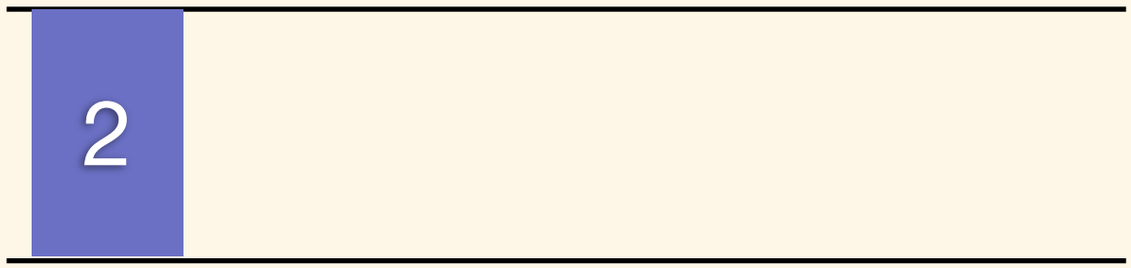

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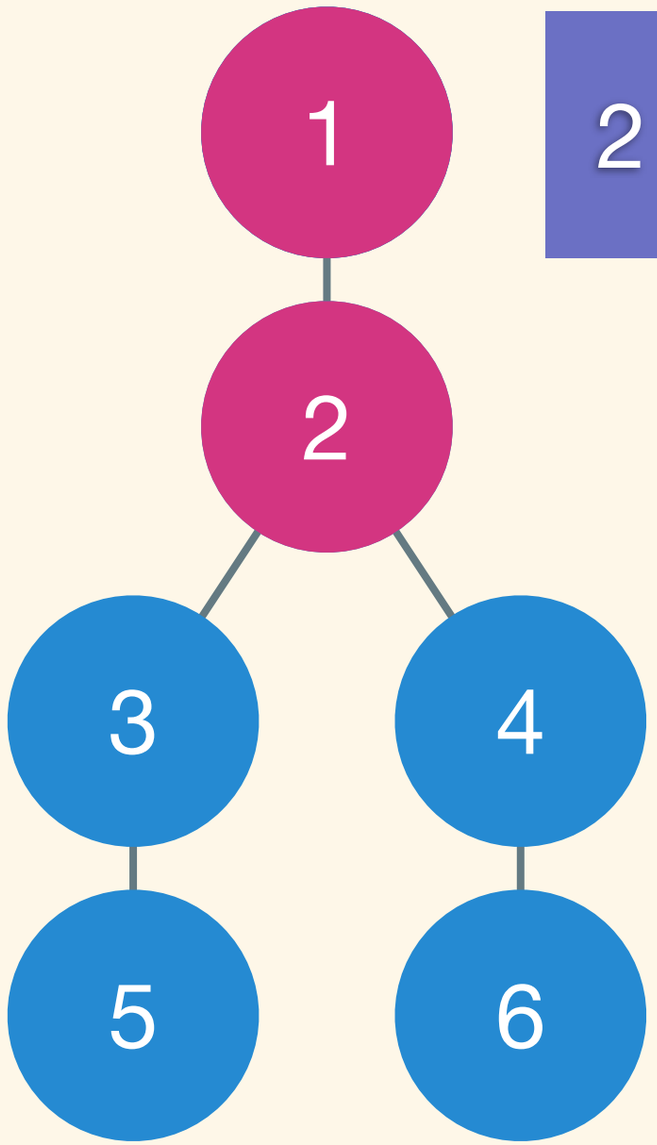

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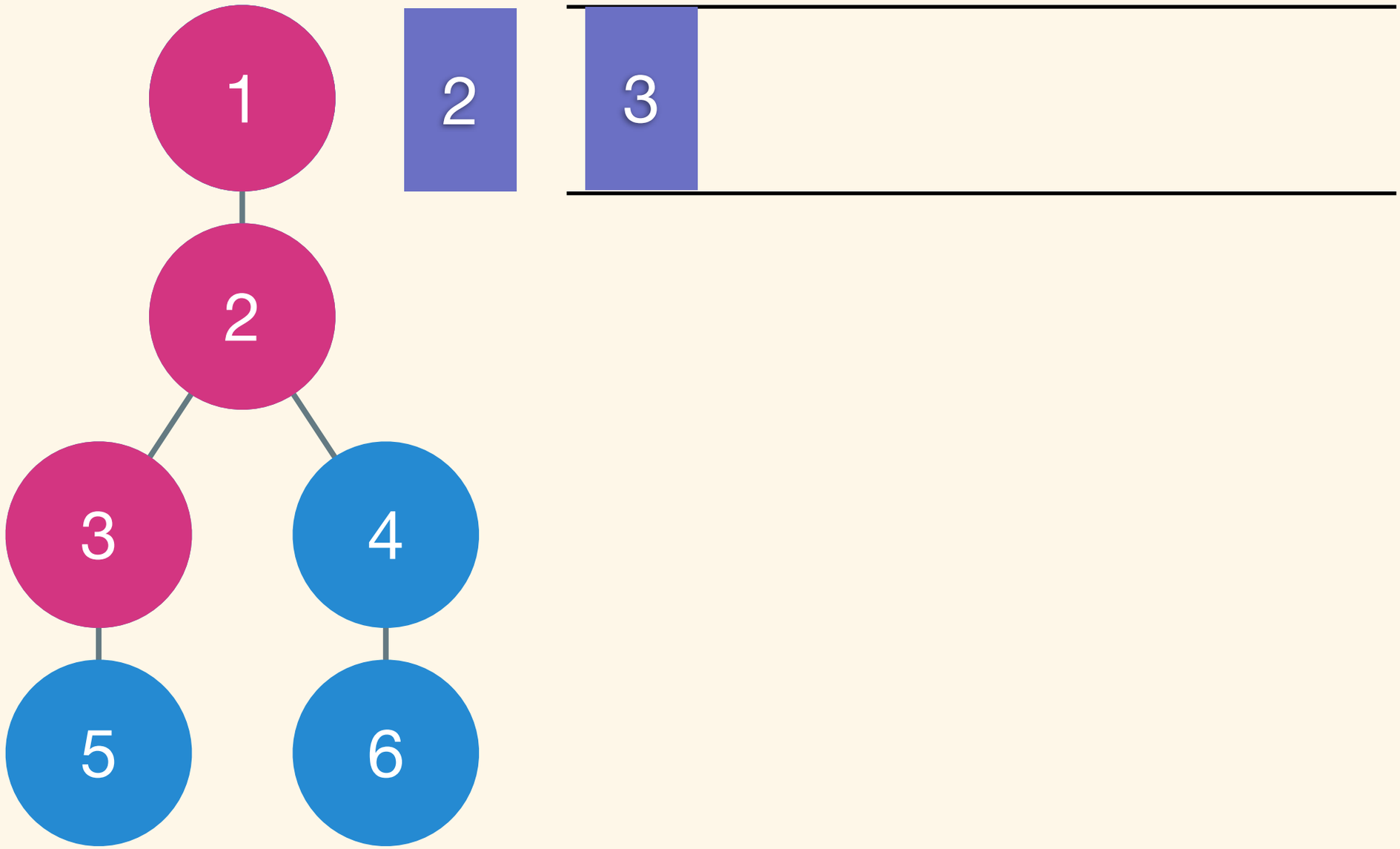

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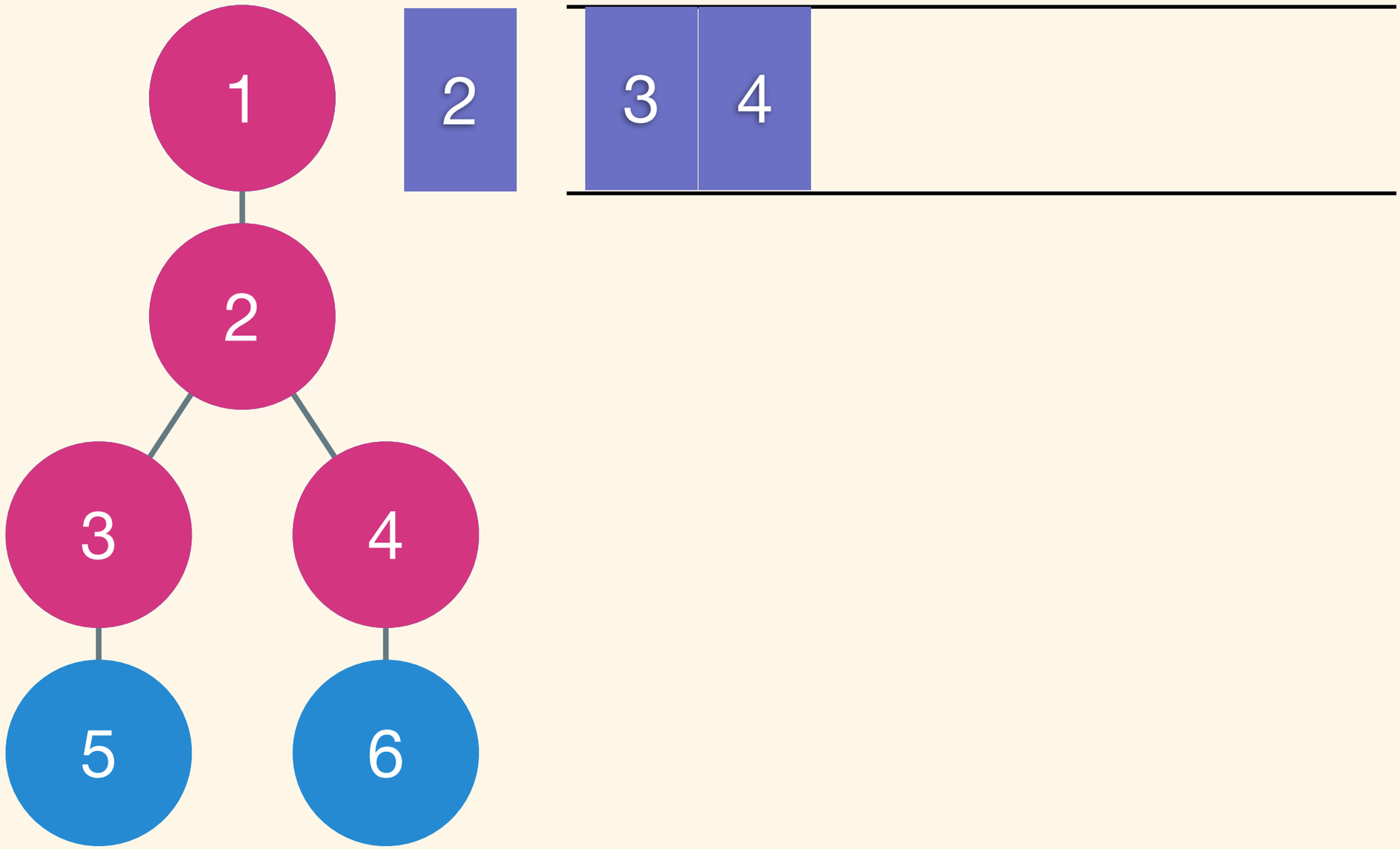

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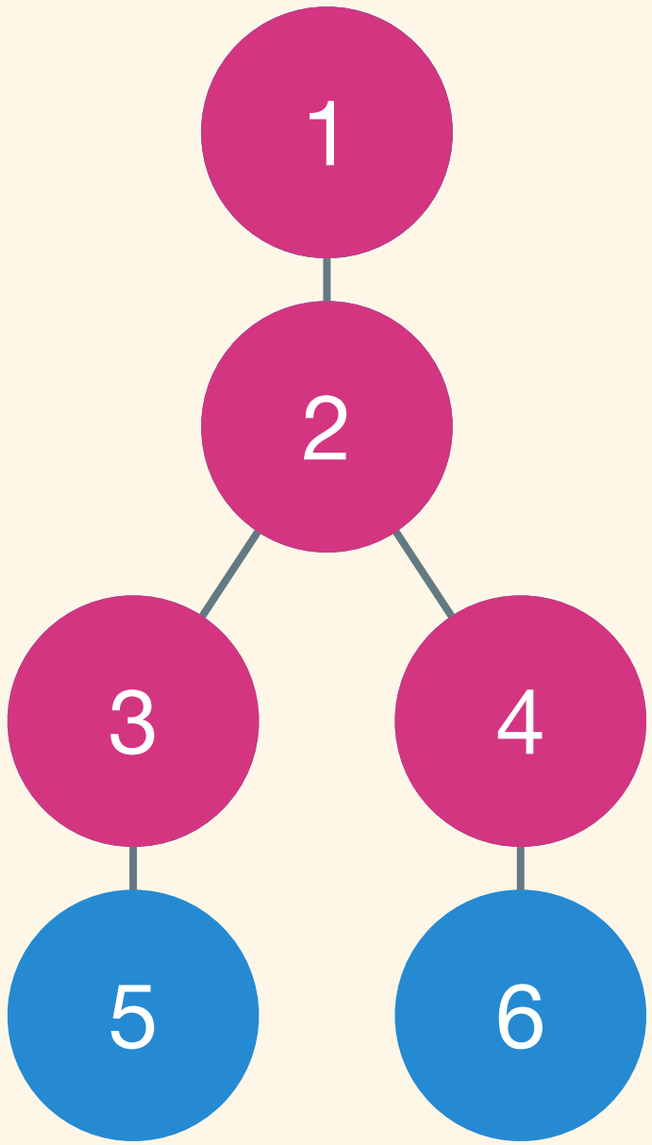

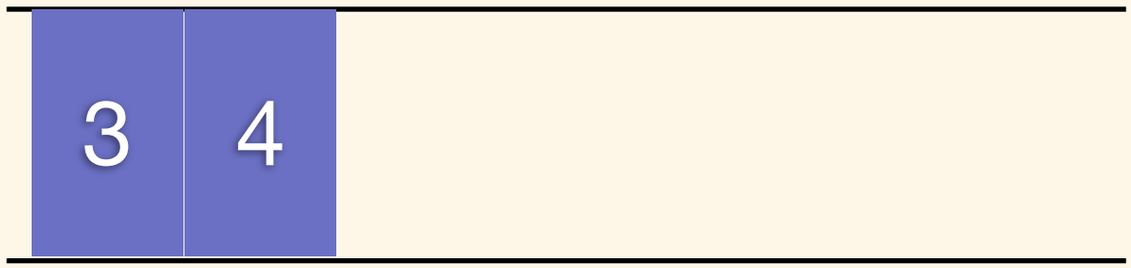

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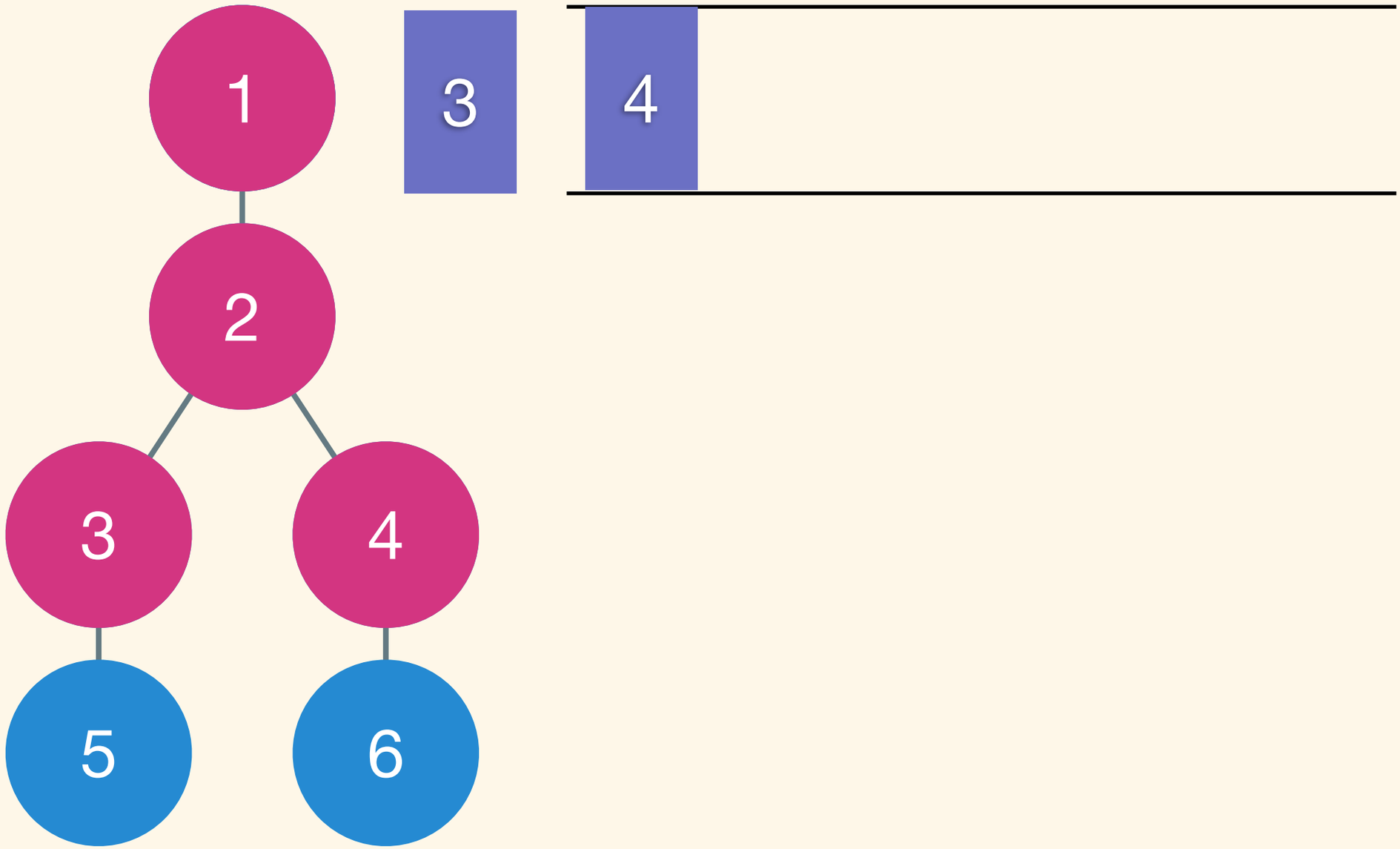

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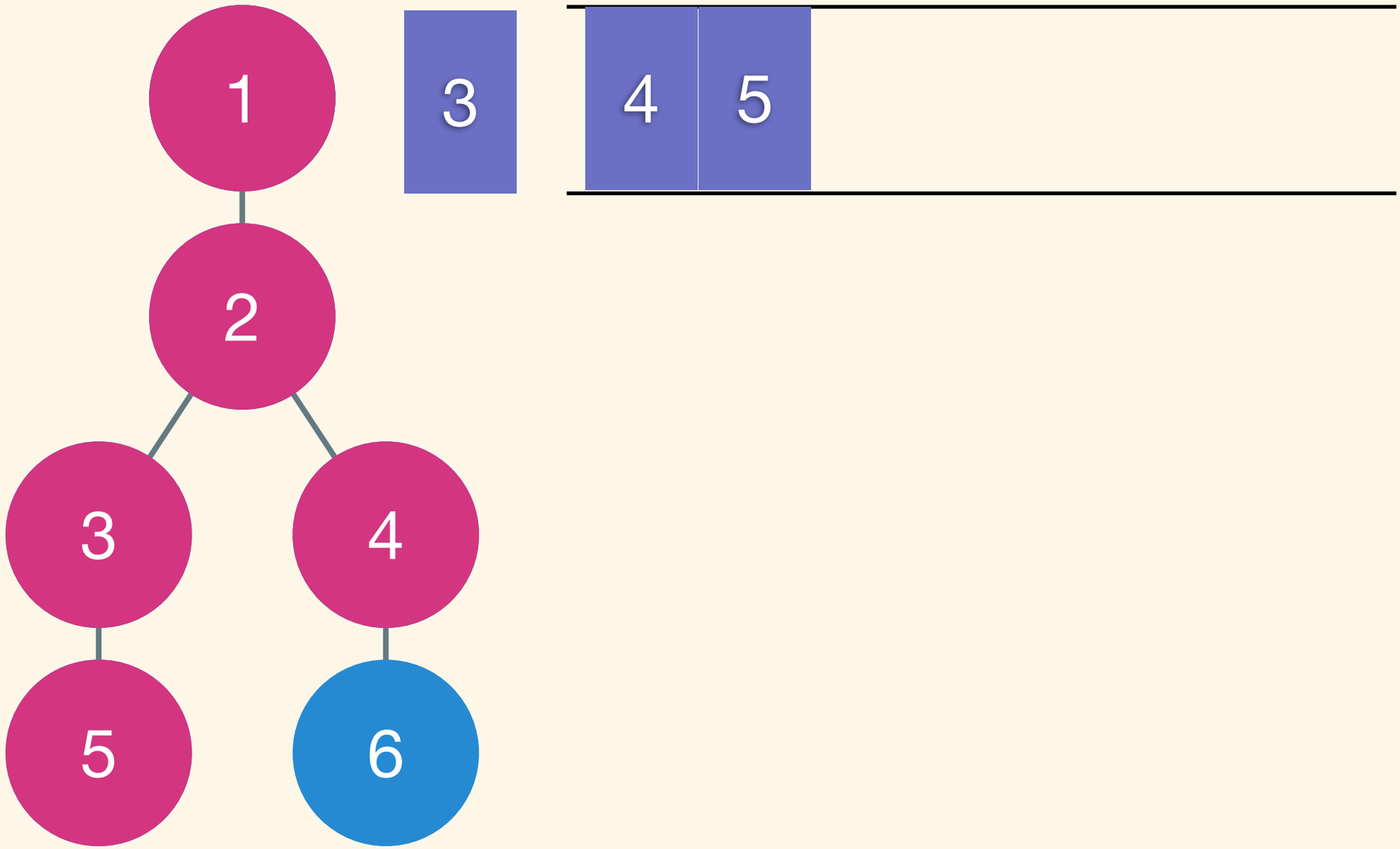

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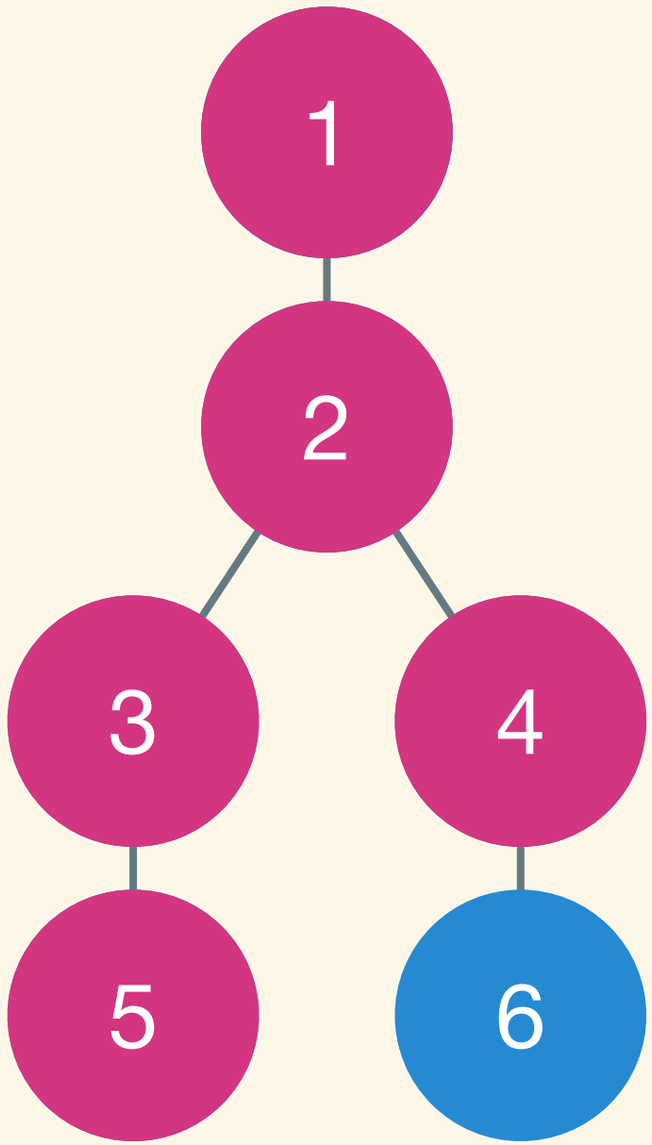

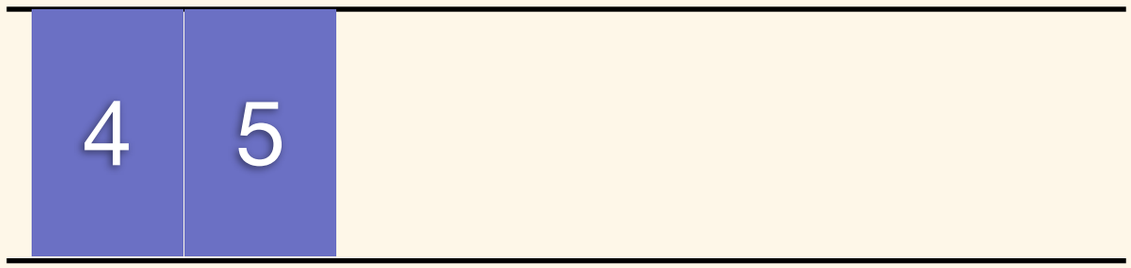

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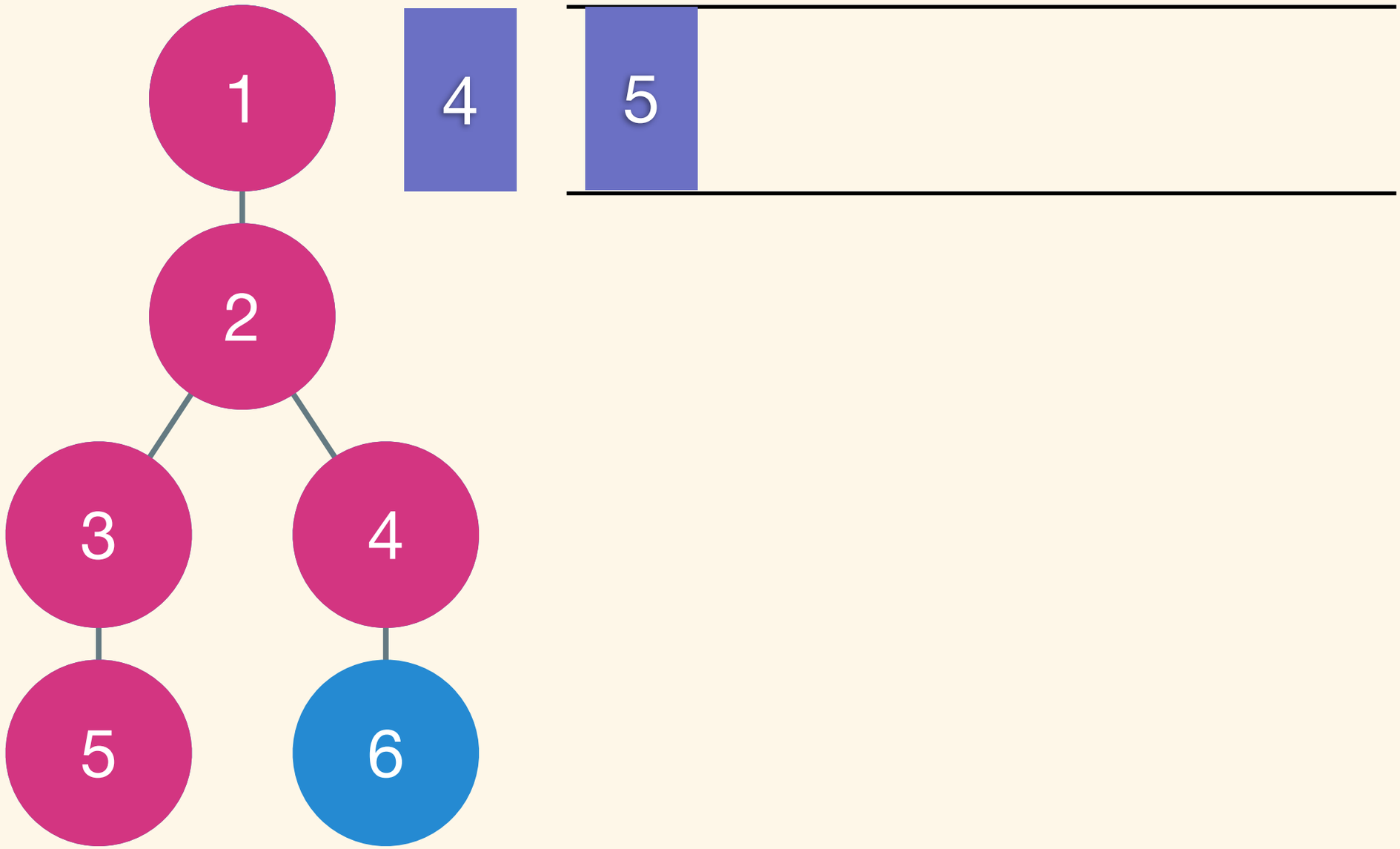

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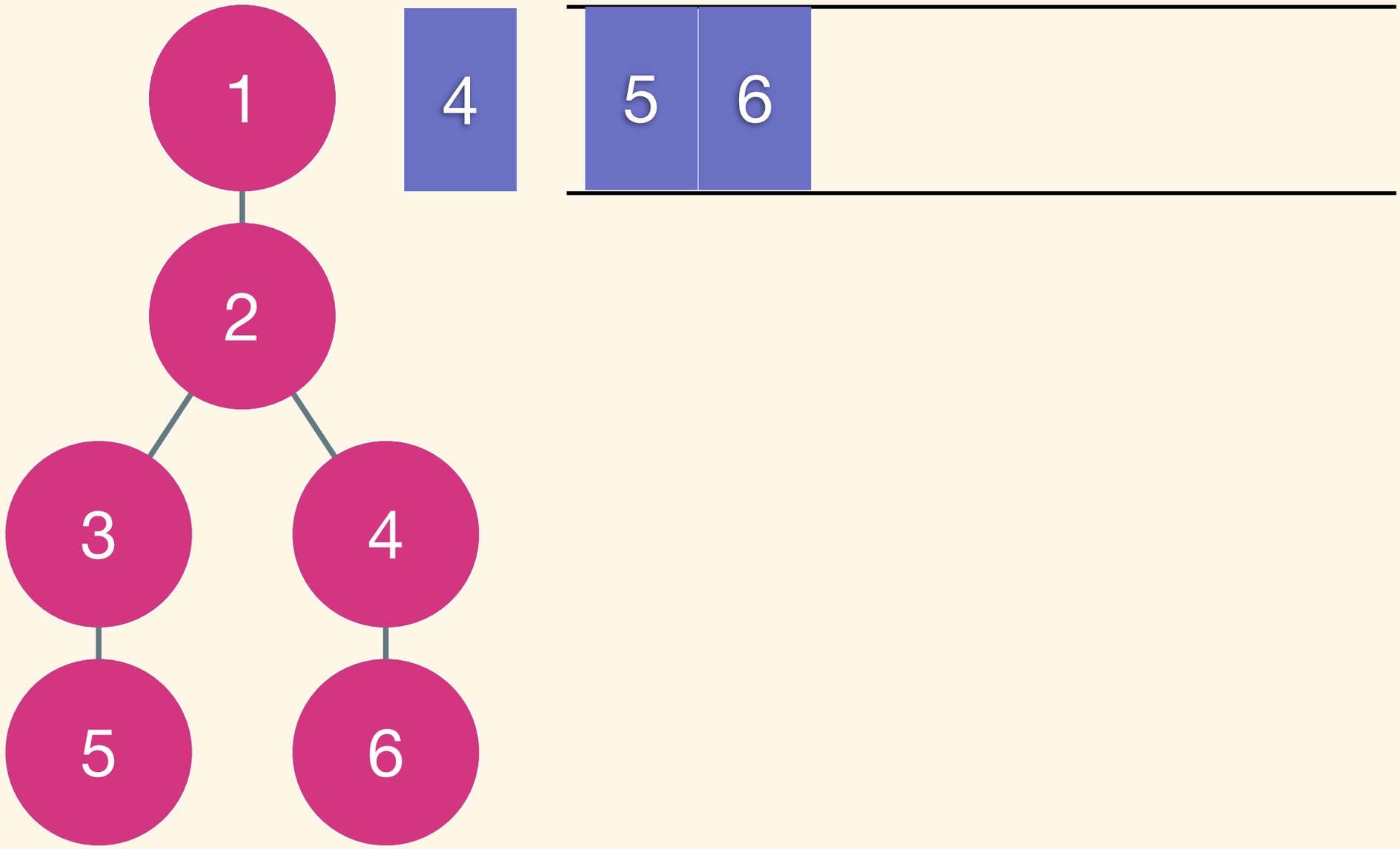

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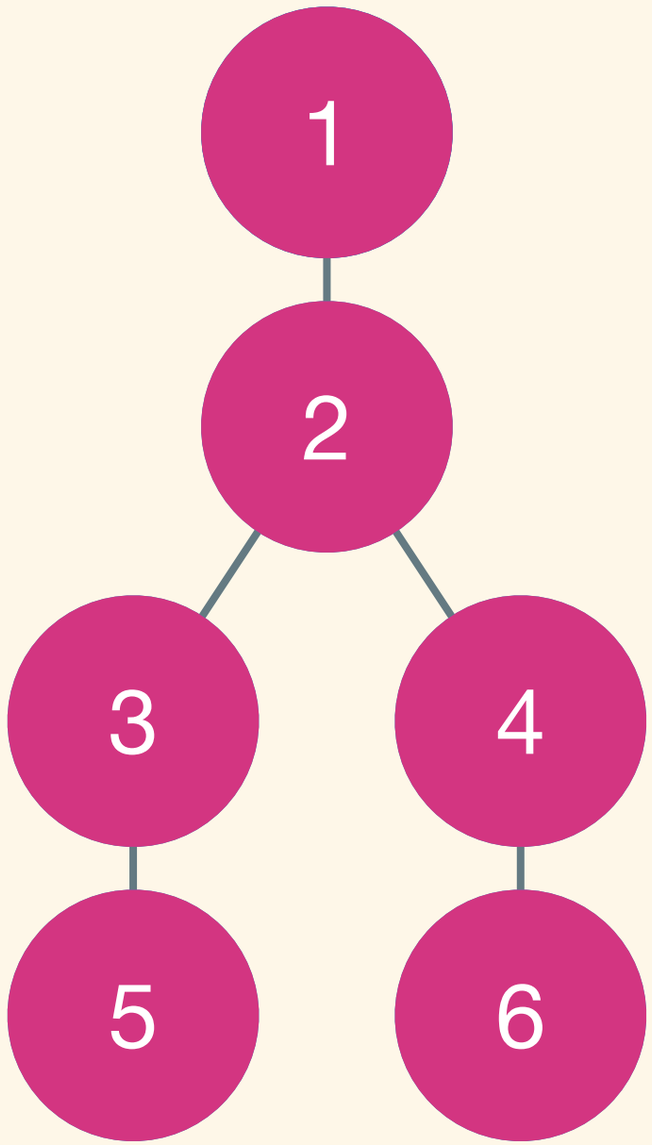

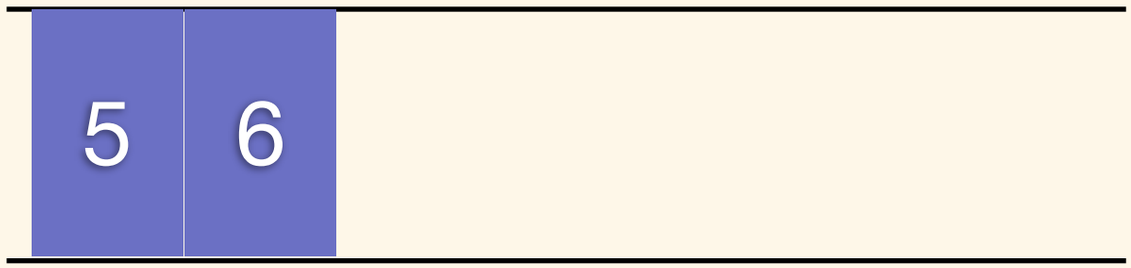

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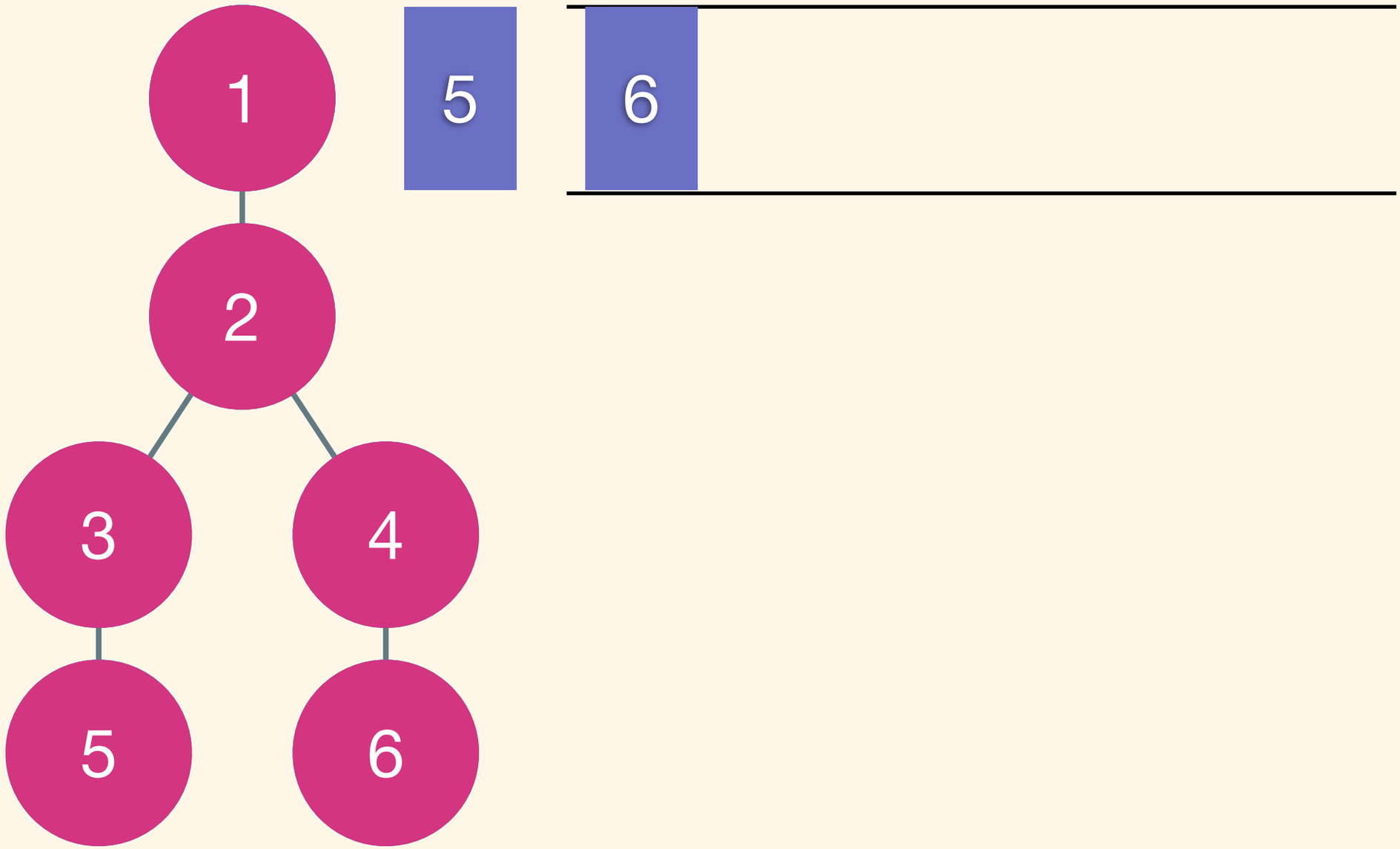

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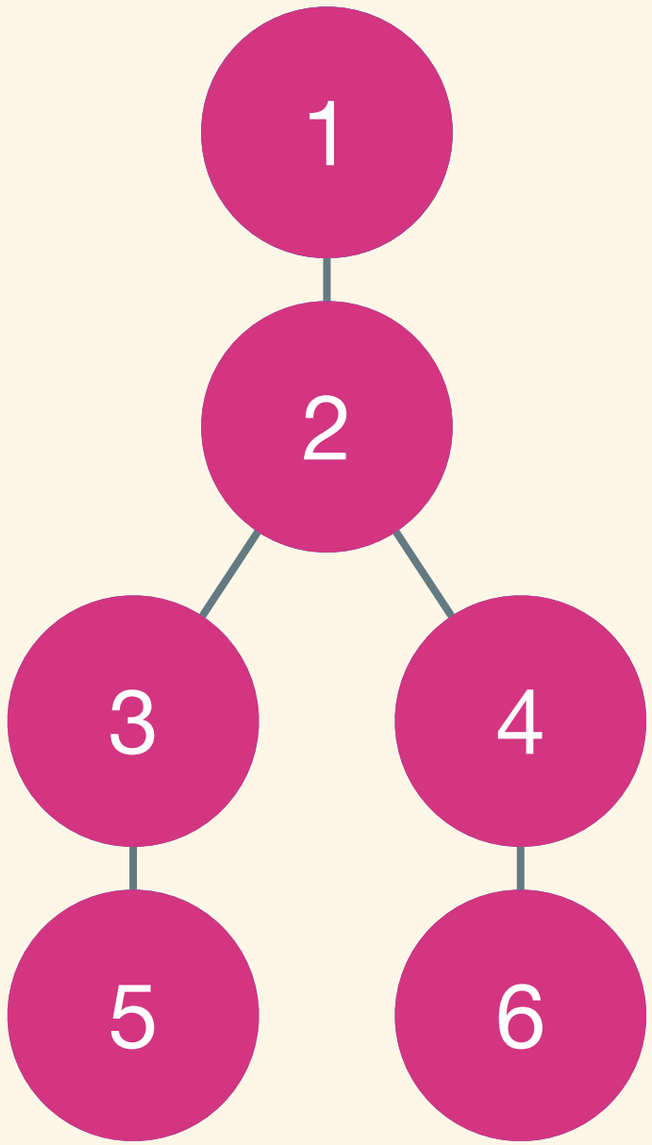

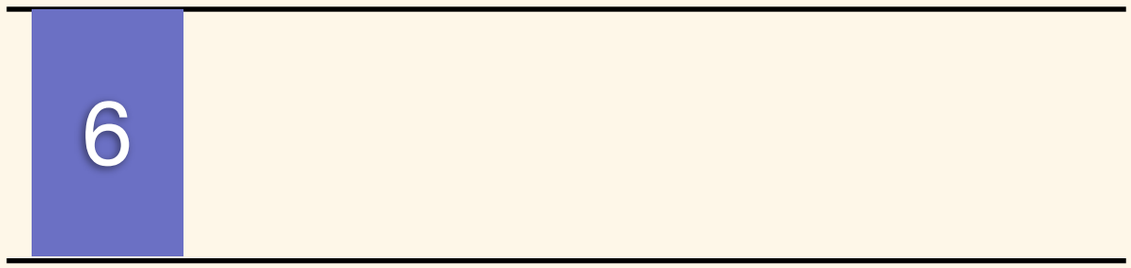

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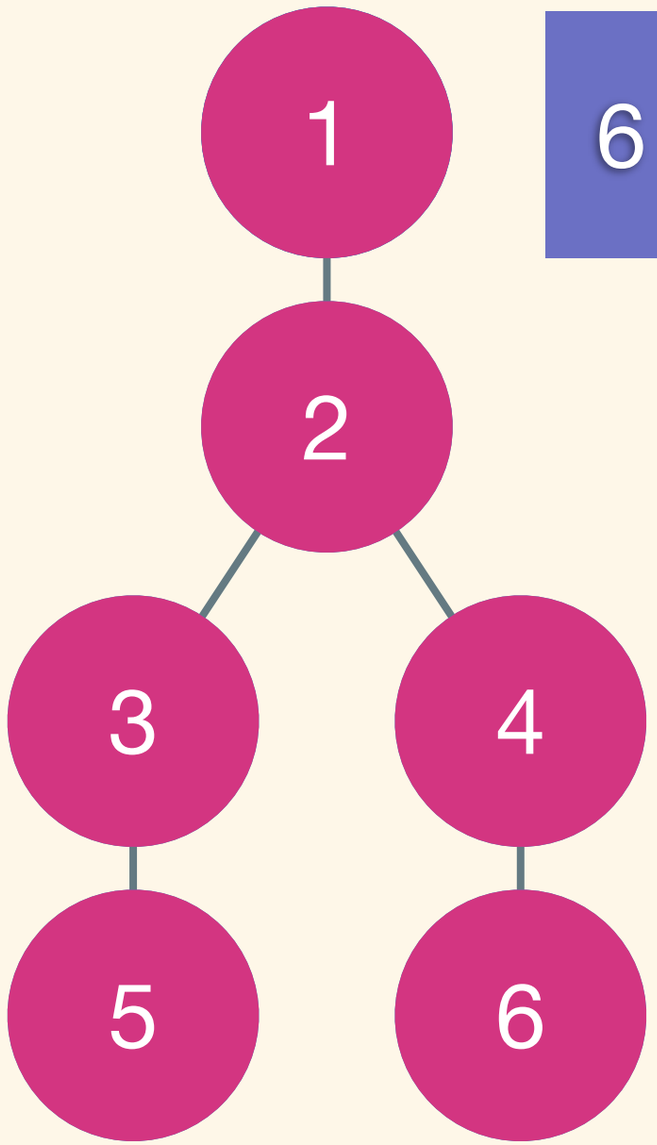

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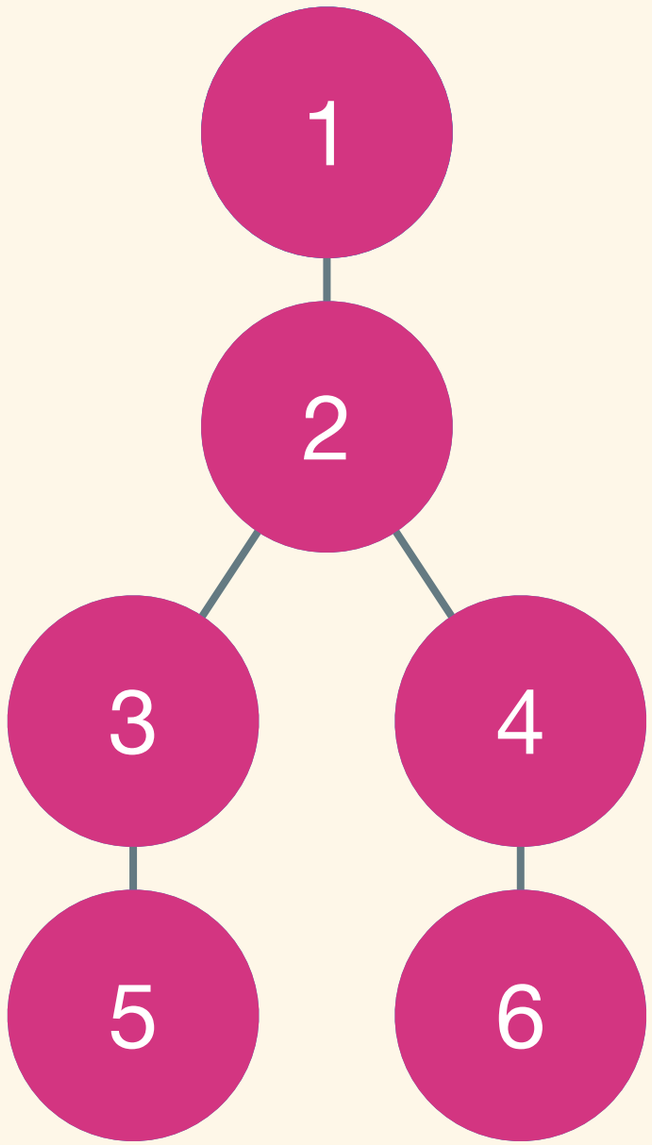
BFS & queue



Source Code

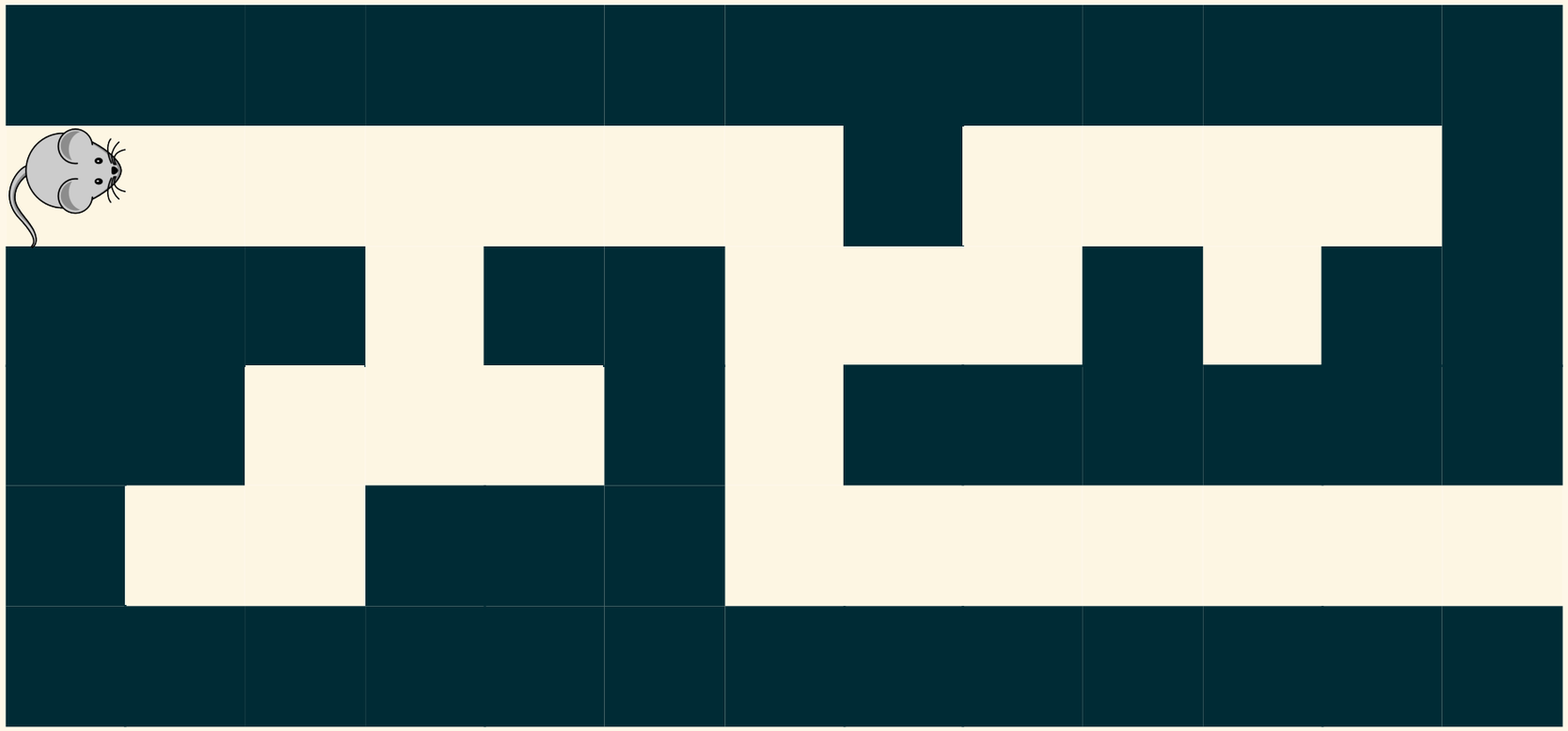
```
// There are n nodes.
// g is an adjacent matrix.

void BFS() {
  queue< int > que;
  que.push( 0 );
  while ( que.empty() != true ) {
    int now = que.front();
    que.pop();
    visited[ now ] = true;
    for ( int i = 0; i < n; ++i )
      if ( g[ now ][ i ] == true )
        que.push( i );
  }
}
```

Time Complexity

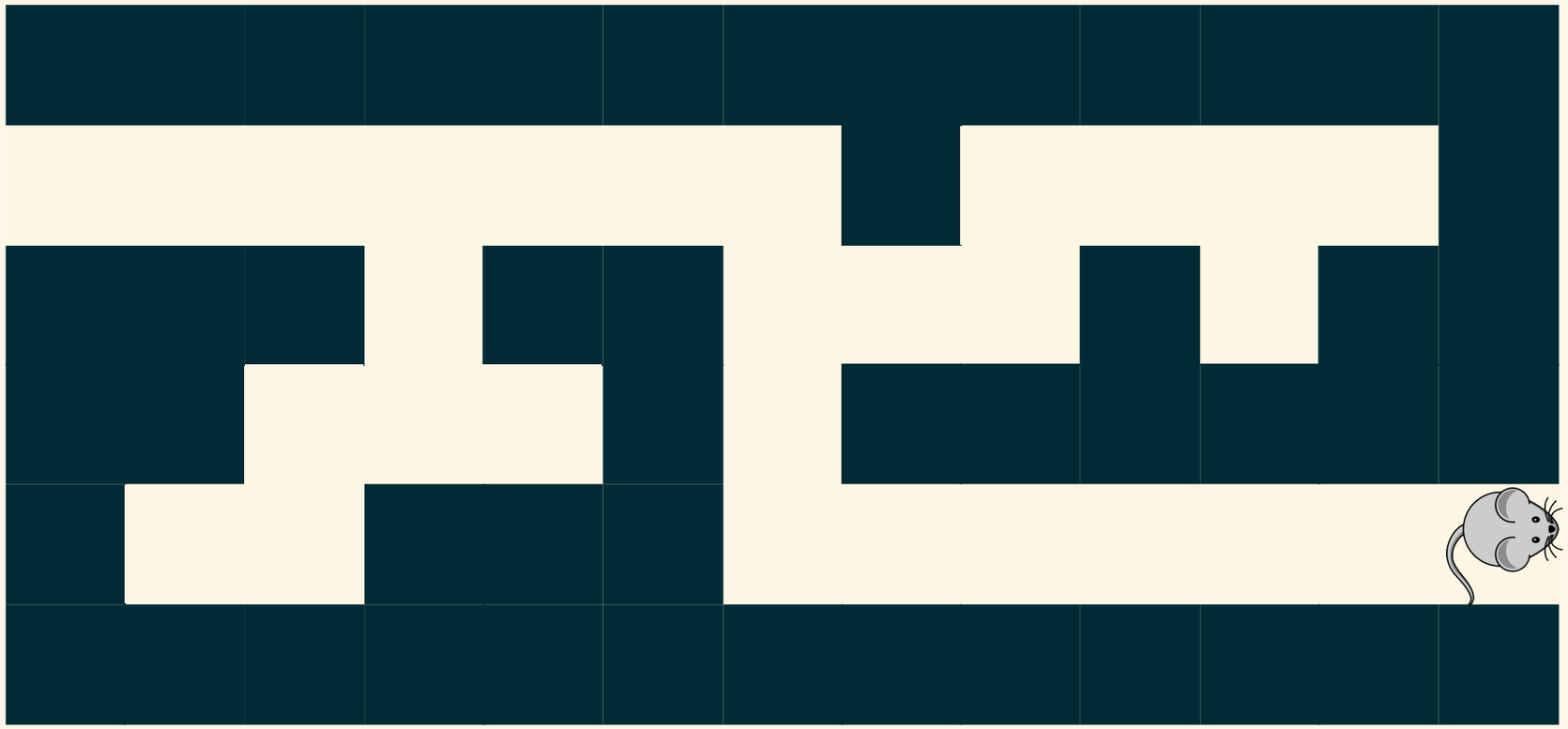
DFS	**O(V+E)**
BFS	**O(V+E)**

V: the number of nodes
E: the number of edges

老鼠走迷宮 (DFS)



老鼠走迷宫 (DFS)



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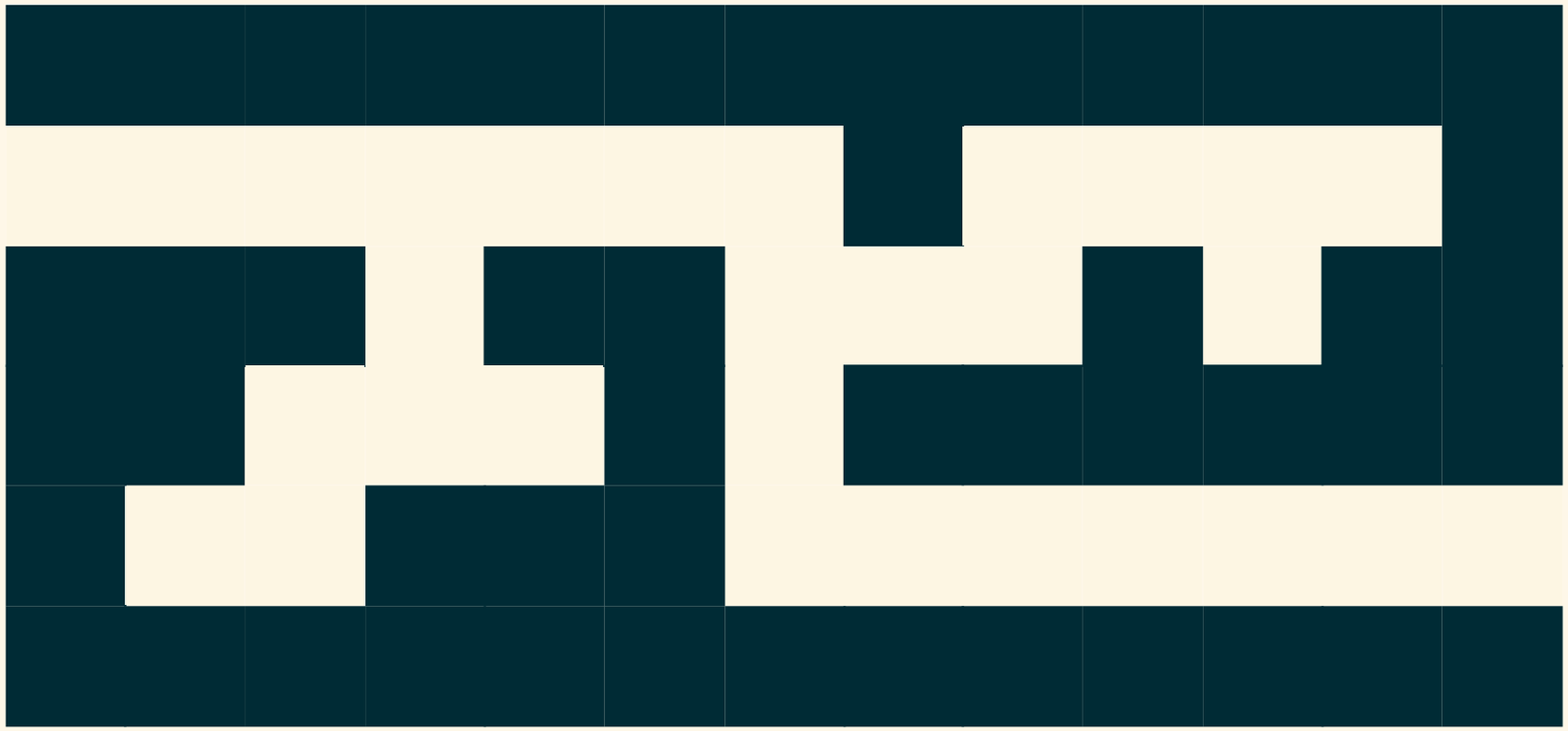

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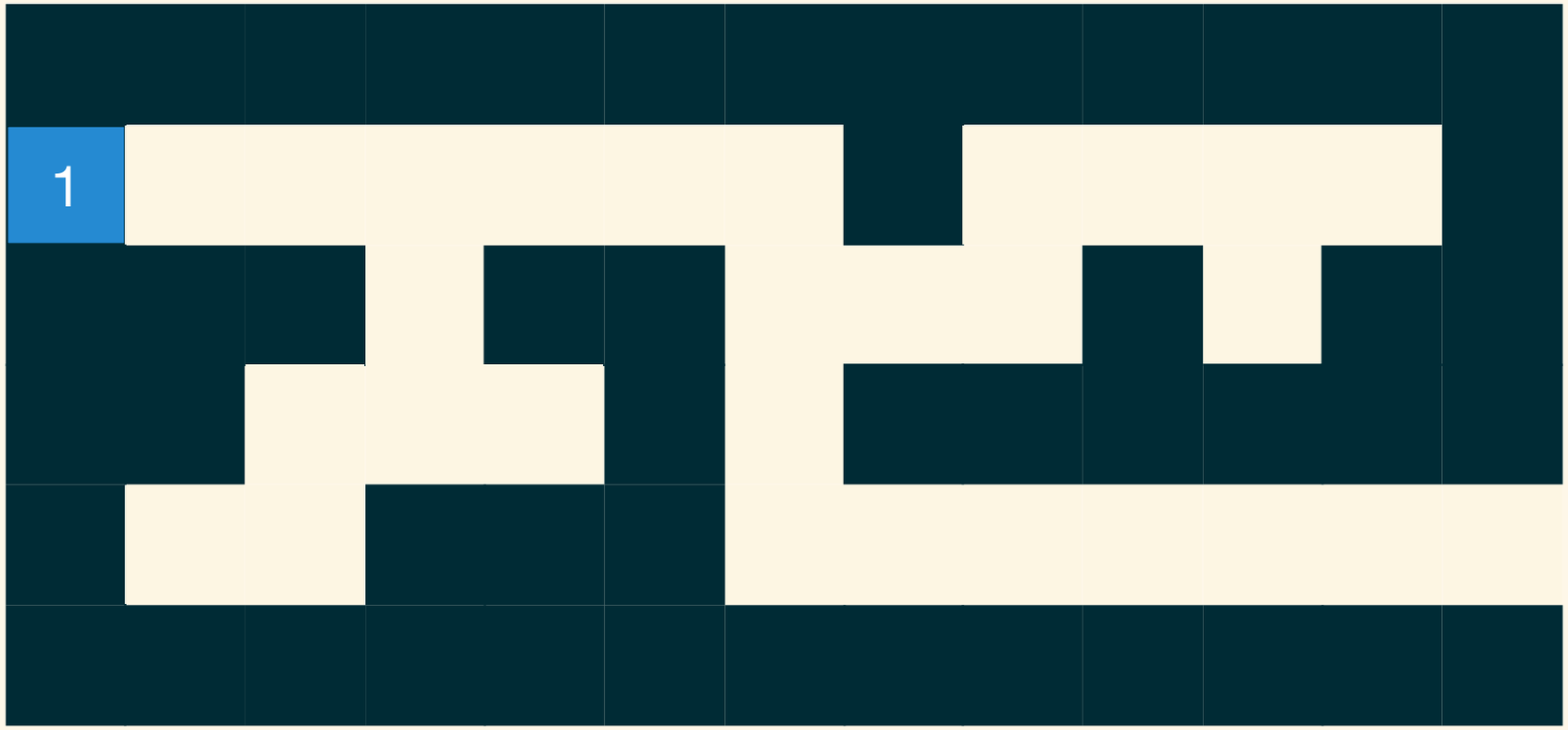

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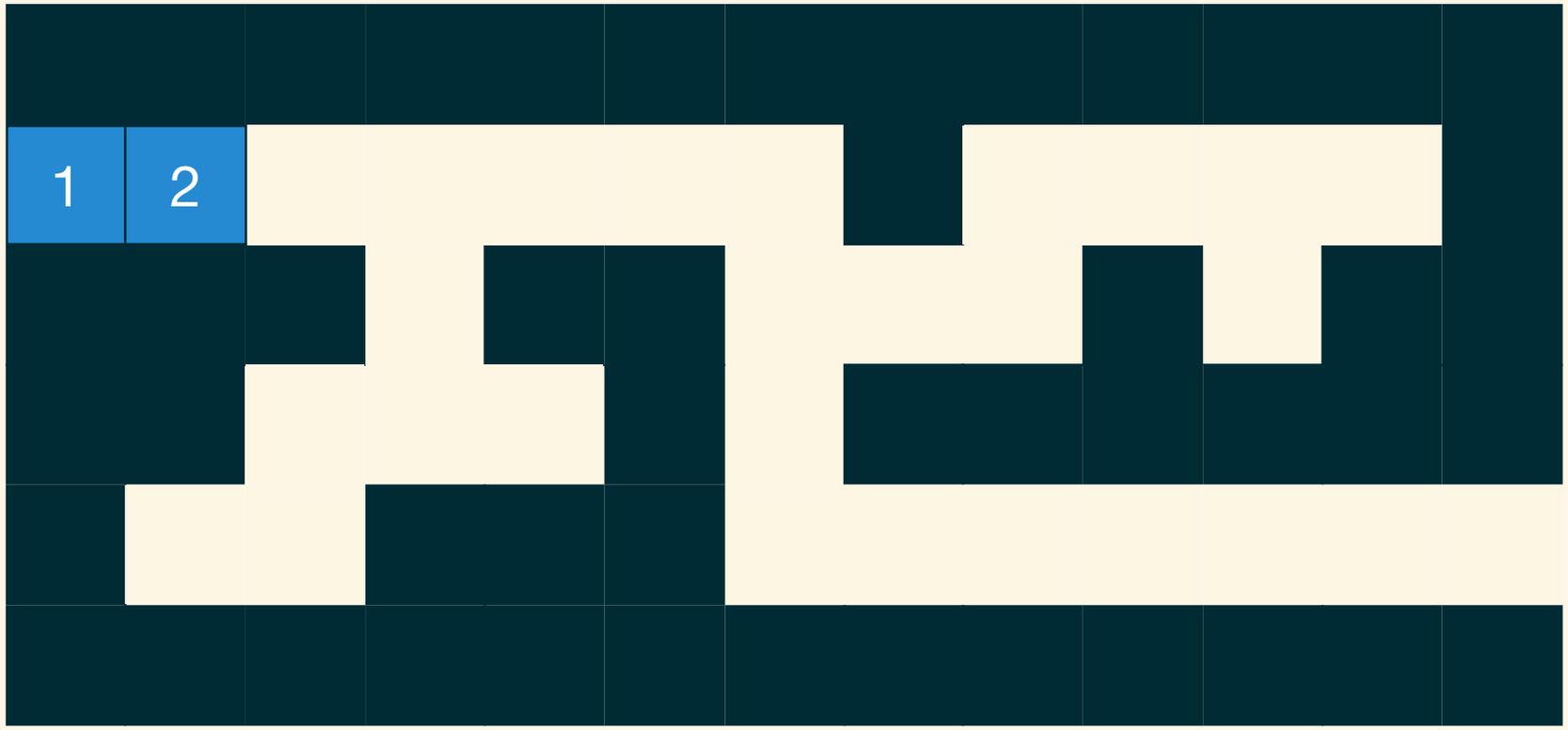

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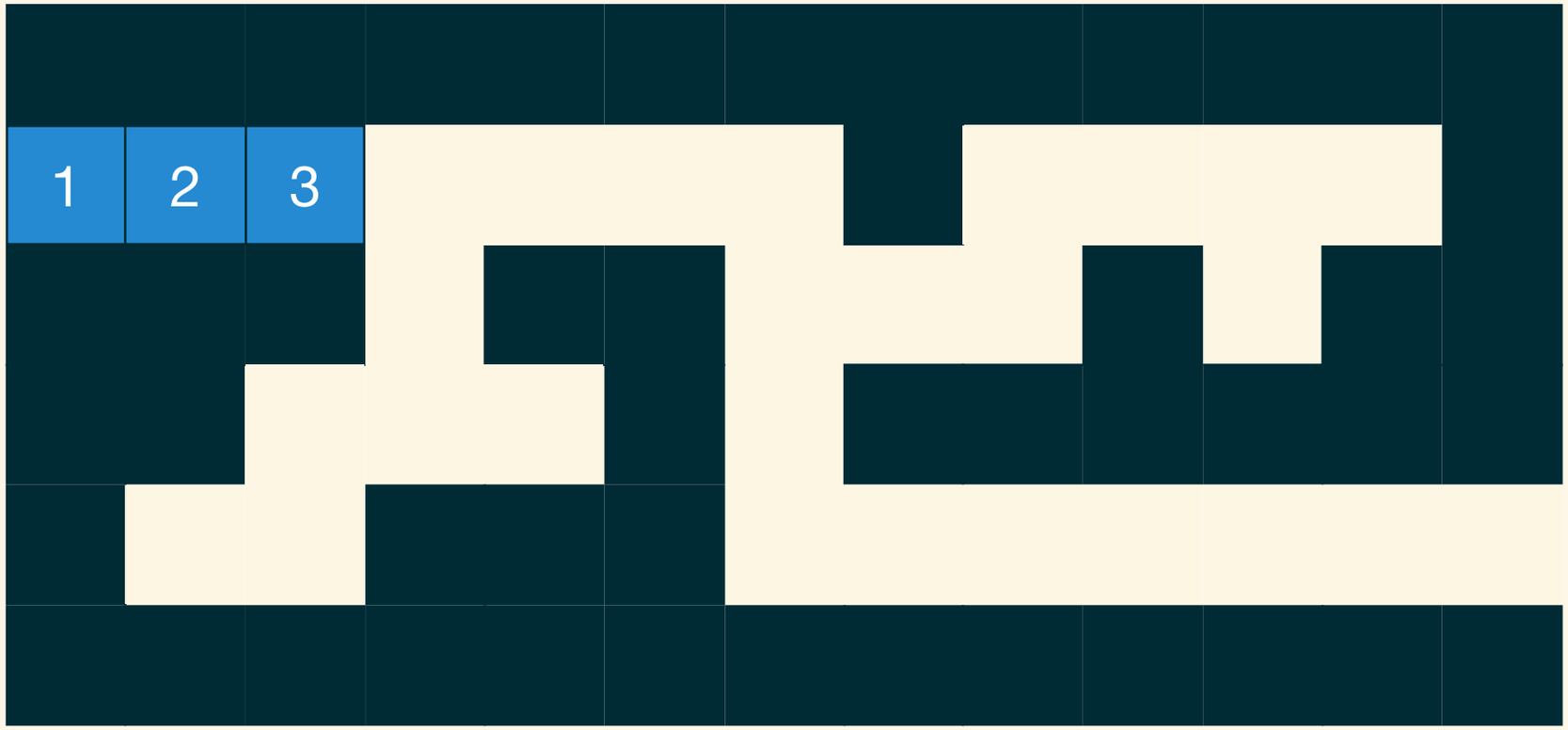

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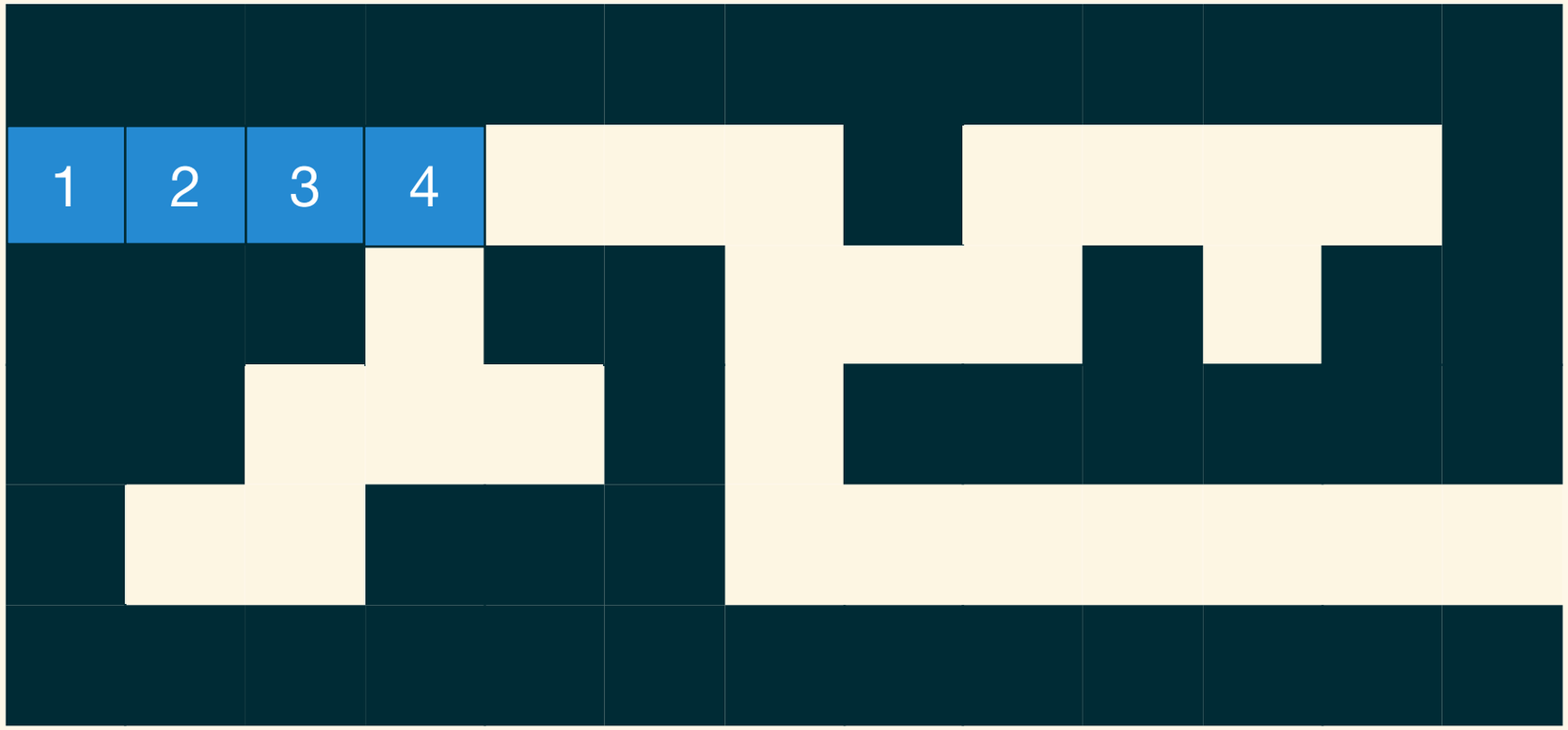

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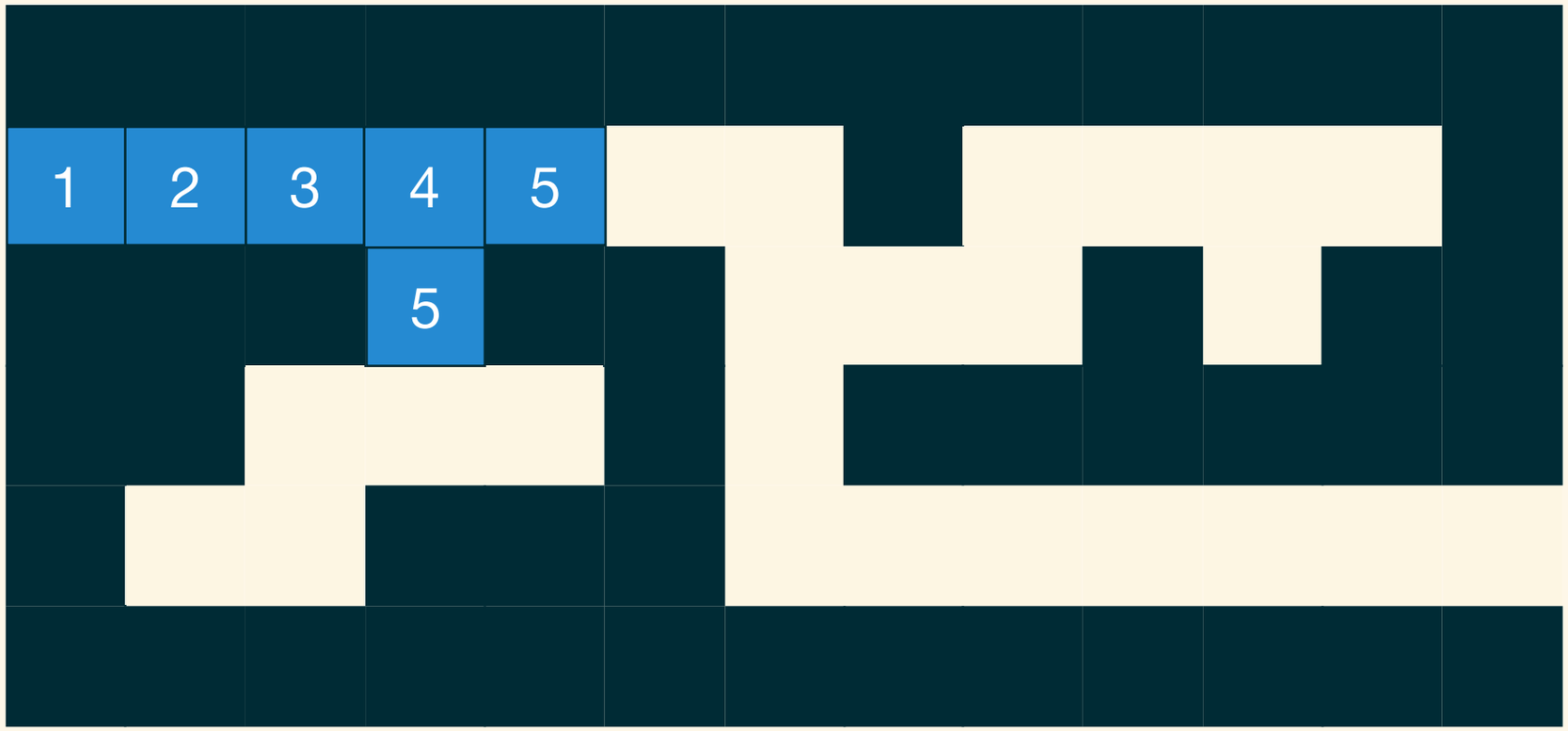

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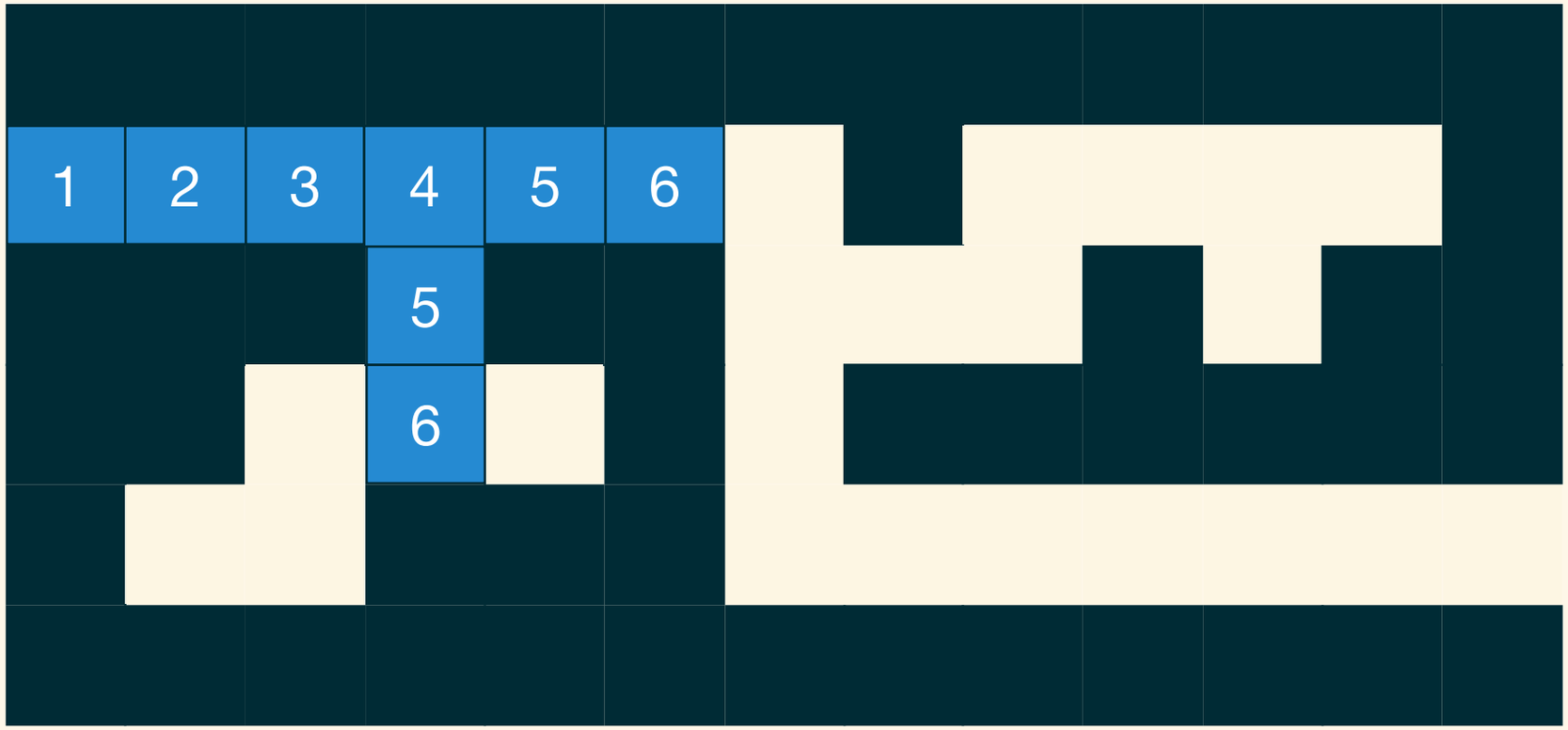

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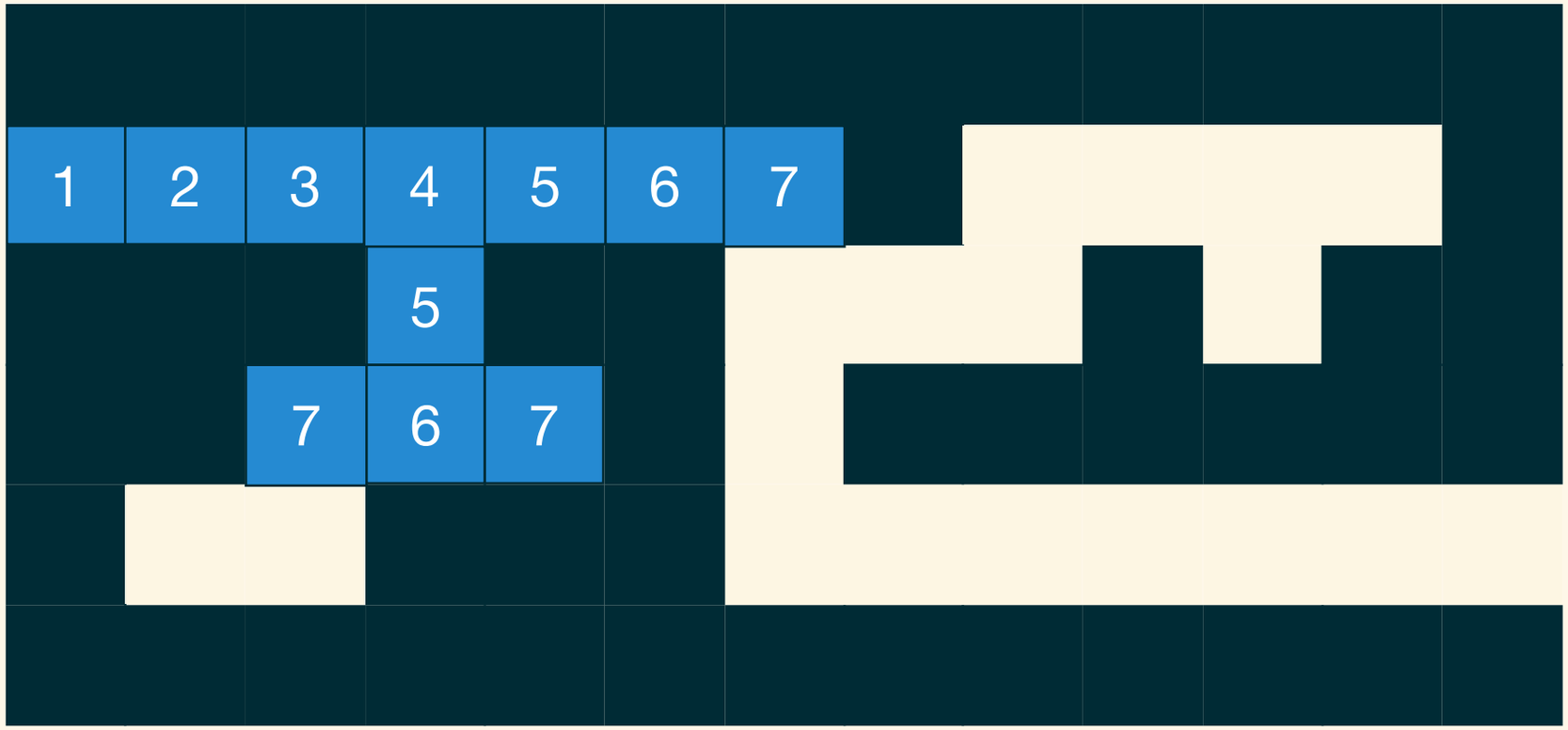

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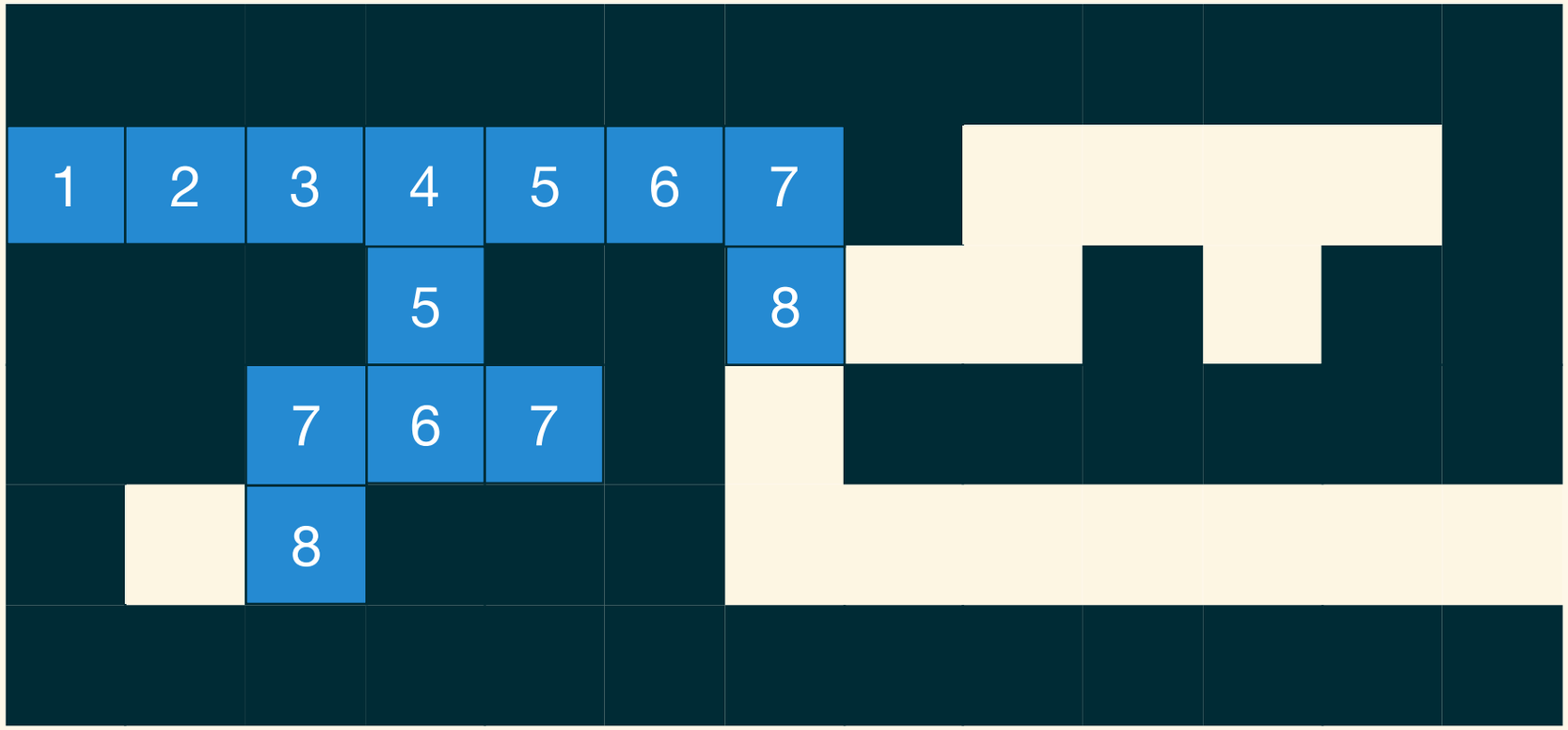

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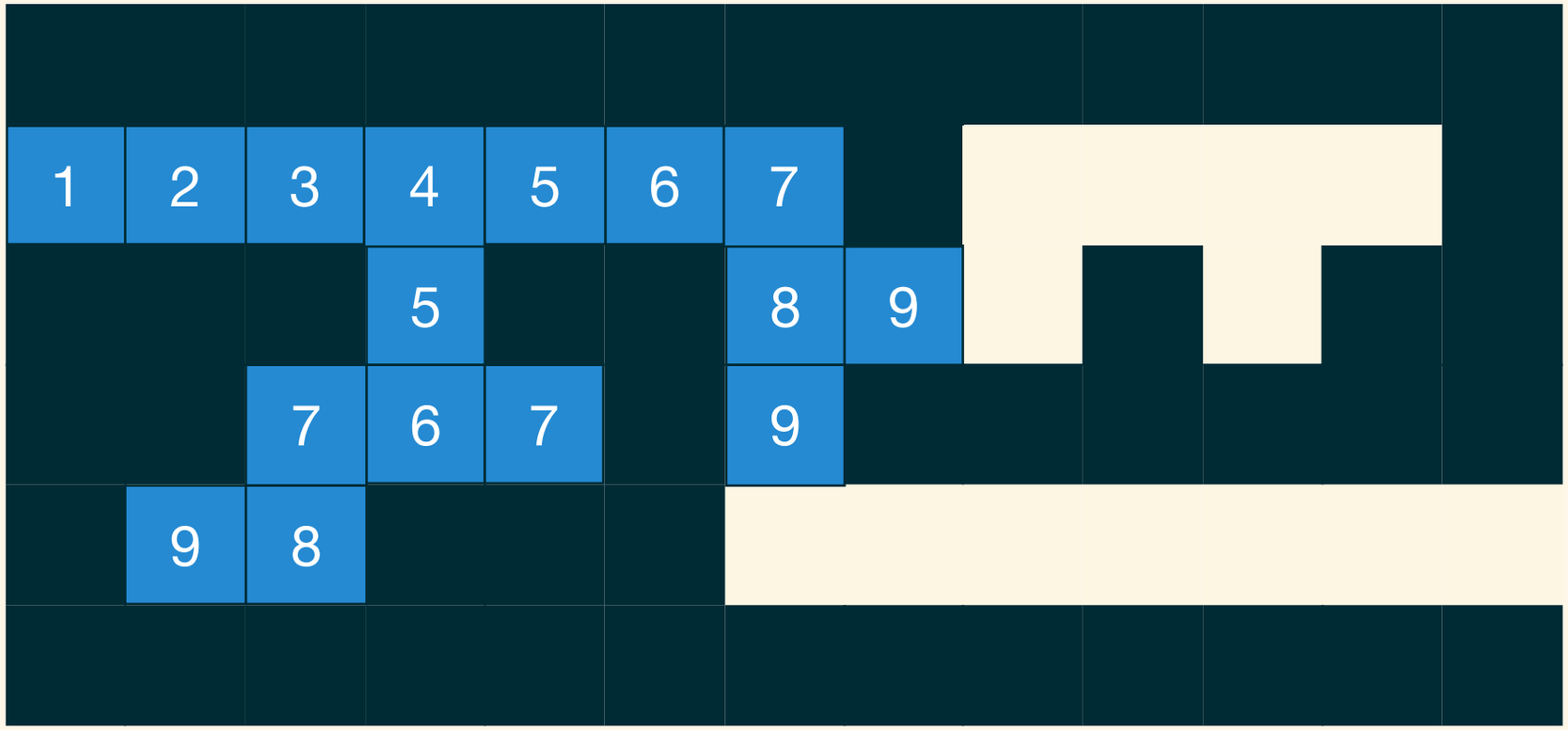

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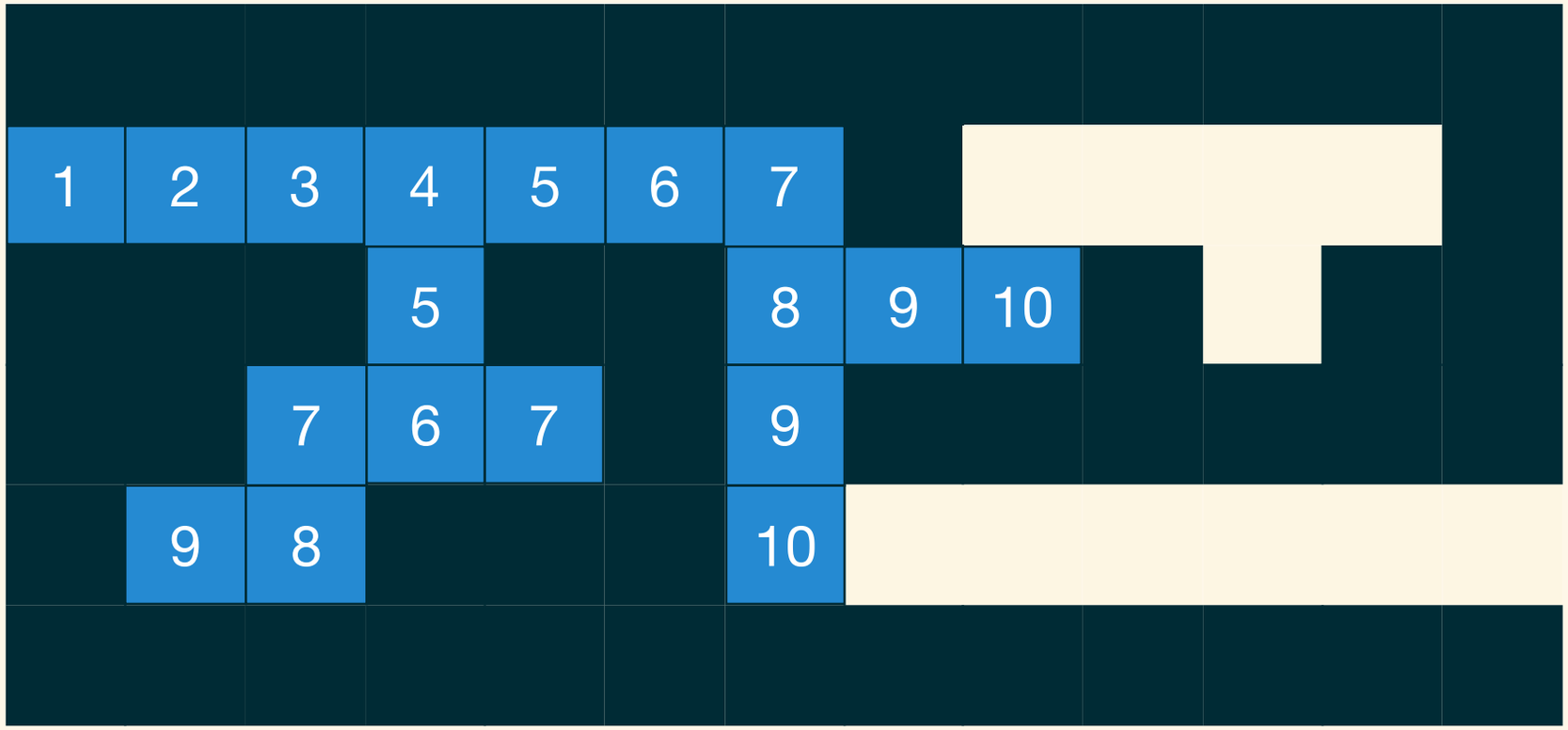

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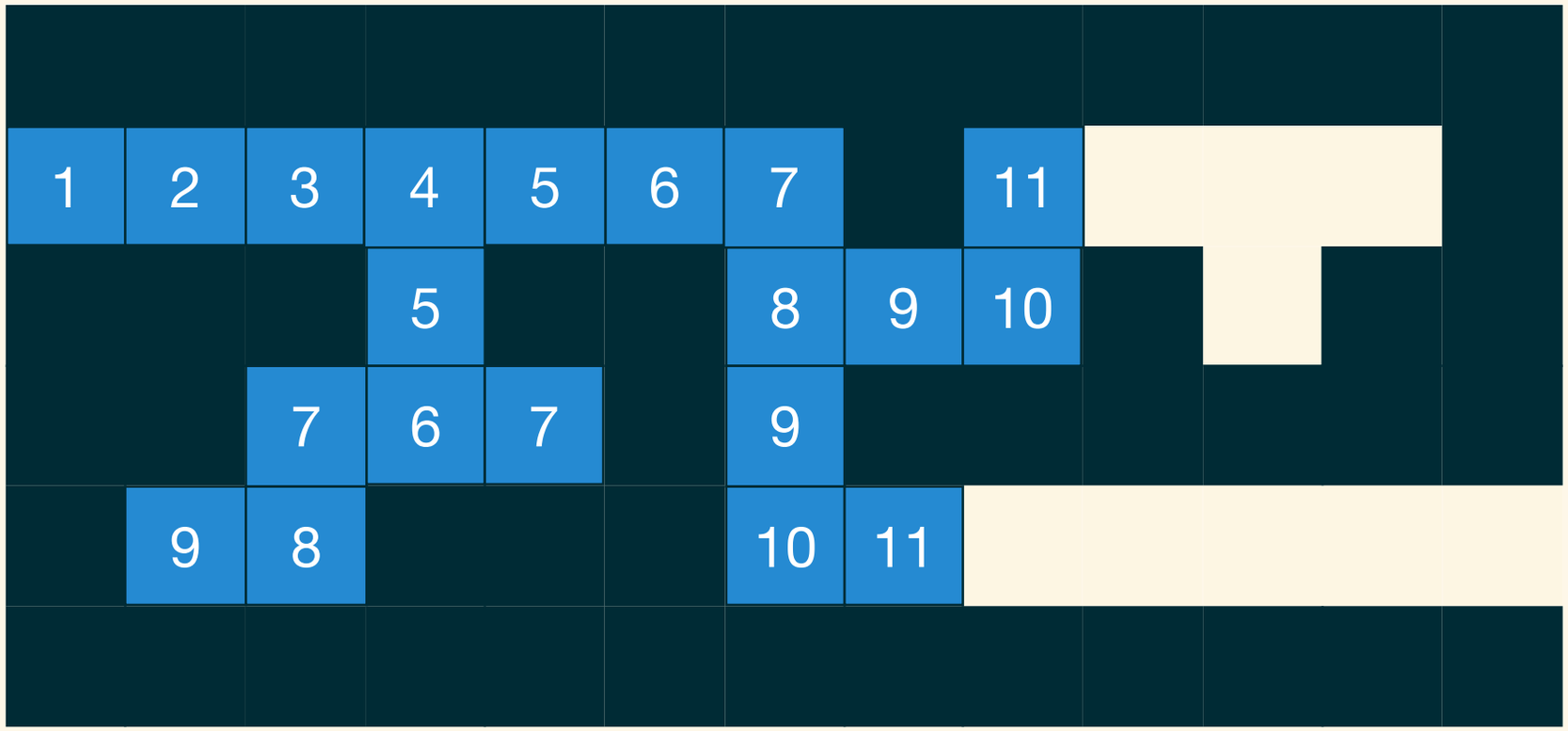

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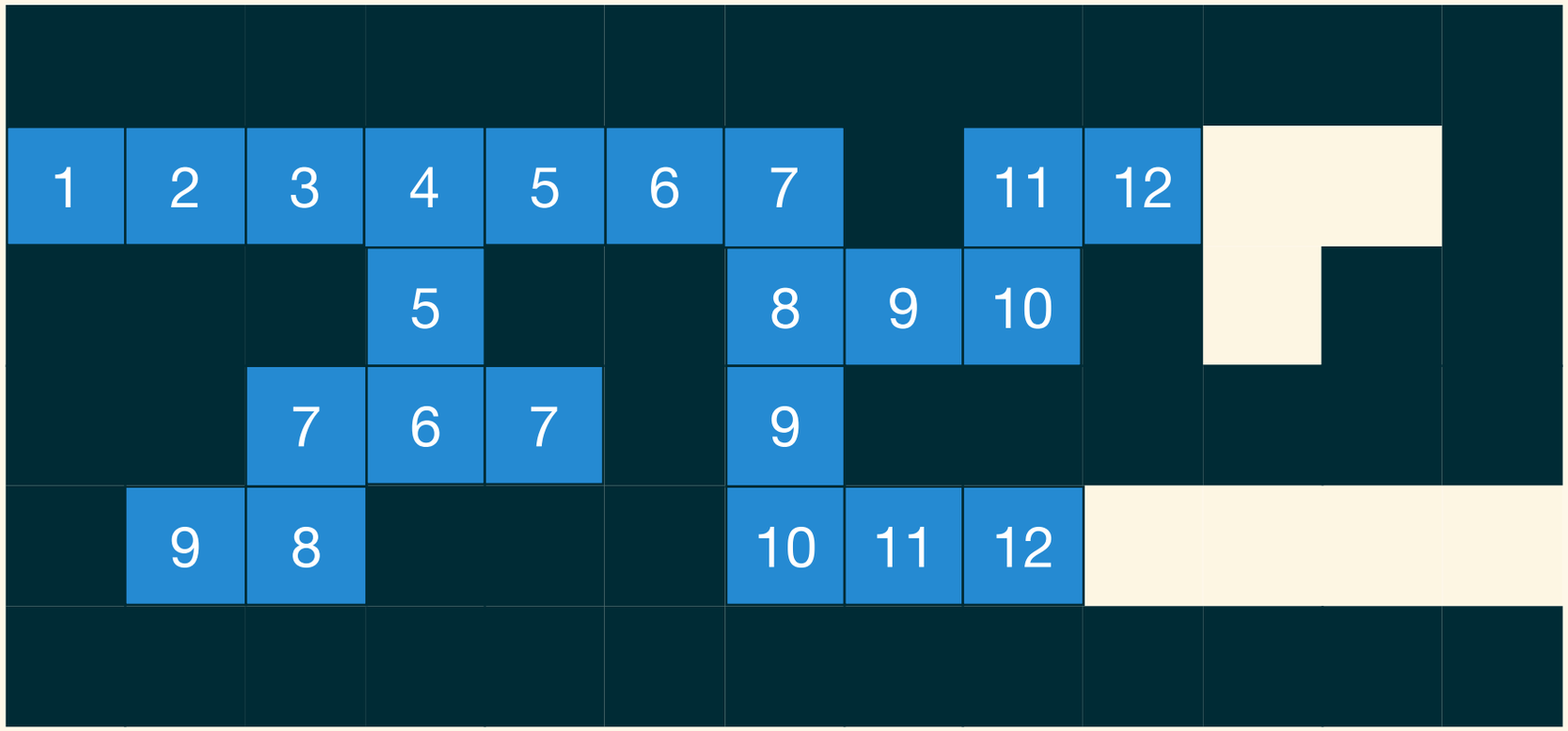

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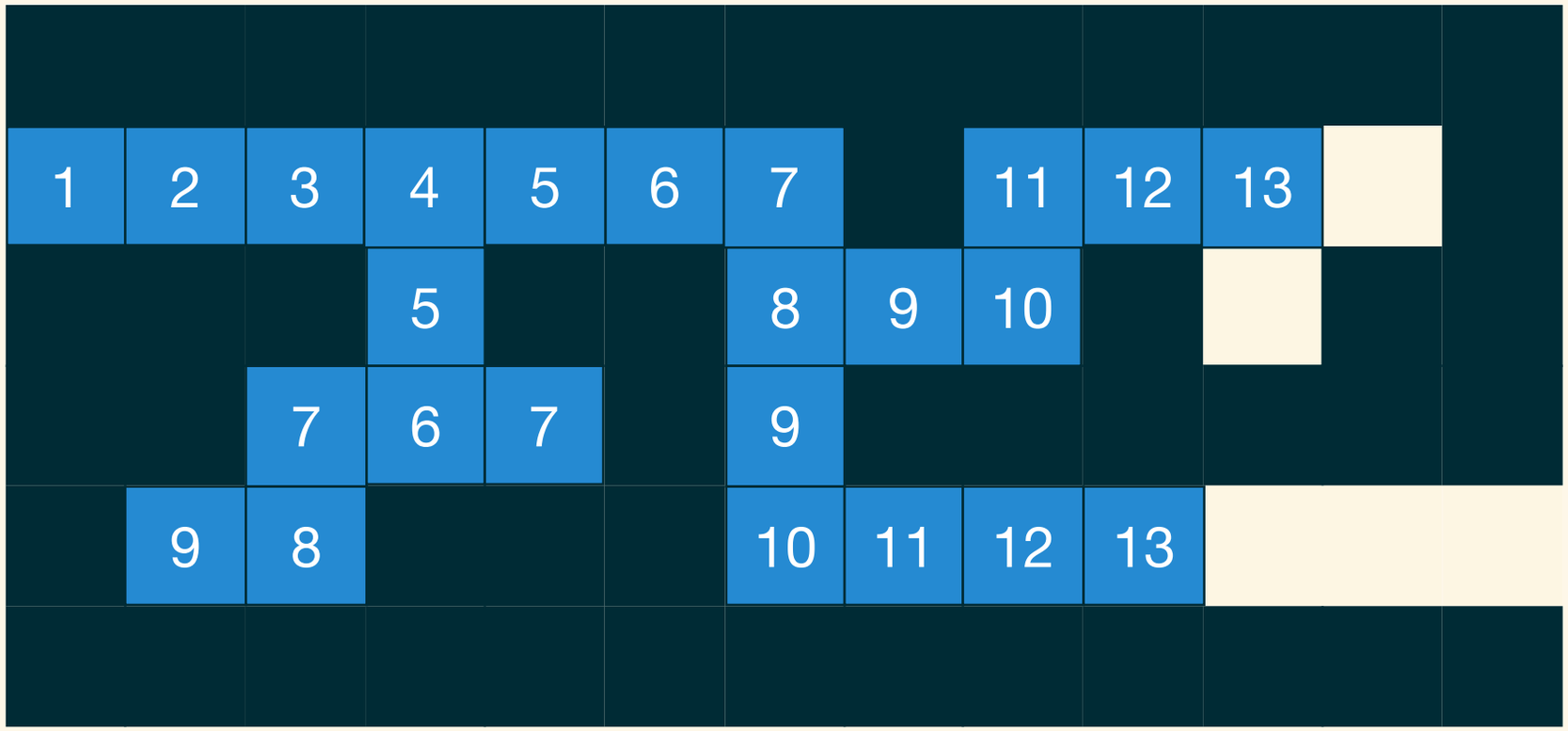

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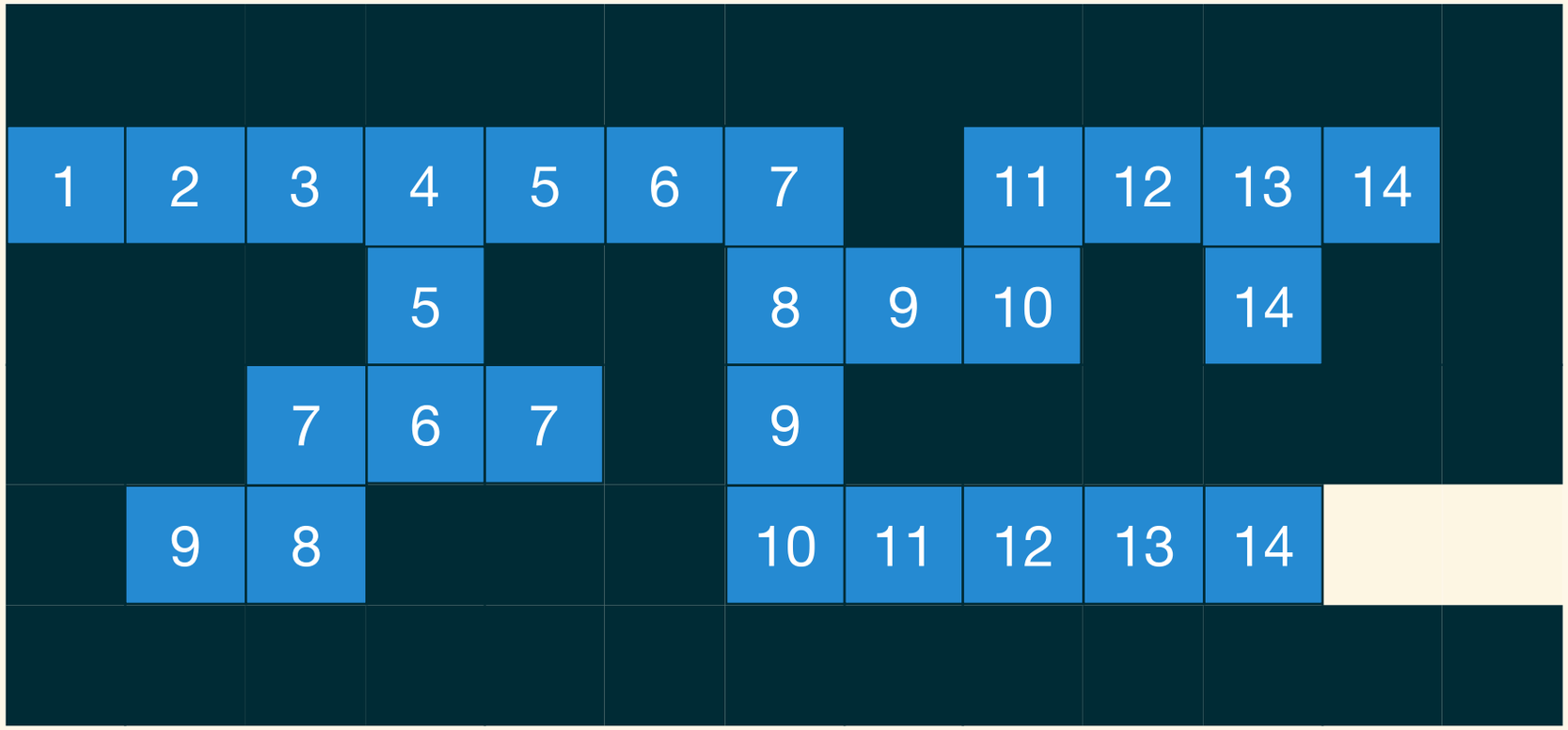

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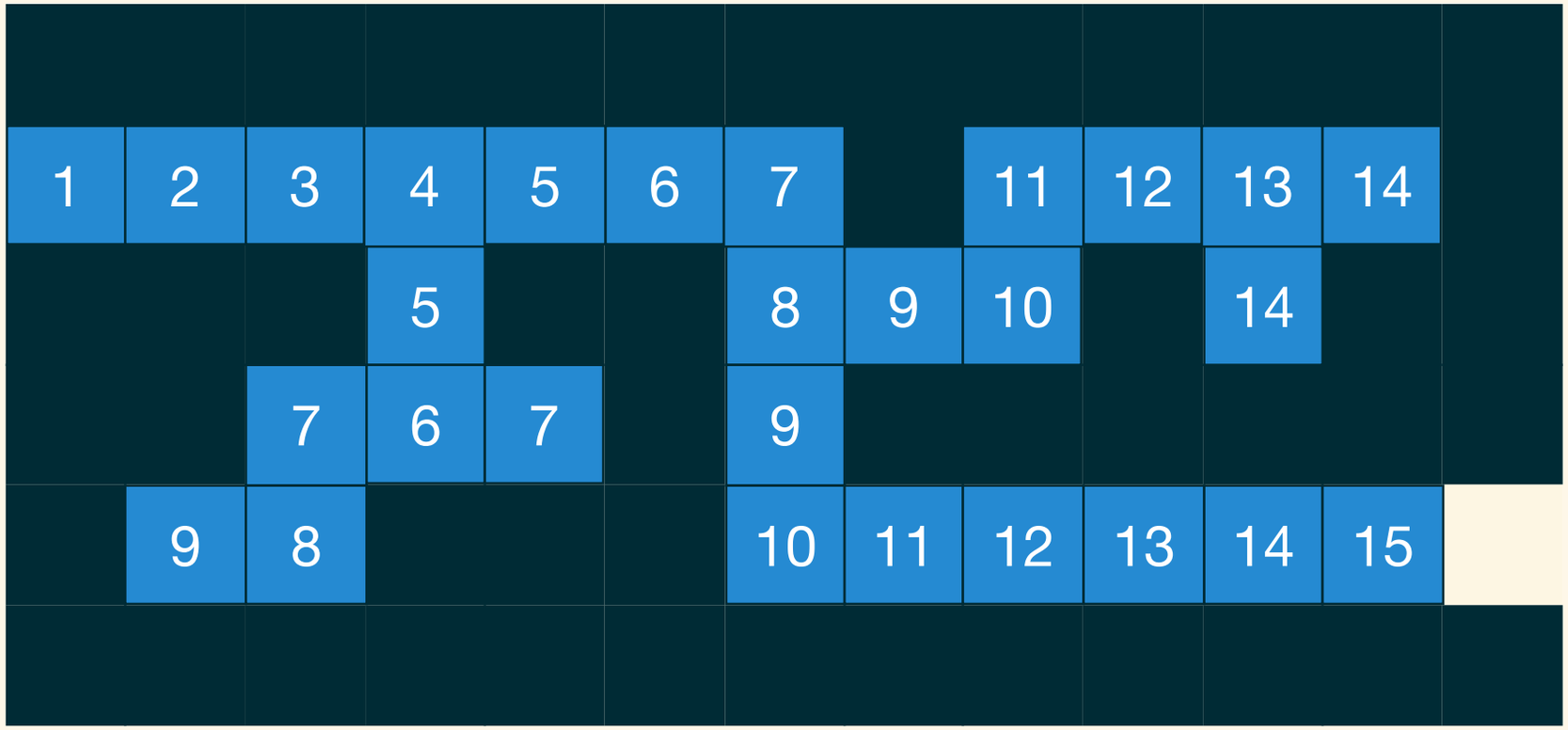

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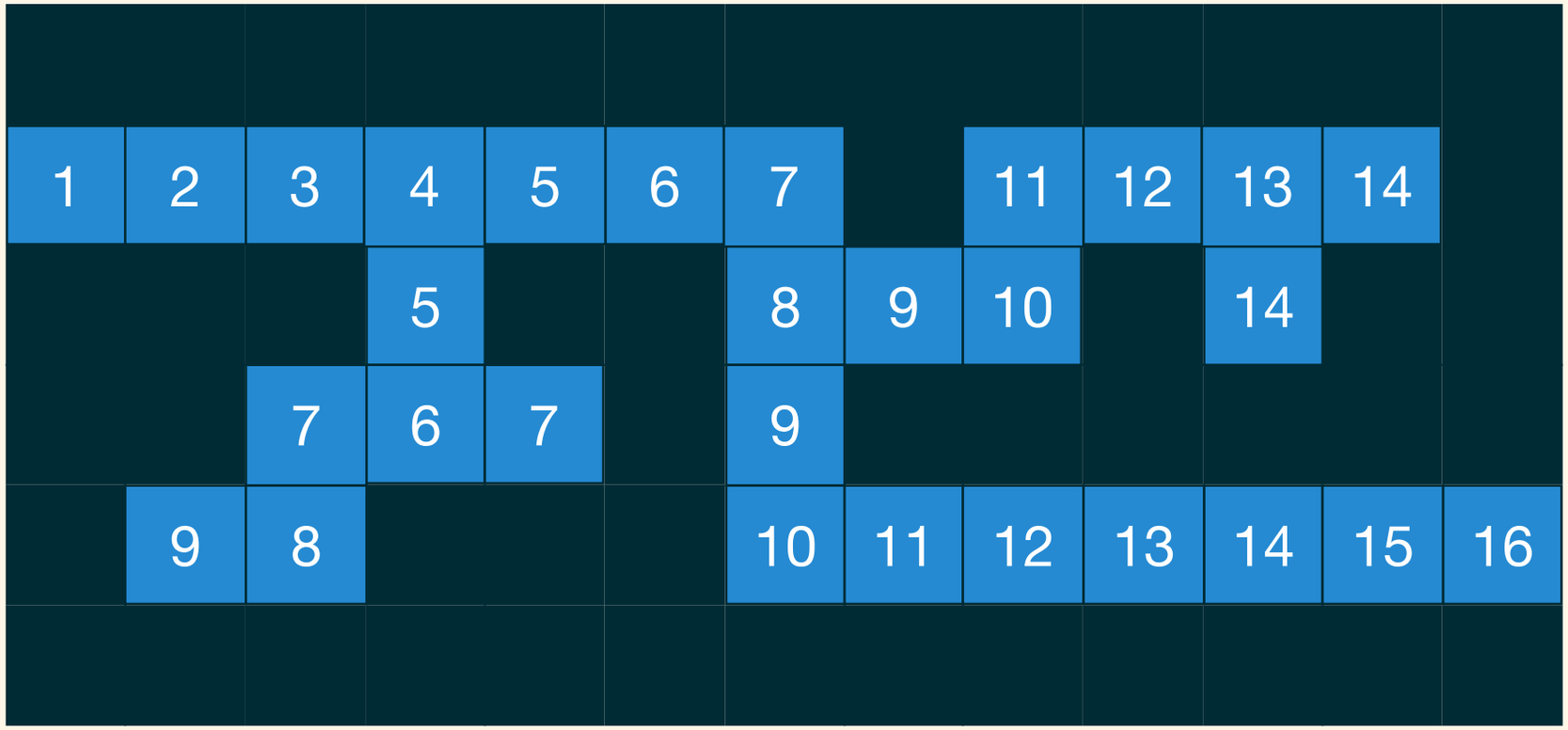

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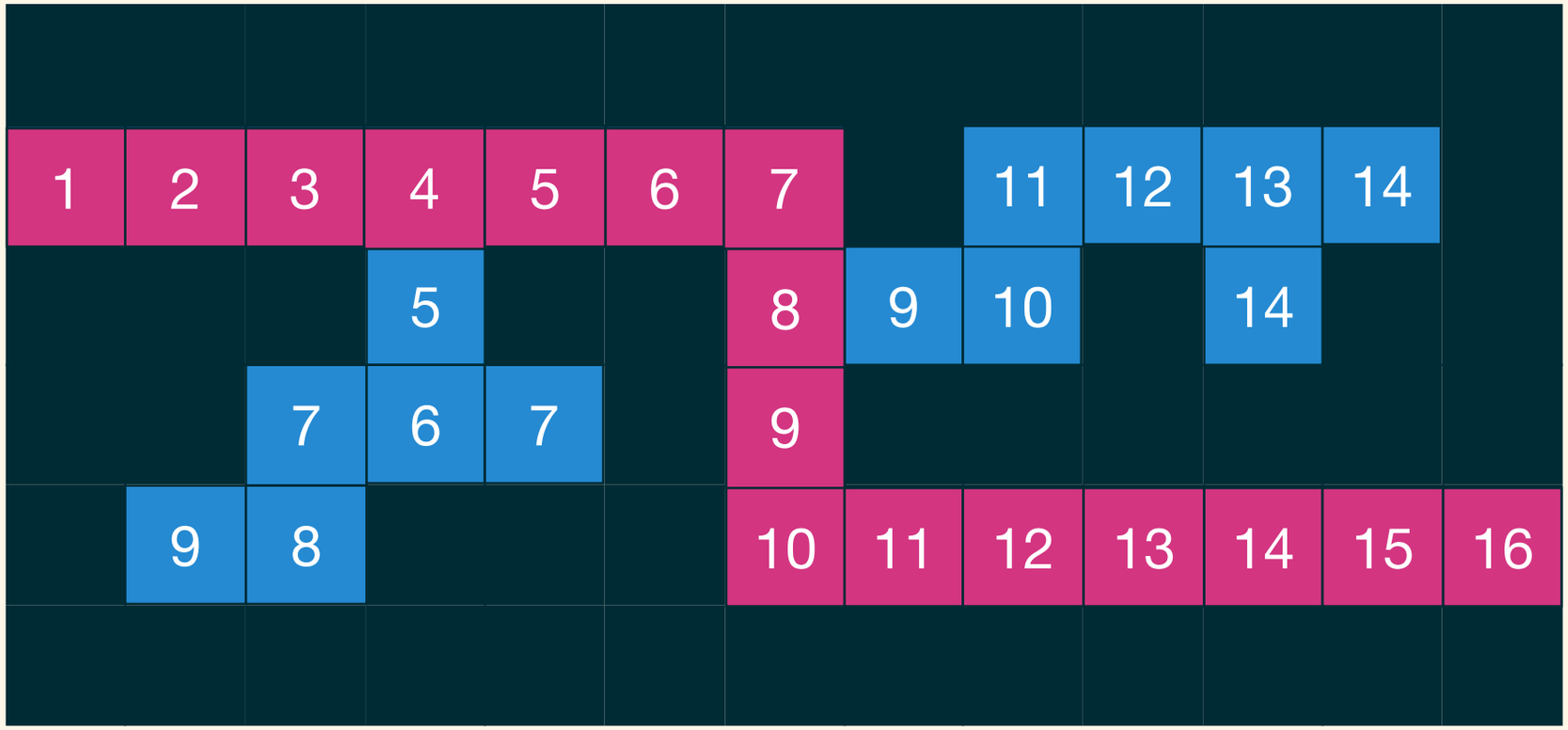

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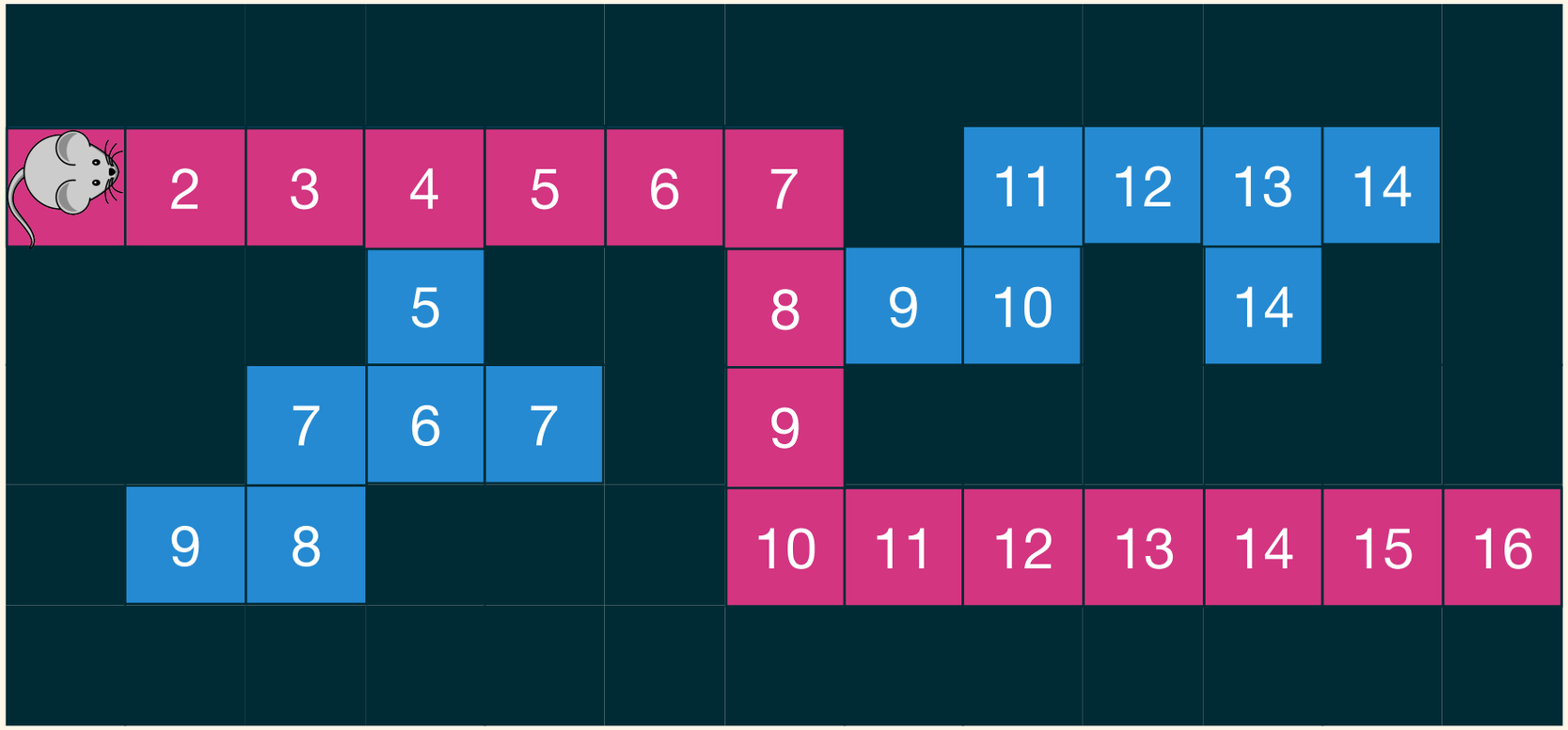

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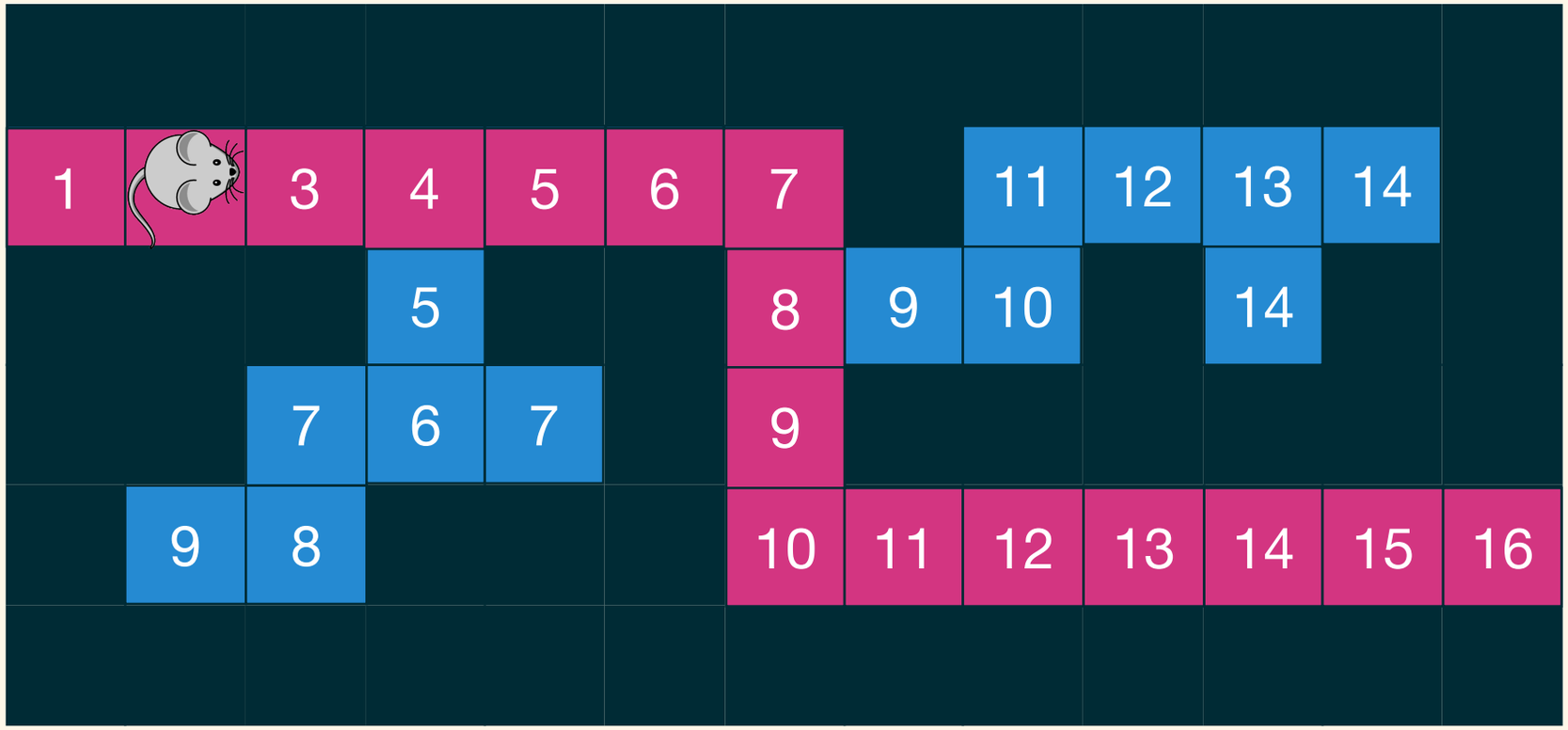

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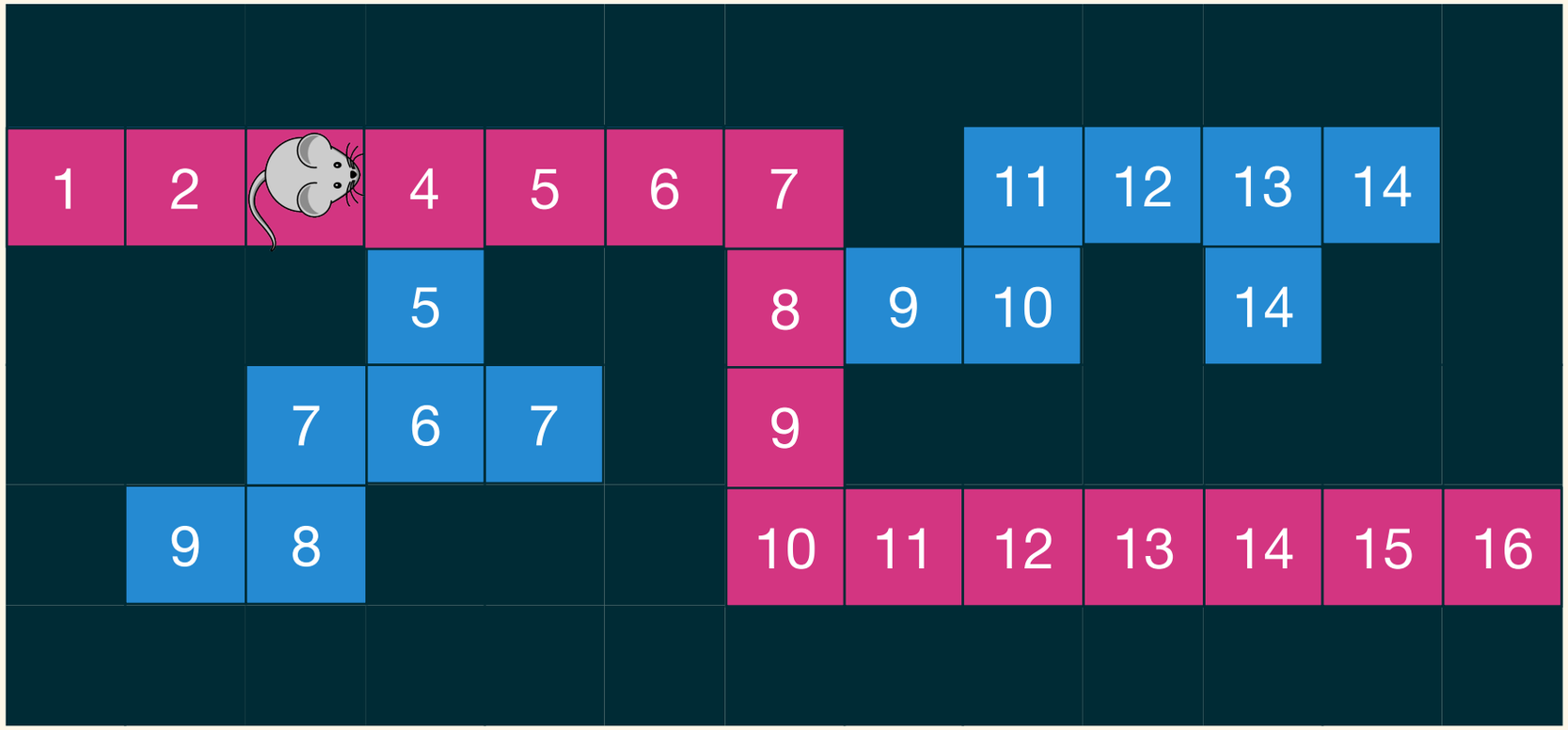

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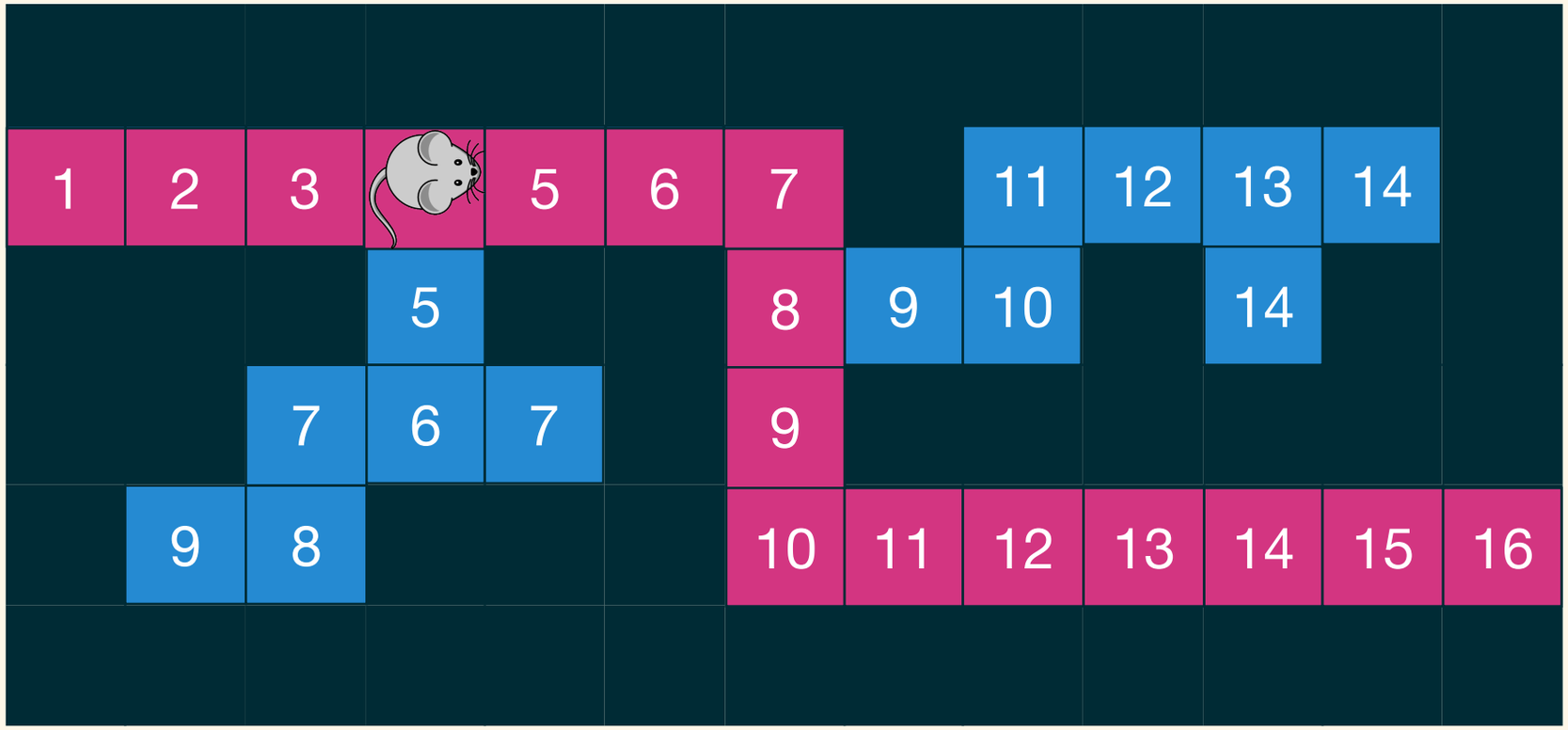

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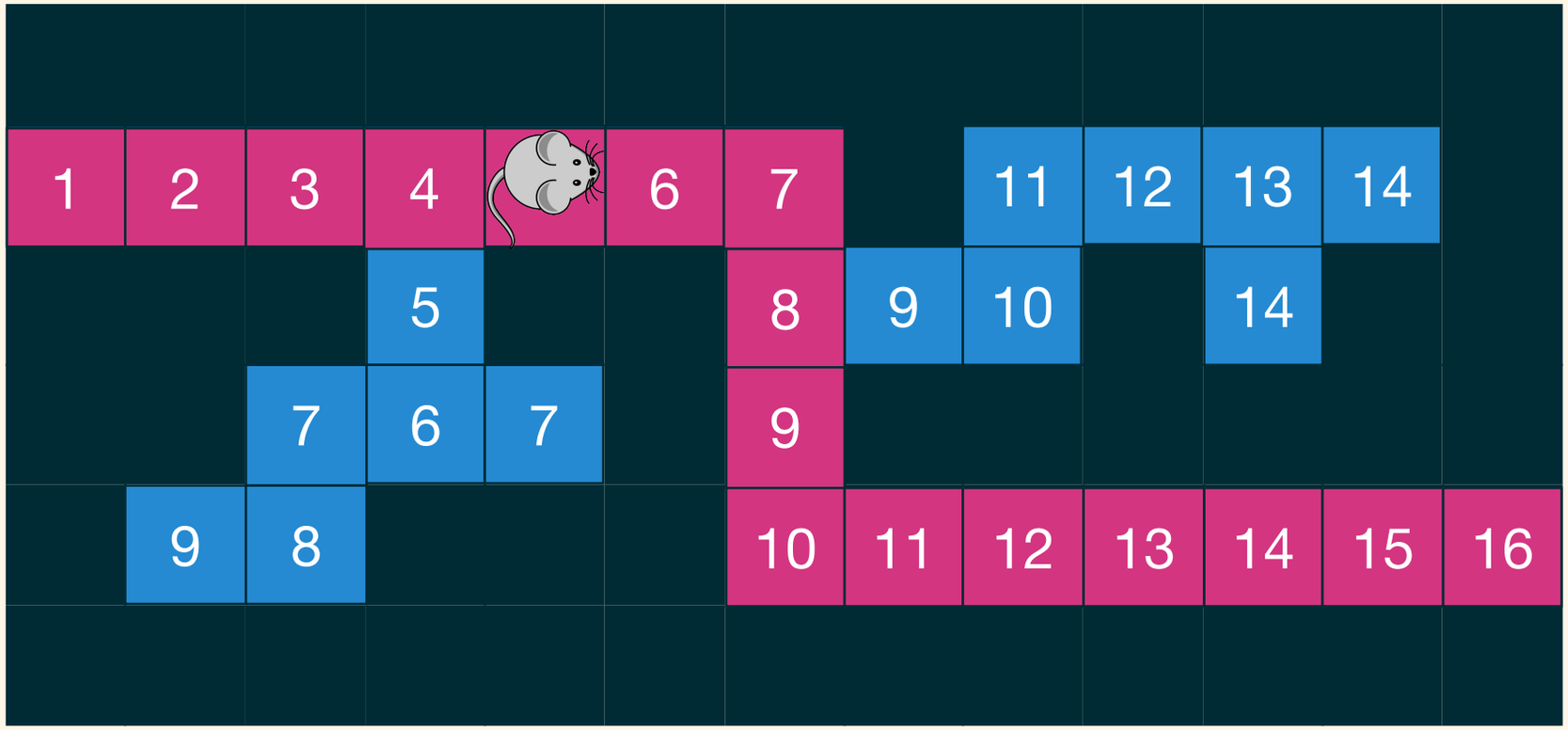

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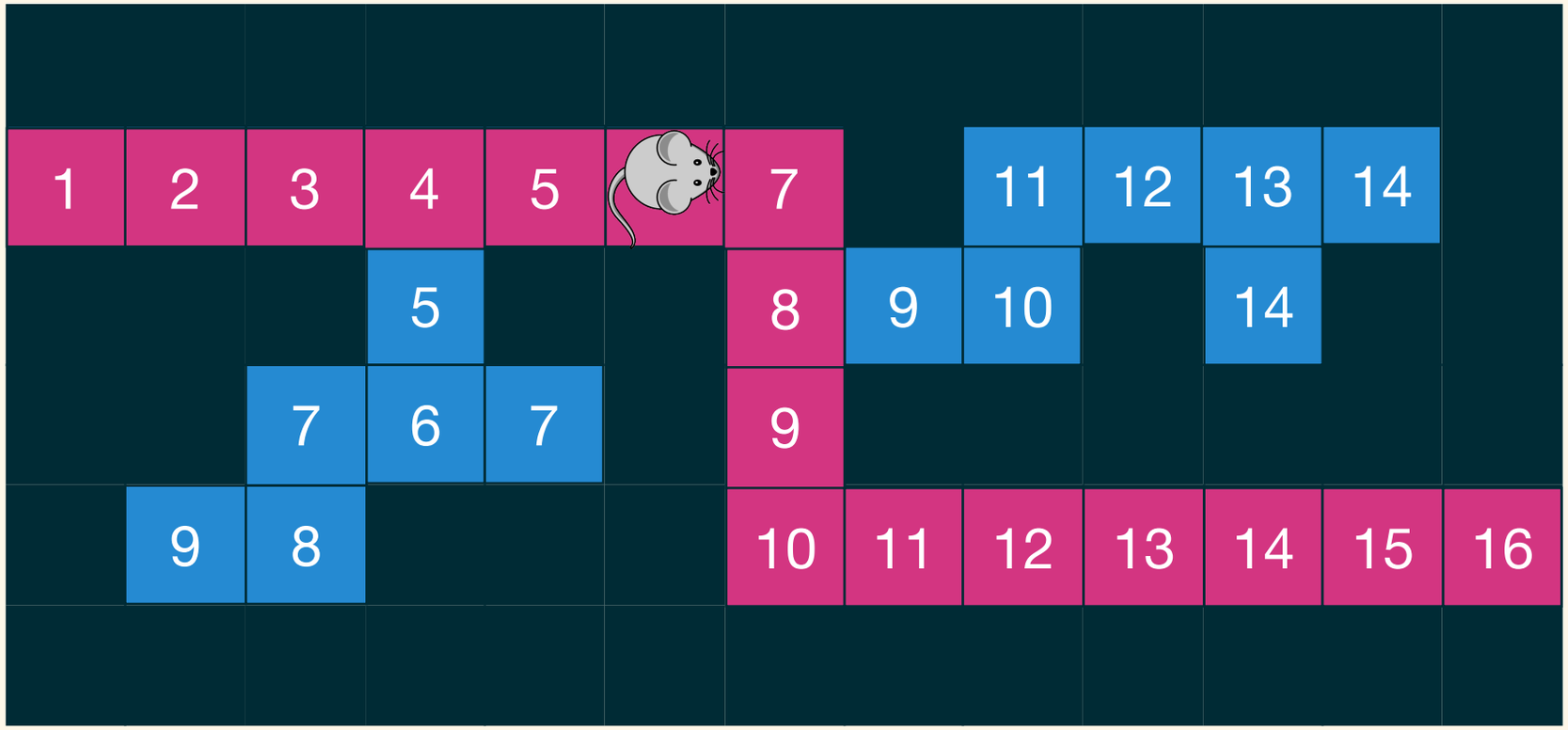

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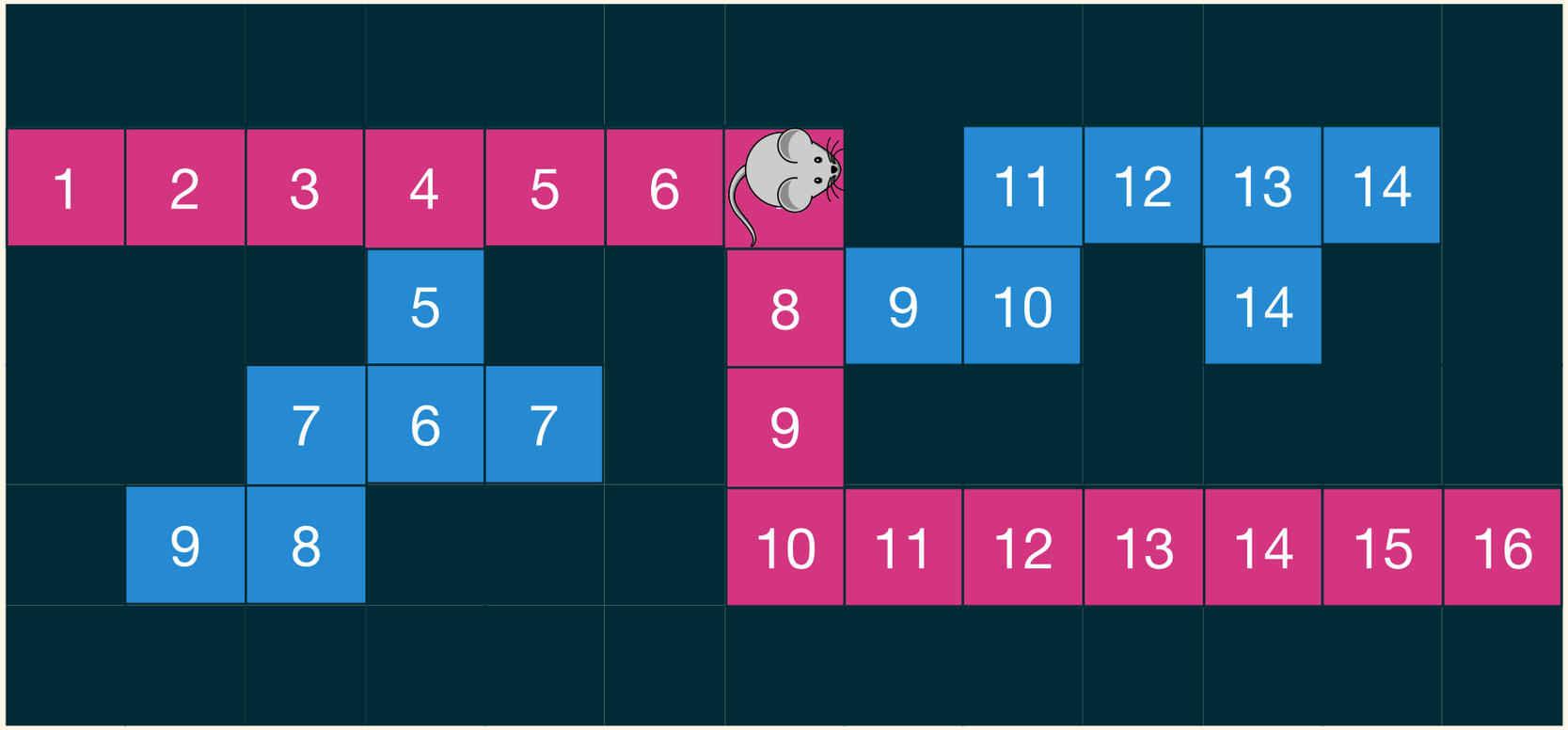

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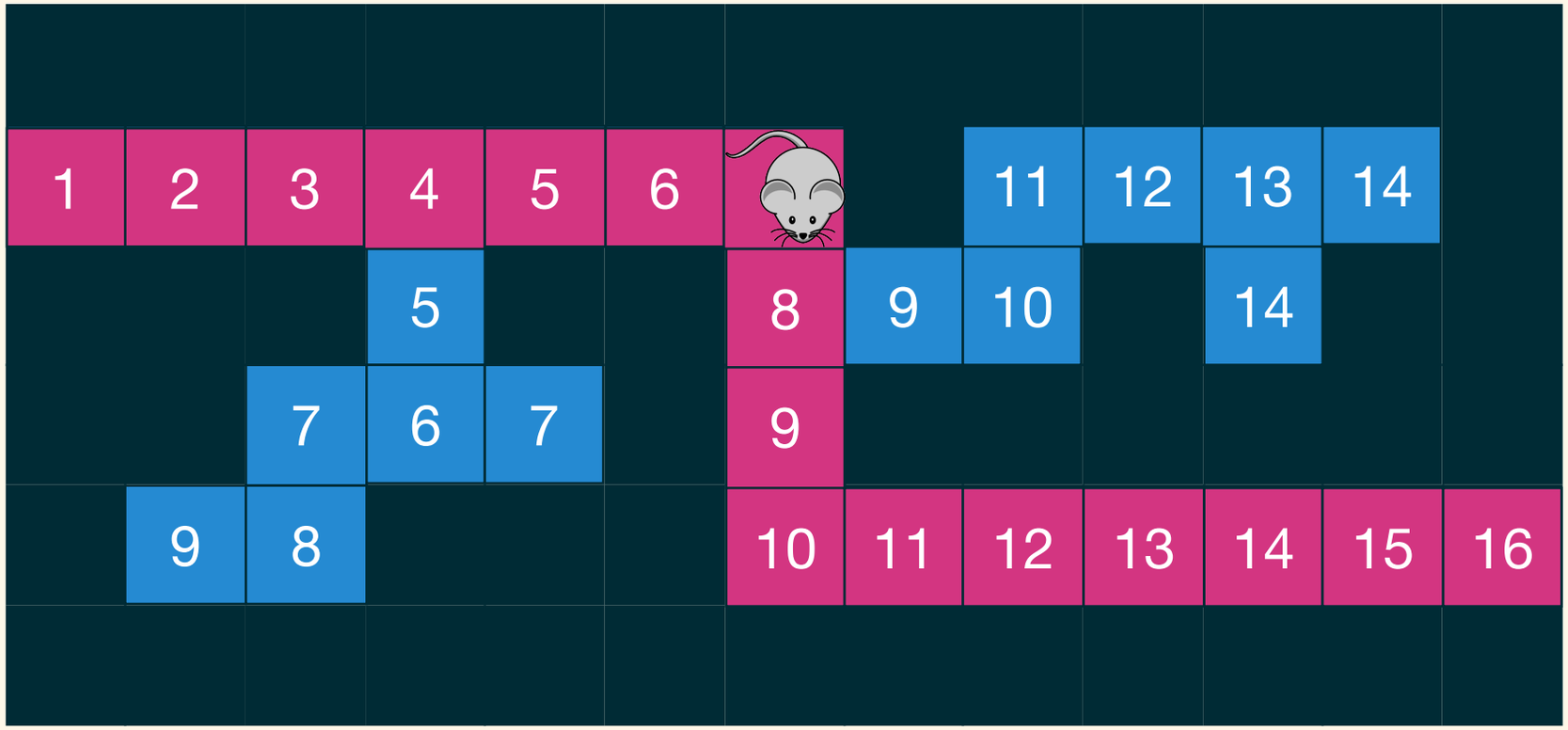

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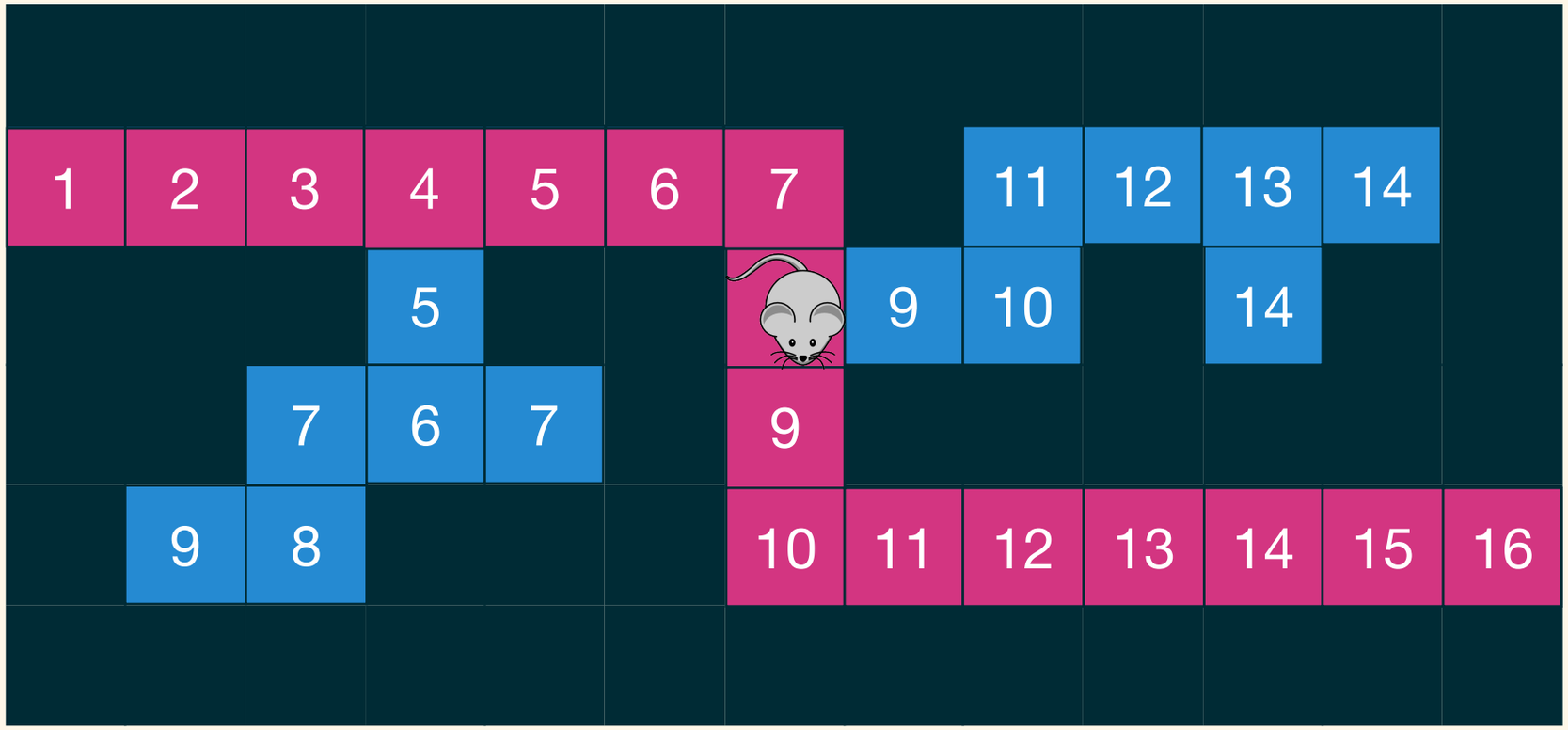

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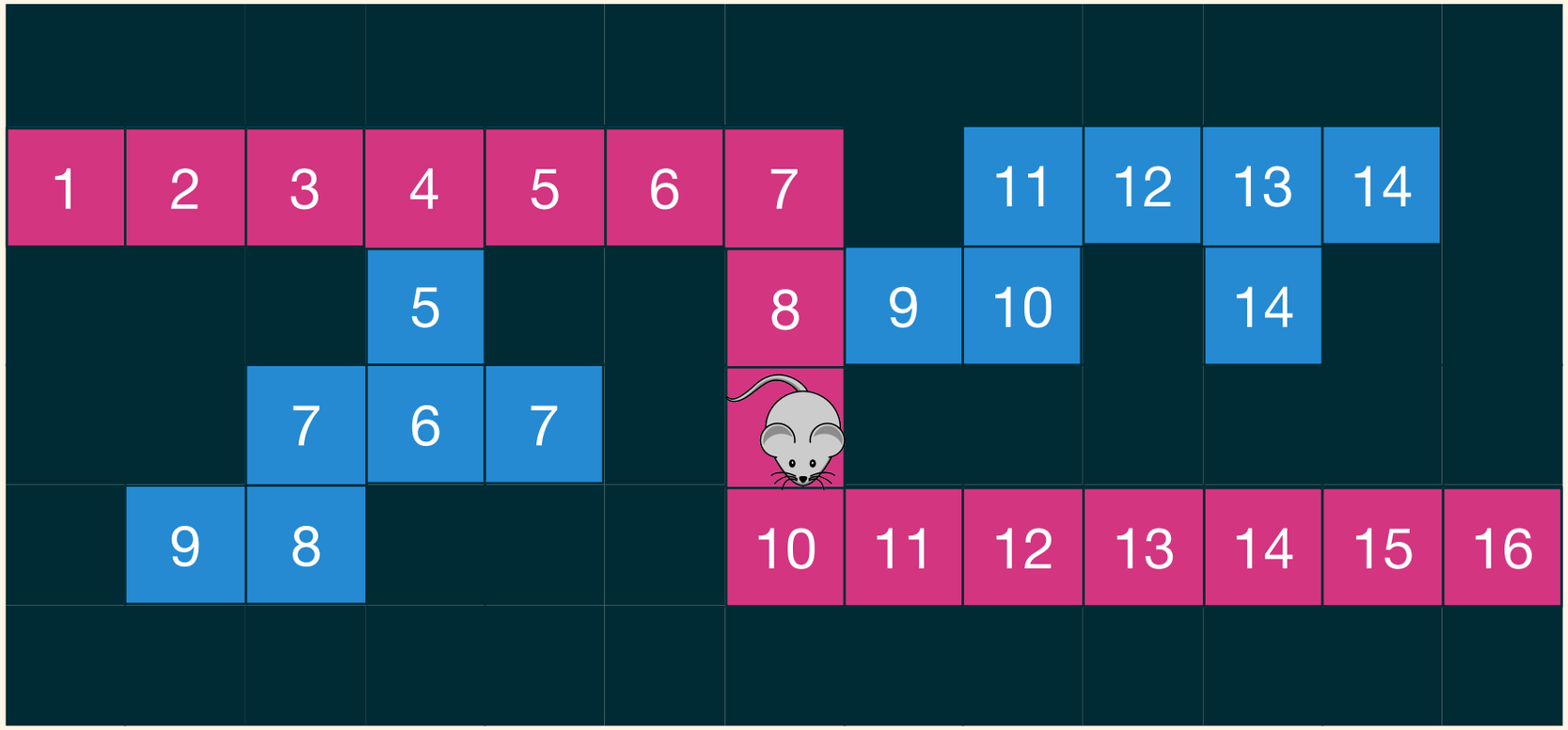
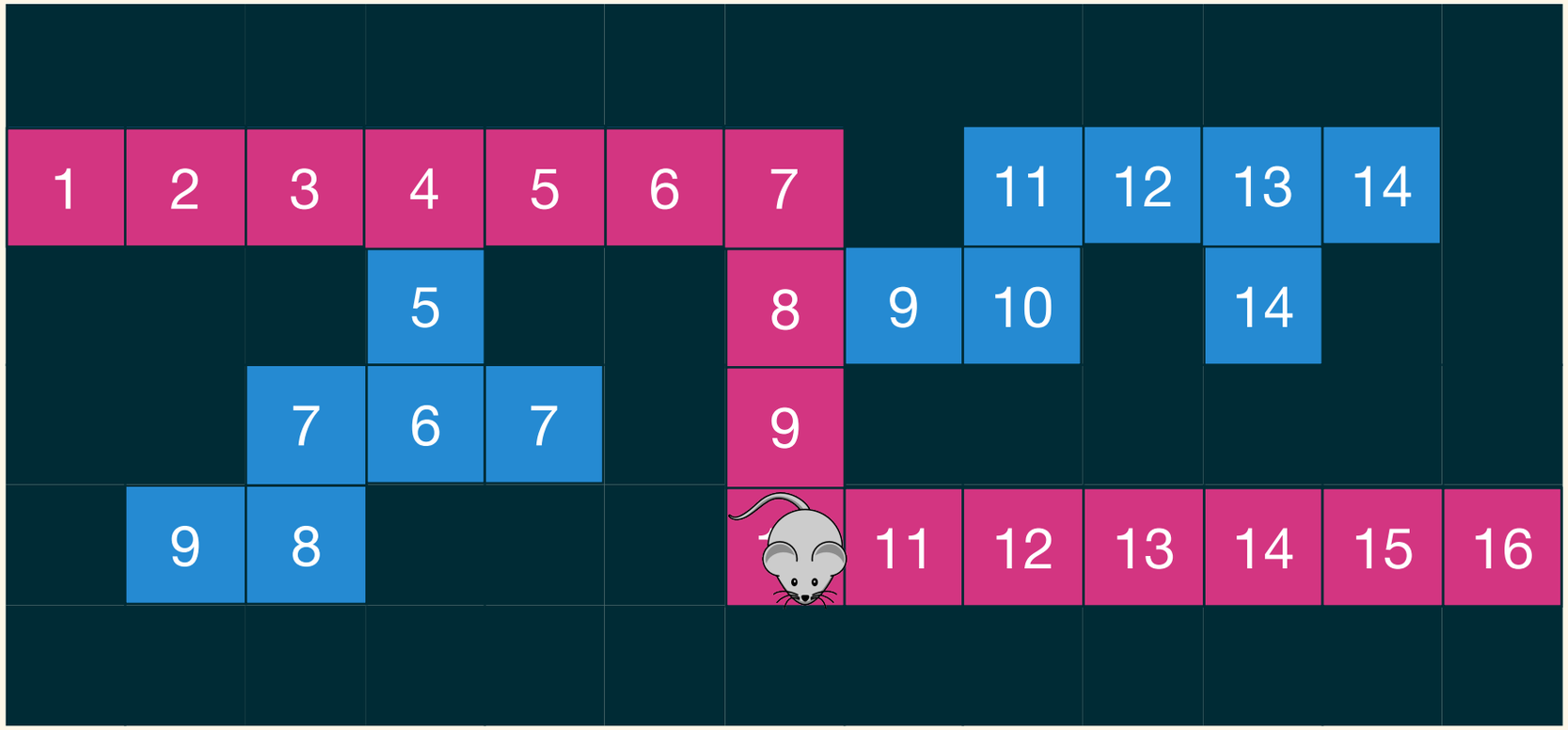
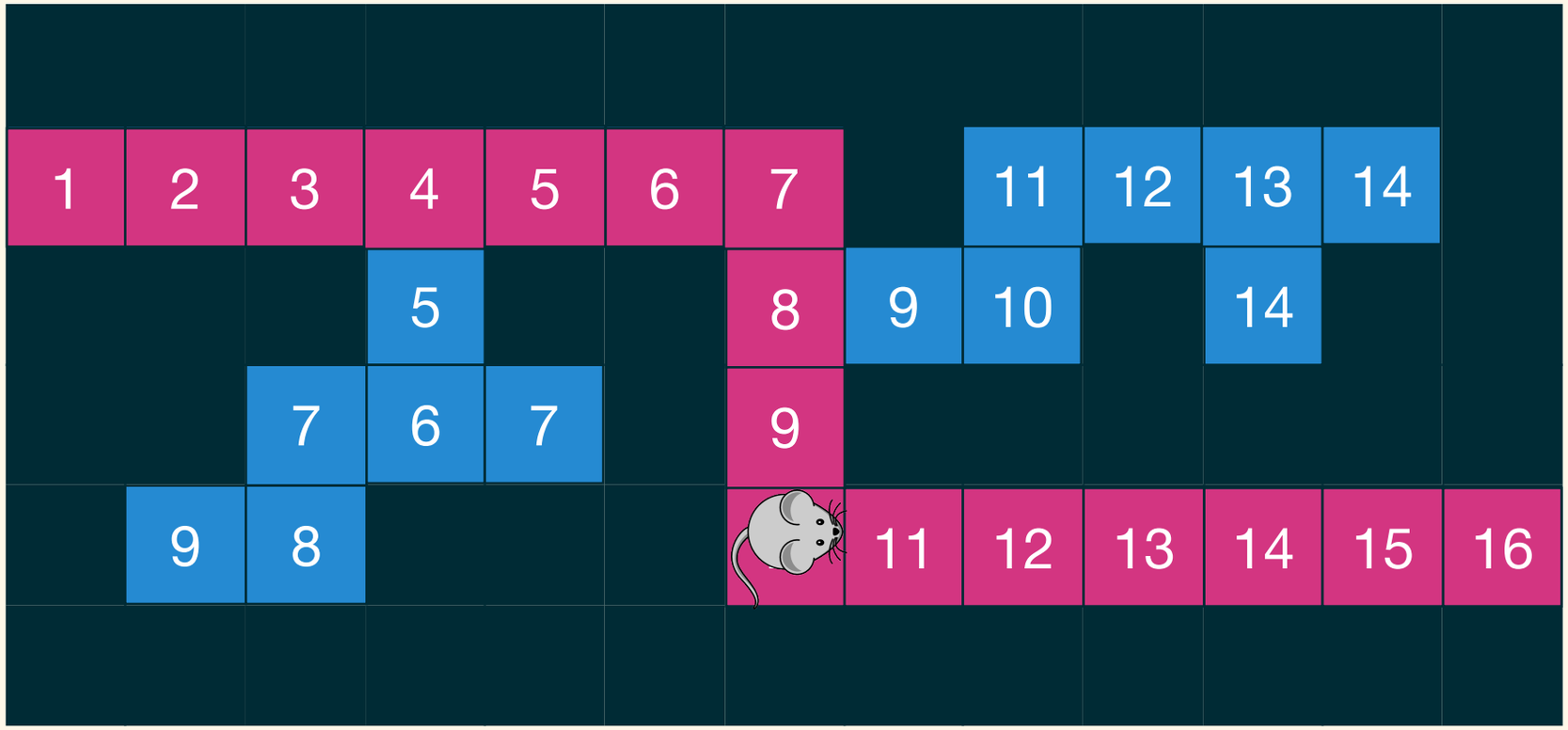


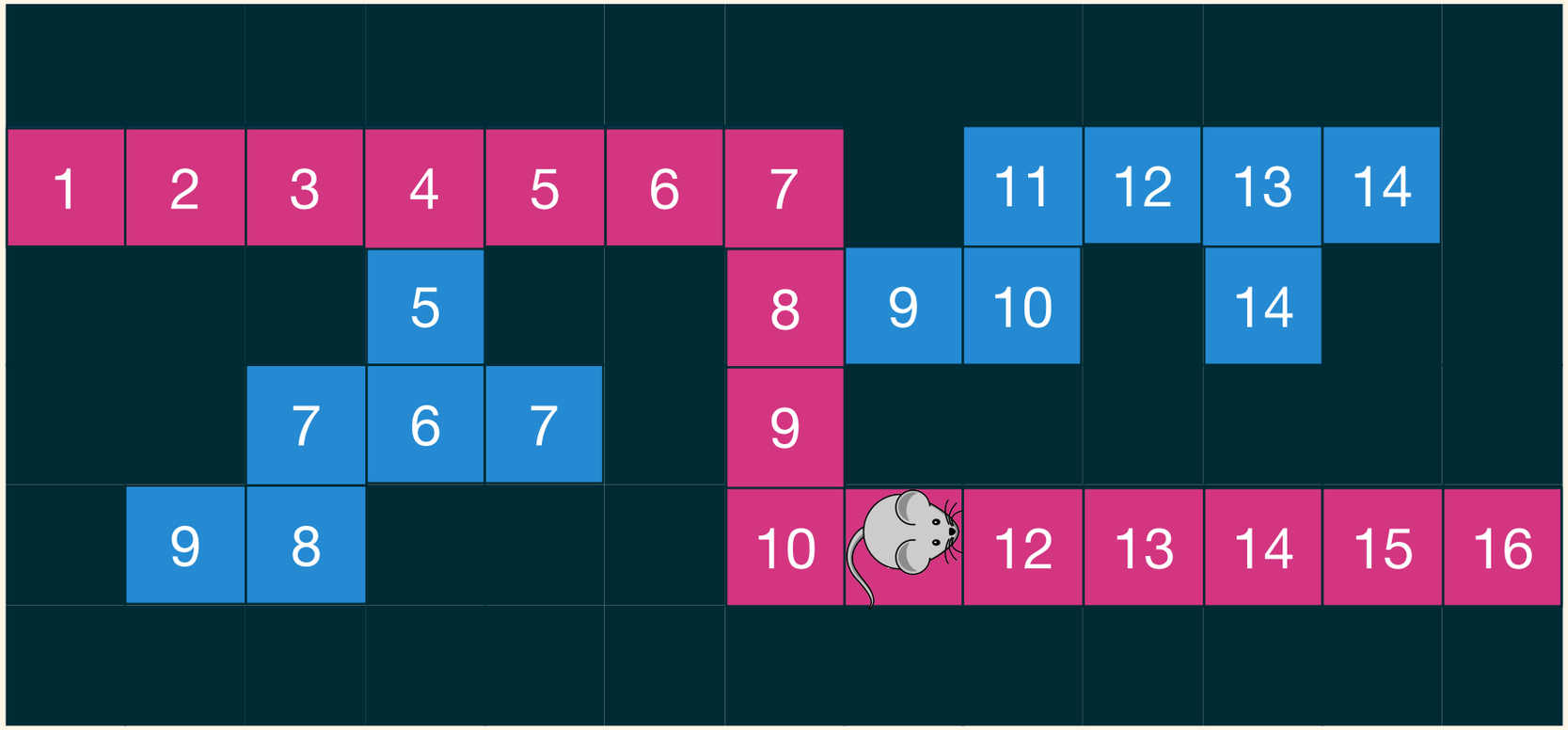
老鼠走迷宫 (BFS)



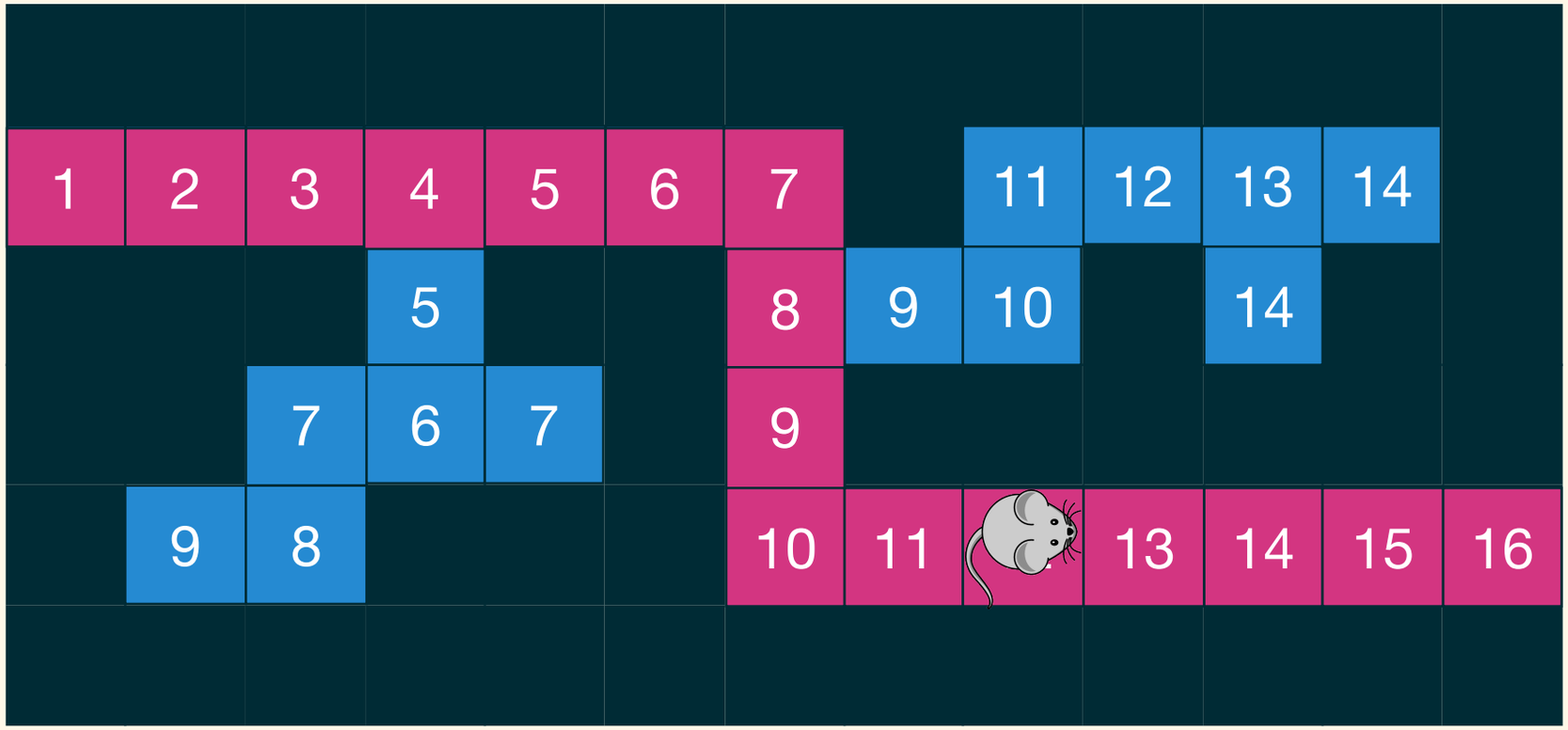
老鼠走迷宮 (BFS)



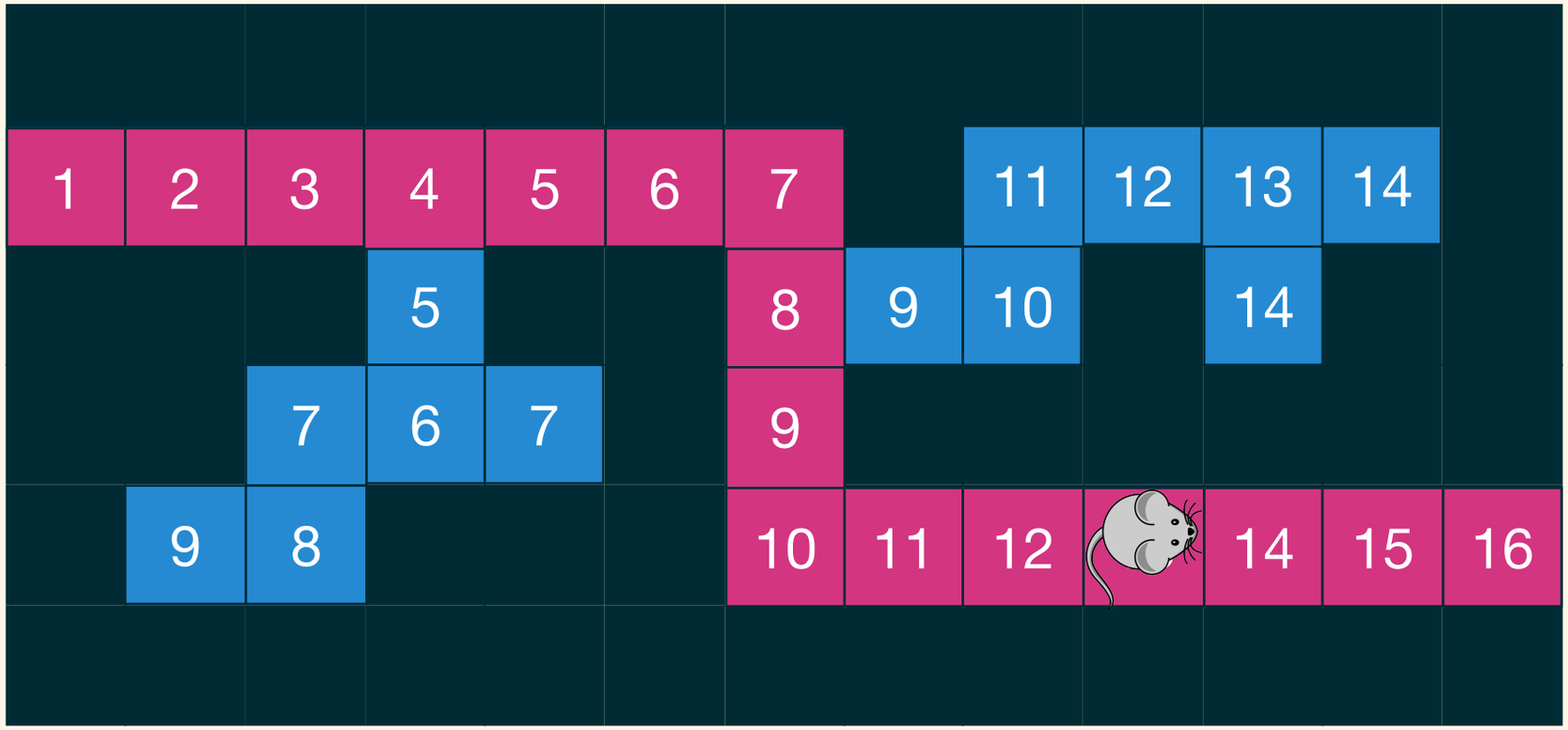
老鼠走迷宮 (BFS)



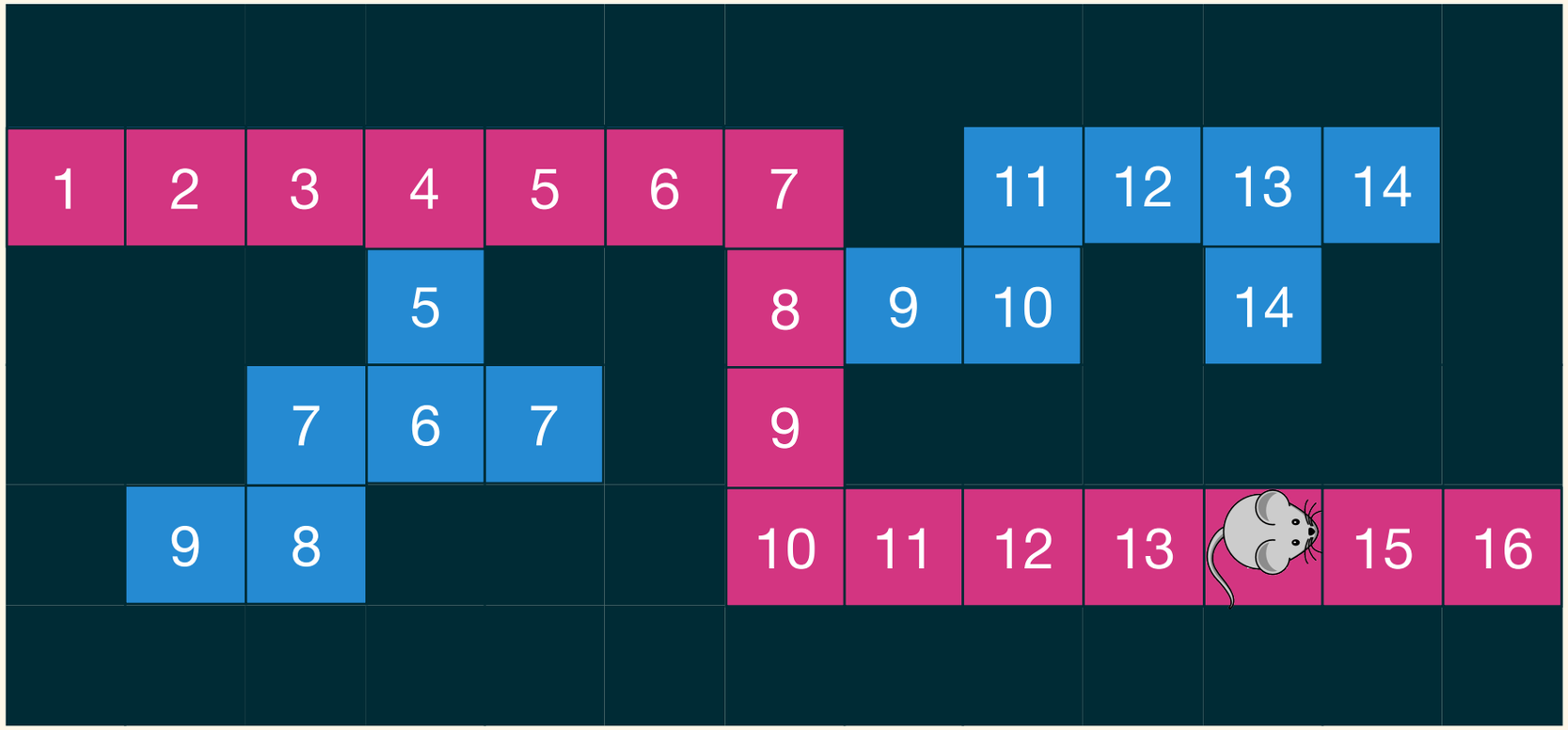
老鼠走迷宫 (BFS)



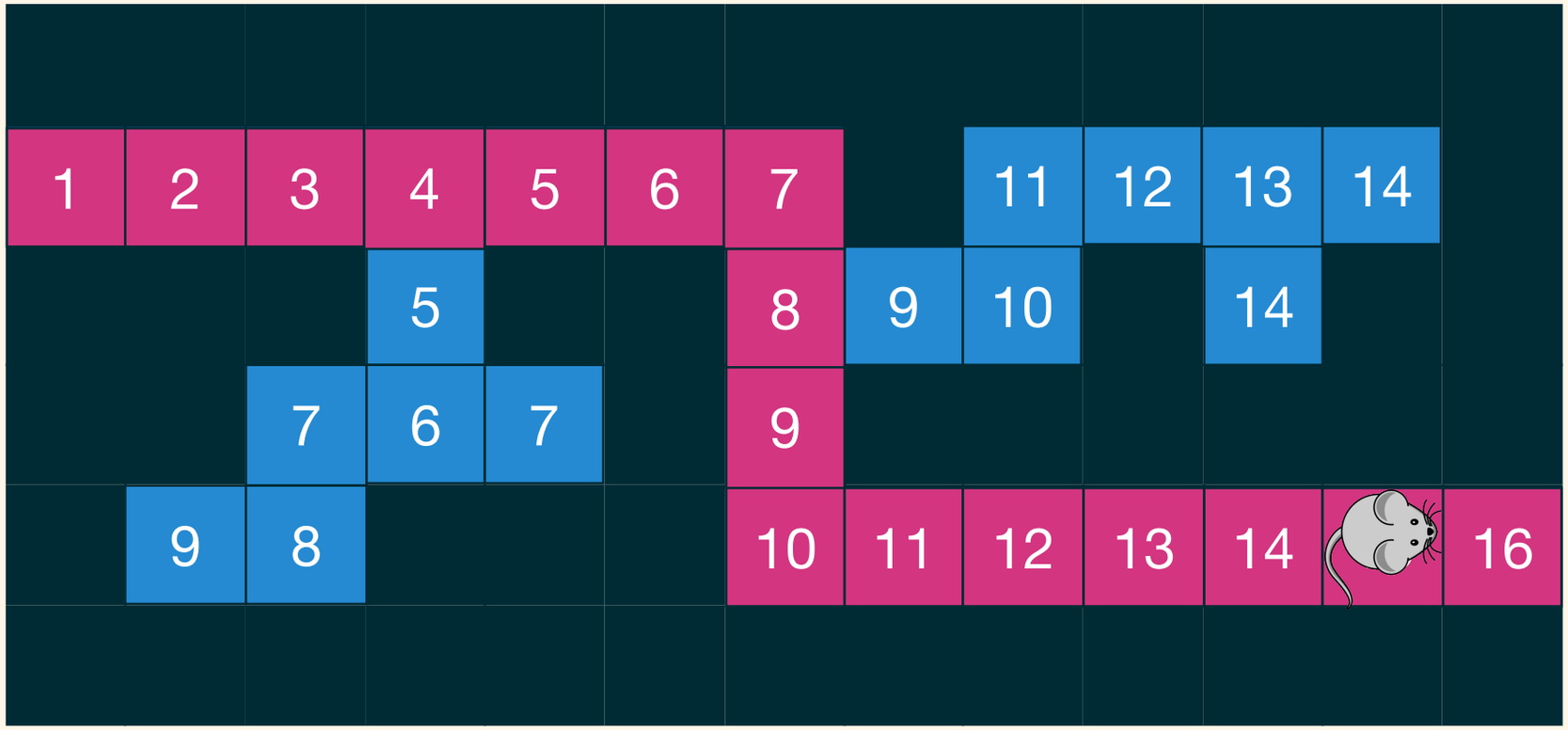
老鼠走迷宮 (BFS)



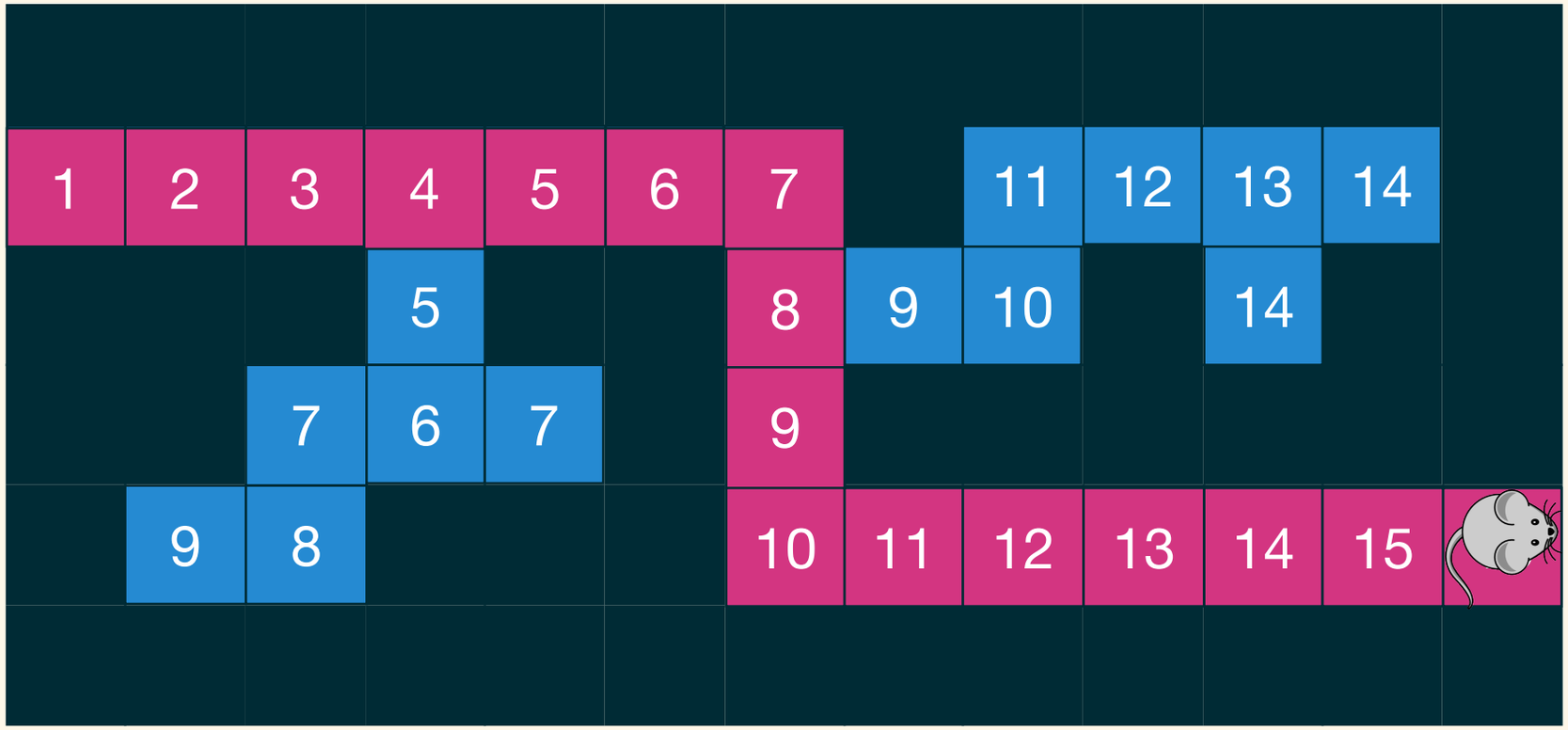
老鼠走迷宫 (BFS)



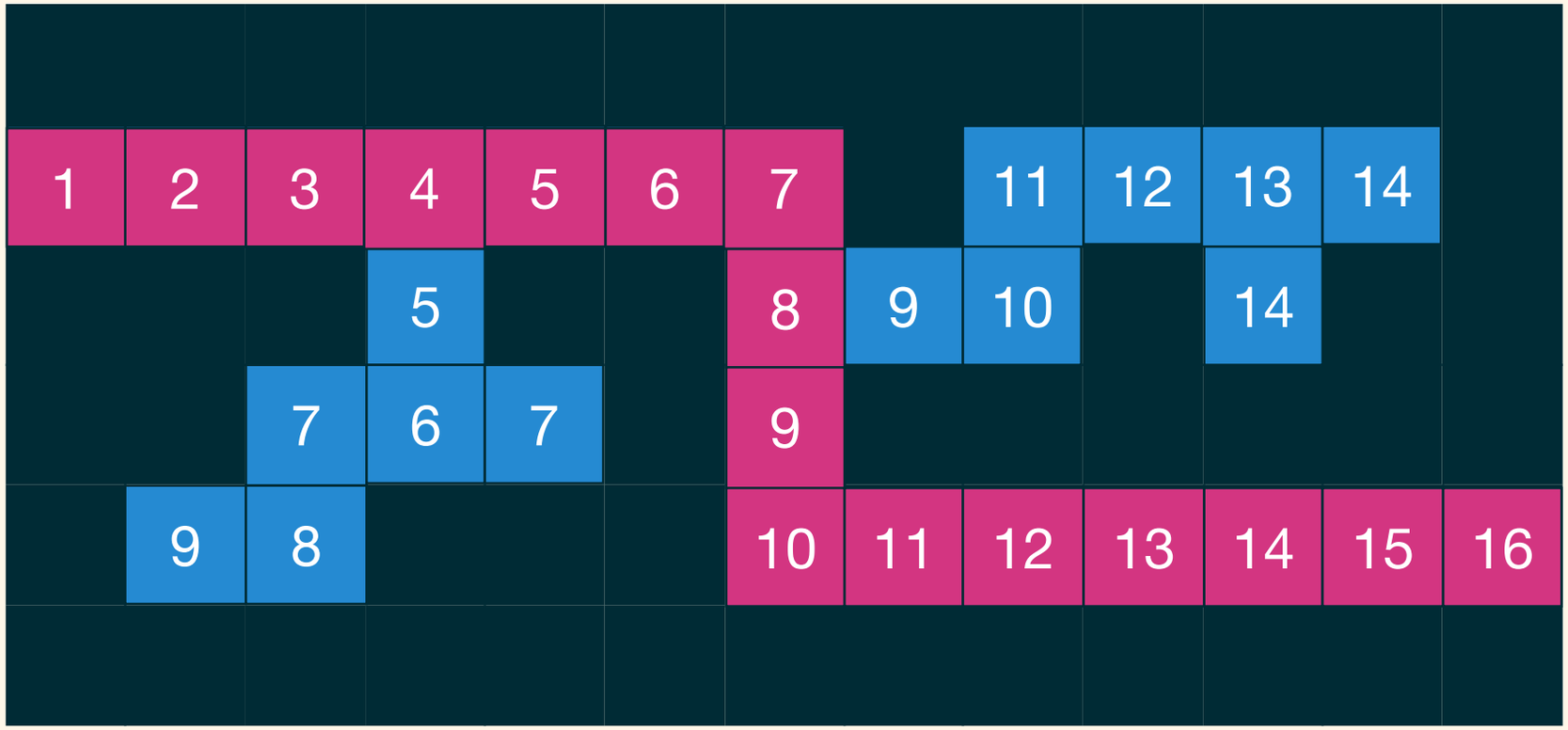
老鼠走迷宮 (BFS)



老鼠走迷宫 (BFS)



老鼠走迷宫 (BFS)



Practice Now

[UVa] 352 - The Seasonal War

352 - The Seasonal War

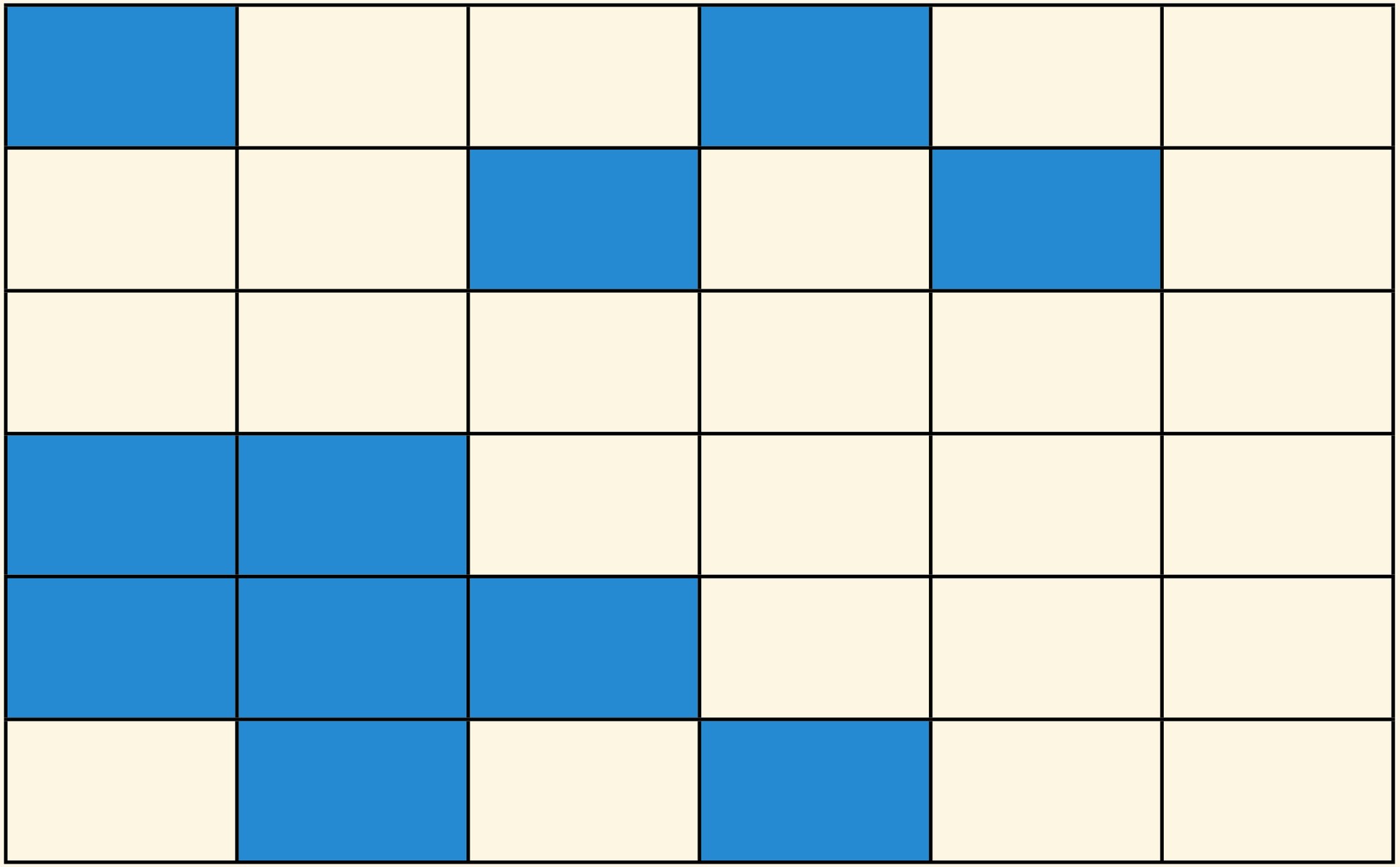
Sample Input

```
6
100100
001010
000000
110000
111000
010100
8
01100101
01000001
00011000
00000010
11000011
10100010
10000001
01100000
```

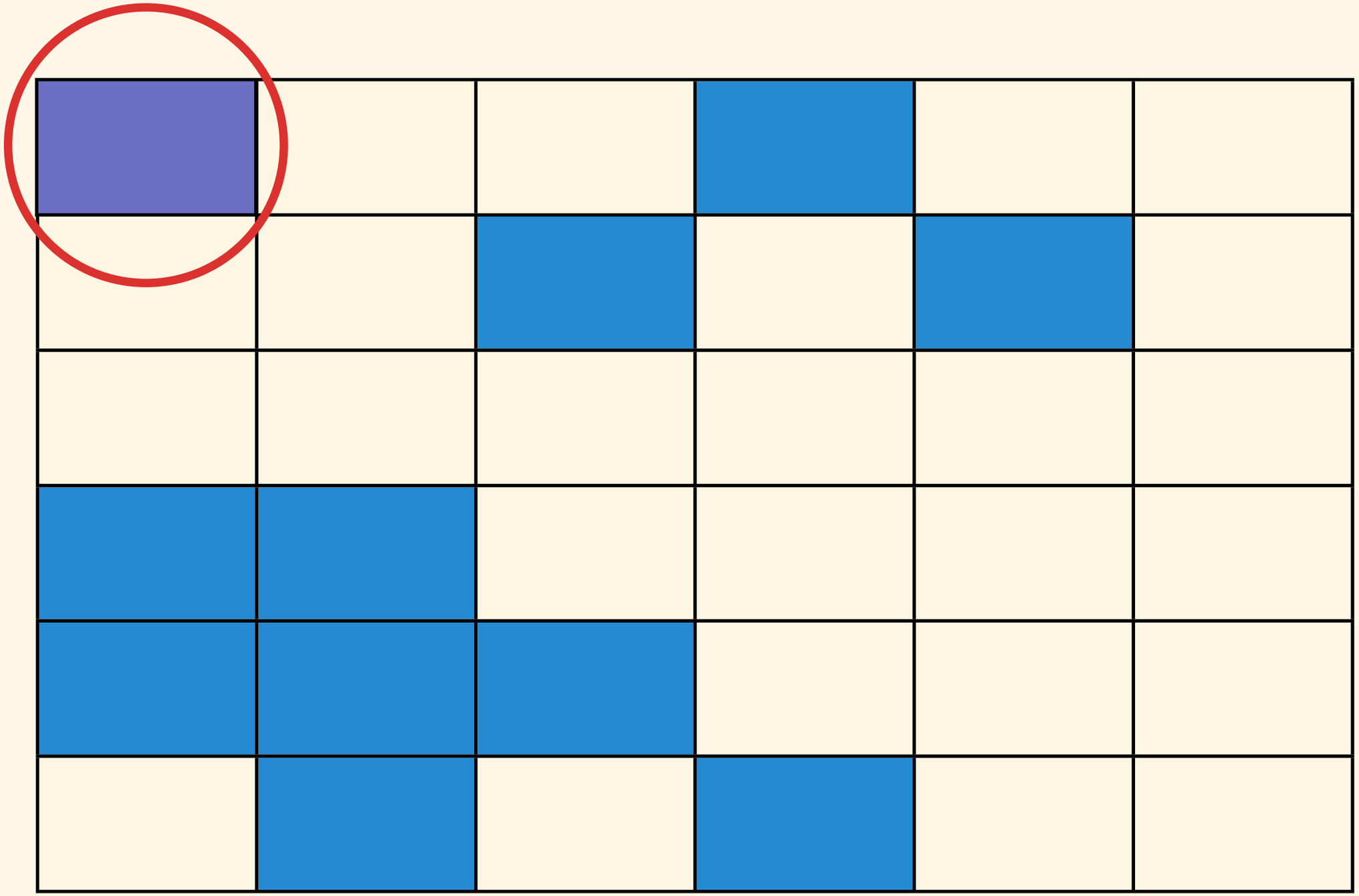
Sample Output

```
Image number 1 contains 3 war eagles.
Image number 2 contains 6 war eagles.
```

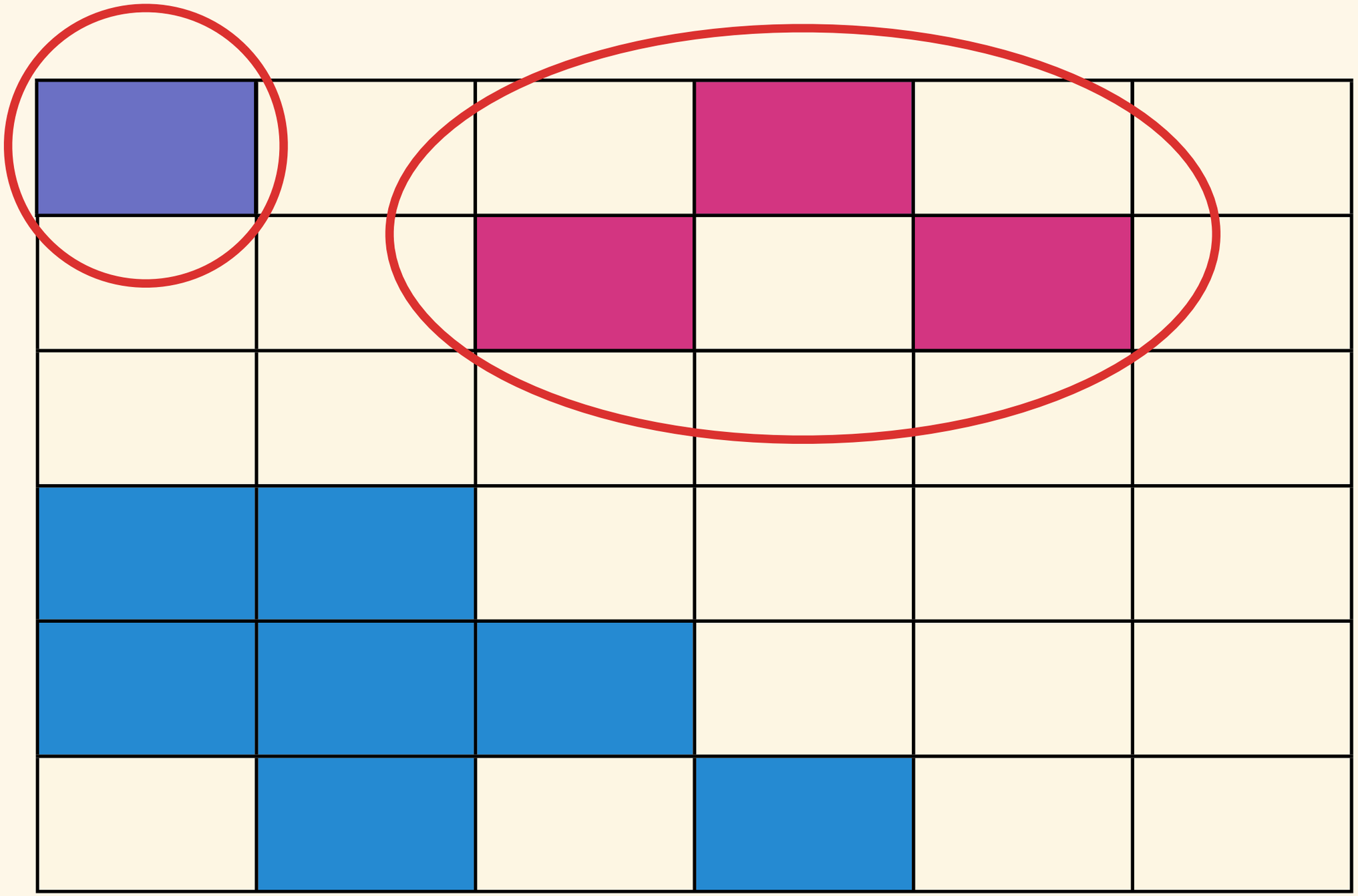
352 - The Seasonal War



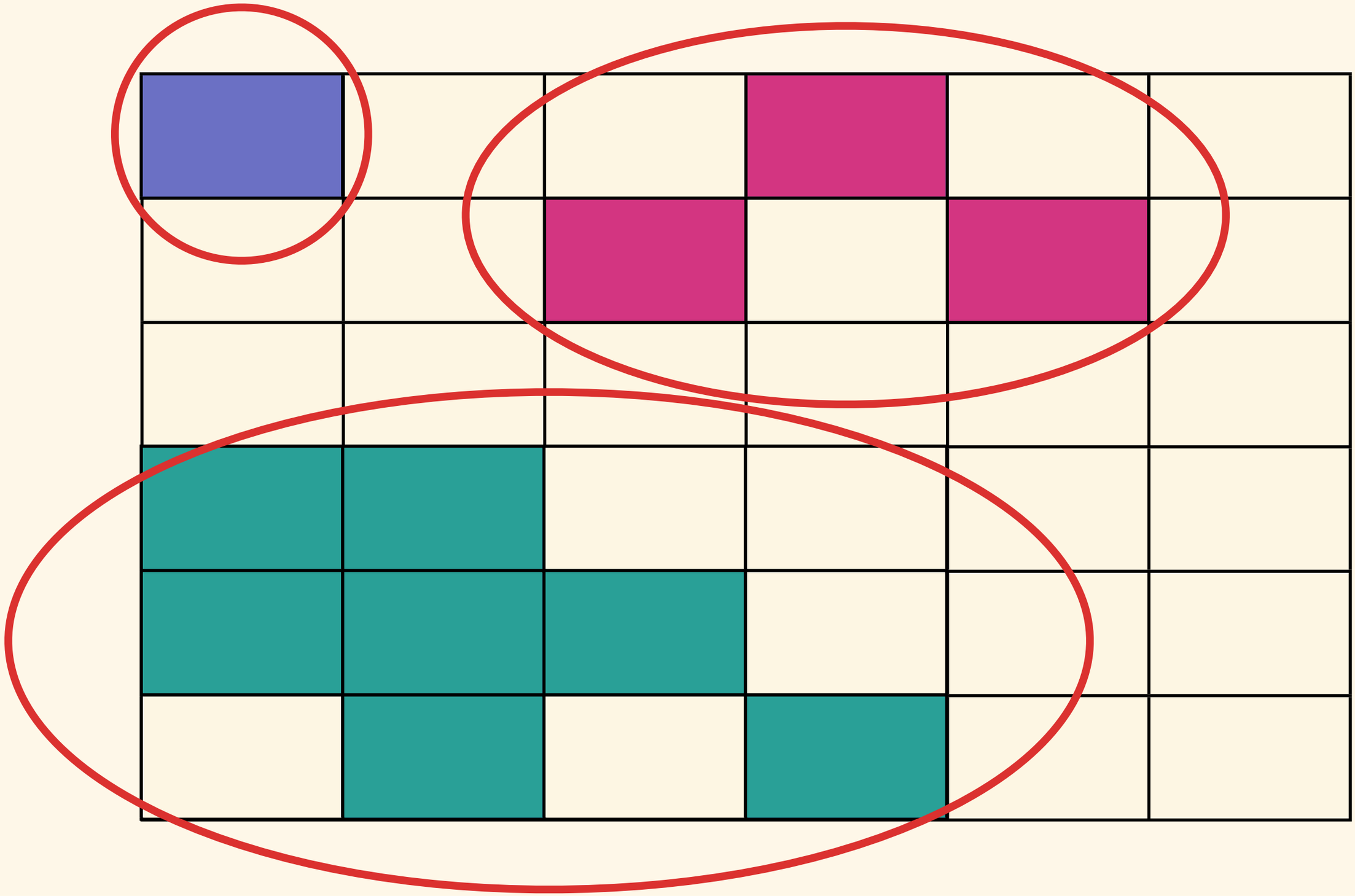
352 - The Seasonal War



352 - The Seasonal War



352 - The Seasonal War



Source Code

```
#include <iostream>
#include <cstdio>
#include <cstring>
using namespace std;

int n;
char map[ 30 ][ 30 ];
bool visited[ 30 ][ 30 ];
int step[ 8 ][ 2 ] = { { 1, 1 }, { 1, 0 }, { 1, -1 }, { 0, 1 },
{ 0, -1 }, { -1, 1 }, { -1, 0 }, { -1, -1 } };

void DFS( int r, int c );

int main() {
   int t = 0;
   while ( scanf( "%d", &n ) != EOF ) {
      int ret = 0;
      for ( int i = 0; i < n; ++i )
         scanf( "%s", map[ i ] );

      memeset( visited, 0, sizeof( visited ) );
```

Source Code

```
    for ( int i = 0; i < n; ++i )
       for ( int j = 0; j < n; ++j )
          if ( map[ i ][ j ] == '1' && visited[ i ][ j ] != true ) {
             DFS( i, j );
             ++ret;
          }
    printf( "Image number %d contains %d war eagles.\n", ++t, ret );
 }
    return 0;
 }
 void DFS( int r, int c ) {
    if ( visited[ r ][ c ] == true )
       return;
    visited[ r ][ c ] = true;
    for ( int i = 0; i < 8; ++i ) {
       int r2 = r + step[ i ][ 0 ], c2 = c + step[ i ][ 1 ];
       if ( r2 >= 0 && r2 < n && c2 >= 0 && c2 < n && map[ r2 ][ c2 ]
       == '1' )
          DFS( r2, c2 );
    }
 }
```

Practice Now

[UVa] 260 - Il Gioco dell'X

Thank You for Your Listening.