

#### 4.4. PROBLEM SET

### COXETER MAGIC SQUARE

Start with 1 in the middle of the top row; then go up and left, assigning numbers in increasing order to empty squares; if you fall off the square imagine the same square as tiling the plane and continue; if a square is occupied, move down instead and continue.

Works for only odd number

6	1	8
7	5	3
2	9	4

15	8	1	24	17
16	14	7	5	23
22	20	13	6	4
3	21	19	12	10
9	2	25	18	11

Implement class `magicsquare`  
and test for various odd values of `n`

1. Make sure the sum is same in all directions

e-mail `magicsquare.h`  
`magicsquare.cpp`  
`magicsquaretest.cpp`  
must use only `../util/util.h`

Figure 4.5: Odd Magic square

Problem 4.4.2.

Initilize the chess board as shown in the figure.

Write a display routine that prints the board configuration

SHOW SOLUTION AS BOTH STATIC AND DYNAMIC ALLOCATION

**K** white king  
**Q** white queen  
**R** white rook  
**B** white bishop  
**N** white knight  
**P** white pawn  
**—** empty square

**k** black king  
**q** black queen  
**r** black rook  
**b** black bishop  
**n** black knight  
**p** black pawn

r	n	b	q	k	b	n	r
p	p	p	p	p	p	p	p
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
P	P	P	P	P	P	P	P
R	N	B	Q	K	B	N	R

Figure 4.6: A chess board

Problem 4.4.3.

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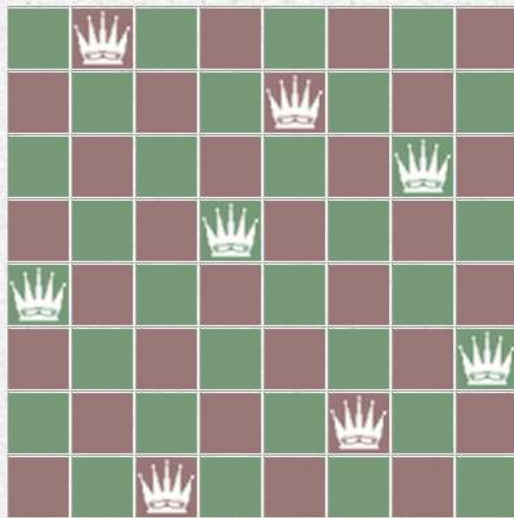
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##### Problem 4.4.4.

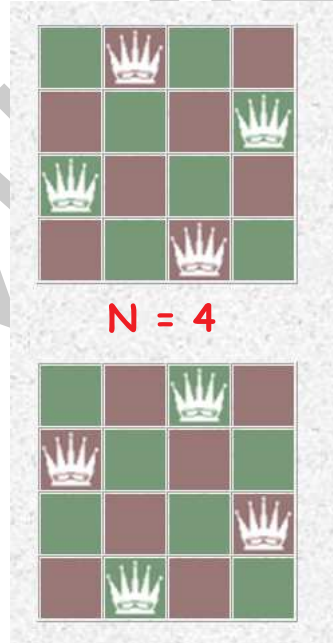
The eight queens puzzle is the problem of placing eight chess queens on an 8×8 chessboard so that no two queens attack each other. Thus, a solution requires that no two queens share the same row, column, or diagonal

### The N Queens Problem

$N = 8$



$N = 4$



For a 1 x 1 board, there is one trivial solution:



$N=1$

Output solution

For 2 x 2 and 3 x 3 boards, there are no solutions.

```

----1---
-----1-
-1-----
-----1--
--1-----
1-----
---1-----
-----1

```

The eight queens puzzle has **92 distinct solutions**. If solutions that differ only by symmetry operations (rotations and reflections) of the board are counted as one, the puzzle has **12 unique (or fundamental) solutions**.

Figure 4.7: N Queens Puzzle