```
/*
Adam Novoa
CS 472
4/13/2015
*/

#include <iostream>
#include <fstream>

using namespace std;


class solver
{
private:
        const static int SIZE = 9;
        int puzzle[SIZE][SIZE];
        bool complete;

public:
        solver()
        {
                for (int i = 0; i < SIZE; i++)
                {
                        for (int j = 0; j < SIZE; j++)
                        {
                                puzzle[i][j] = 0;
                        }
                }
                complete = false;
        }

        void read(ifstream &infile)
        {
                char trash;
                for (int i = 0; i < SIZE; i++)
                {
                        for (int j = 0; j < SIZE; j++)
                        {
                                infile >> puzzle[i][j];
                                infile >> trash;
                        }
                }
                return;
        }

        void print(ofstream &outfile)
        {
                for (int i = 0; i < SIZE; i++)
                {
                        for (int j = 0; j < SIZE; j++)
                        {
                                cout << puzzle[i][j];
                                cout << ',';
                                outfile << puzzle[i][j];
                                outfile << ',';
                        }
                        cout << endl;
                        outfile << endl;
                }
```

```
                        return;
                }

        void solve(int x, int y)
        {
                if (puzzle[y][x] == 0)
                {
                        for (int val = 1; val <= 10 && complete == false; val++)
                        {
                                puzzle[y][x] = val;
                                if (val < 10 && isValid())
                                {
                                        if (x < SIZE - 1)
                                        {
                                                solve(x + 1, y);
                                        }
                                        else if (y < SIZE - 1)
                                        {
                                                solve(0, y + 1);
                                        }
                                        else
                                        {
                                                complete = true;
                                        }
                                }
                                if (val == 10)
                                {
                                        puzzle[y][x] = 0;
                                }
                        }
                        return;
                }
                if (complete == false)
                {
                        if (x < SIZE - 1)
                        {
                                solve(x + 1, y);
                        }
                        else if (y < SIZE - 1)
                        {
                                solve(0, y + 1);
                        }
                }
                return;
        }

        bool isValid()
        {
                for (int i = 0; i < SIZE; i++)
                {
                        for (int j = 0; j < SIZE; j++)
                        {
                                if (puzzle[i][j] != 0)
                                {
                                        int temp = puzzle[i][j];
                                        for (int h = j; h < SIZE; h++)
                                        {
                                                if (temp == puzzle[i][h] && h != j)
                                                {
                                                        return false;
                                                }
                                        }
```

```
                    }
                }
            }
        }

        for (int i = 0; i < SIZE; i++)
        {
            for (int j = 0; j < SIZE; j++)
            {
                if (puzzle[i][j] != 0)
                {
                    int temp = puzzle[i][j];
                    for (int h = 0; h < SIZE; h++)
                    {
                        if (temp == puzzle[h][j] && h != i)
                        {
                            return false;
                        }
                    }
                }
            }
        }


        for (int i = 0; i < SIZE; i++)
        {
            for (int j = 0; j < SIZE; j++)
            {
                if (puzzle[i][j] == 2 && i == 1 && j == 0)
                {
                    j = j;
                }
                if (puzzle[i][j] != 0)
                {
                    int h;
                    int k;
                    if (i < 3)
                    {
                        h = 0;
                    }
                    else if (i < 6)
                    {
                        h = 3;
                    }
                    else if (i < 9)
                    {
                        h = 6;
                    }
                    if (j < 3)
                    {
                        k = 0;
                    }
                    else if (j < 6)
                    {
                        k = 3;
                    }
                    else if (j < 9)
                    {
                        k = 6;
                    }
```

```
                                               int temp = puzzle[i][j];
                                               for (int y = 0; y < 3; y++)
                                               {
                                                       for (int x = 0; x < 3; x++)
                                                       {
                                                               if (temp == puzzle[h + y][k + x] && (h
 + y != i || k + x != j))

                                                               {
                                                                       return false;
                                                               }
                                                       }
                                               }
                               }
                       }
               }
                       return true;
               }

       };

       int main()
       {
               solver s;
               ifstream infile;
               infile.open("puzzle.txt");
               s.read(infile);
               infile.close();

               s.solve(0,0);

               ofstream outfile;
               outfile.open("result.txt");
               if (s.isValid())
               s.print(outfile);
               outfile.close();

               system("pause");
               return 0;
       }
       /*
       puzzle in puzzle.txt
       4,0,0,0,2,5,1,0,7,
       0,0,6,7,0,0,0,0,0,
       0,0,5,0,0,0,0,9,0,
       0,0,0,1,0,8,0,6,0,
       0,0,7,0,0,0,0,2,0,
       0,0,0,0,0,0,0,0,0,
       1,0,0,2,0,9,3,0,0,
       0,0,0,0,0,0,0,0,5,
       0,3,4,0,0,1,0,0,0,

       answer to test puzzle
       4,8,9,6,2,5,1,3,7,
       2,1,6,7,9,3,5,4,8,
       3,7,5,8,1,4,6,9,2,
       9,2,3,1,5,8,7,6,4,
       5,4,7,9,3,6,8,2,1,
       8,6,1,4,7,2,9,5,3,
       1,5,8,2,4,9,3,7,6,
       6,9,2,3,8,7,4,1,5,
       7,3,4,5,6,1,2,8,9,
```

```
    */
```