Refactoring - Tetris #3

(with examples in java)

3. Make Block implement the same interface as Tetromino.

```
public class Block implements Grid {
14
15
16
            private final int row;
17
            private final int col:
            private final char style;
18
19
            public Block(char style) {
20
-11
                this(0, 0, style);
22
23
.4
            private Block(int row, int col, char style) {
!5
!6
                 this.row = row;
                 this.col = col:
!7
                this.style = style;
28
            }
29
30
            public int row() {
-11
                 return row;
32
            }
33
34
            public int col() {
:15
                 return col;
36
37
38
            public char style() {
19
                 return style;
40
41
42 of X
            public int rows() {
-3
                 return 1;
44
45
            public int columns() {
46 of
.7
                 return 1:
48
49
            public char cellAt(int row, int col) {
50 🗊
^{-1}
                 return style;
52
53
54
            public boolean isAt(int row, int col) {
55
                 return row == this.row && col == this.col;
56
57
            public Block moveTo(int row, int col) {
58
59
                return new Block(row, col, style);
60
61
```

4a. Change Board.drop() to accept any Grid. Block contains the movement logic, so we wrap the Grid in it.

```
45
                  private boolean hitsAnotherBlock(Block block) {
46
        -6
                      return blocks[block.row()][block.col()] != EMPTY;
        47
48
        48
49
        49
                  public void drop(Grid block) {
50
                      if (hasFalling()) {
        10
51
52
53
54
        *1
                           throw new IllegalStateException("Another block may not be
        52
                      fallingBlock = new Block(block).moveTo(0, columns() / 2);
        3
        54
55
56
57
        55
        56
                  public boolean hasFalling() {
        -7
                      return fallingBlock != null;
58
        58
59
       59
                  private void stopFallingBlock() {
60
       60
```

4b. Make Block contain a Grid.

```
public class Block implements Grid {
14
15
          private final int row;
16
          private final int col:
17
          private final char style;
18
19 X
          private final Grid inner;
20
21
          public Block(char style) {
!2
              this(0, 0, style, new Piece(style + "\n"));
23
          }
24
25 ×
          public Block(Grid inner) {
26
              this(0, 0, 'z', inner);
27
28
          private Block(int row, int col, char style, Grid inner) {
10
              this.row = row:
              this.col = col:
1
12
              this.style = style;
13 X
              this.inner = inner:
          }
34
                                               55
35
                                                          public char cellAt(int row, int col) {
          public int row() {
                                               56 at
36
                                                               return style;
:7
              return row:
                                               -7
38
                                                          }
                                               58
30
                                               59
                                                          public boolean isAt(int row, int col) {
                                               60
                                               -11
                                                               return row == this.row && col == this.col:
                                                          }
                                               62
                                               63
                                                          public Block moveTo(int row, int col) {
                                               64
                                               15
                                                               return new Block(row, col, style, inner);
                                               66
                                                          }
                                               67
                                               68
                                                          public Block moveDown() {
                                                              return new Block(row + 1, col, style, inner);
                                               i9
                                               70
                                               71
                                               72
```

4c. Change Block to delegate its Grid methods to the contained Grid.

```
public char style() {
                                                                         public char style() {
                                                         44
                                                                44
       return style;
                                                        45
                                                                .5
                                                                             return style:
                                                                46
                                                         46
                                                                47
                                                         47
   public int rows() {
                                                                48 🗊
                                                                         public int rows() {
                                                        48
                                                                             return inner.rows();
       return 1:
                                                      >> 49
                                                                50
                                                        50
                                                                51
                                                        51
                                                                52 🖈
   public int columns() {
                                                                         public int columns() {
                                                        52
       return 1:
                                                      » 53
                                                                -3
                                                                             return inner.columns():
                                                                54
                                                         54
                                                                55
                                                        55
                                                                56 🗊
   public char cellAt(int row, int col) {
                                                        56
                                                                         public char cellAt(int row, int col) {
                                                      ≫ 57
       return style;
                                                                             return inner.cellAt(row, col);
                                                        58
                                                                58
                                                                59
                                                         59
   public boolean isAt(int row, int col) {
                                                                60
                                                                         public boolean isAt(int row, int col) {
                                                         60
       return row == this.row && col == this.col:
                                                                -11
                                                                             return row == this.row && col == this.col:
                                                        61
                                                                62
                                                        62
                                                                63
                                                         63
                                                                64
   public Block moveTo(int row, int col) {
                                                                         public Block moveTo(int row, int col) {
                                                         64
                                                                15
       return new Block(row, col, style, inner);
                                                                             return new Block(row, col, style, inner);
                                                        65
                                                                66
                                                         66
                                                         67
                                                                67
                                                                68
   public Block moveDown() {
                                                         68
                                                                         public Block moveDown() {
Run 🐎 All tests
                                                                Done: 58 of 58 Failed: 14(0,047 s)
🚜 🔞 <default>
                                                                   Output Main Statistics
       庄 🚷 FallingBlocksTest$When_a_block_is_dropped (tetris)
                                                                java.lang.ArrayIndexOutOfBoundsException: 1
             test_It_starts_from_the_top_middle
                                                                        at tetris.Piece.cellAt(Piece.java:89)
             test_It_moves_down_one_row_per_tick
                                                                        at tetris.Block.cellAt(Block.java:57)
             test_At_most_one_block_may_be_falling_at_a_time
                                                                        at tetris.Board.cellAt(Board.java:89)
       ±⊢ 🚳 FallingBlocksTest (tetris)
                                                                        at tetris.GridAsciiView.toString(GridAsciiView.java:26
       at tetris.Board.toString(Board.java:96)
×
                                                                        at tetris.FallingBlocksTest$When a block is dropped.te
       2
                                                                        at sun.reflect.NativeMethodAccessorImpl.invokeO(Native
```

4d. Fix the row/column coordinate mismatch in Block.cellAt().

```
}
                                                       51
                                                               52 🗊
                                                                         public int columns() {
public int columns() {
                                                       52
                                                               -3
                                                                             return inner.columns():
    return inner.columns():
                                                       53
                                                               54
                                                       54
                                                               55
                                                       55
                                                                         public char cellAt(int row, int col) {
                                                               56 at
                                                       56
                                                                             int innerRow = row - rowOffset;
public char cellAt(int row, int col) {
                                                               7 X
    return inner.cellAt(row, col);
                                                    ≫ 57
                                                                             int innerCol = col - colOffset;
                                                               18
                                                               9
                                                                             return inner.cellAt(innerRow, innerCol);
                                                       58
                                                       59
                                                               60
public boolean isAt(int row, int col) {
                                                               61
                                                       60
    return row == this.row && col == this.col;
                                                               62
                                                     ≫ 61
                                                                         public boolean isAt(int row, int col) {
                                                               :3
                                                                             return row == this.rowOffset && col == this.colOffset;
}
                                                       62
                                                               64
                                                       63
                                                               65
public Block moveTo(int row, int col) {
                                                       64
    return new Block(row, col, style, inner);
                                                       65
                                                               66
                                                                         public Block moveTo(int row, int col) {
                                                               - 7
                                                                             return new Block(row, col, style, inner);
                                                       66
                                                       67
                                                               68
public Block moveDown() {
                                                       68
                                                               69
    return new Block(row + 1, col, style, inner);
                                                                         public Block moveDown() {
                                                    >> 69
                                                               70
                                                                             return new Block(rowOffset + 1, colOffset, style, inner):
}
                                                               1
                                                       70
                                                       71
                                                               72
                                                              73
                                                       72
      Run > All tests
                                                                          Done: 58 of 58(0,015 s)
                                                                             Output Marketics
                  All Tests Passed
                                                                          "C:\Program Files\Java\jdkl.6.0 14\bin\java"
                                                                          17 test classes found in package ''
                                                                          Process finished with exit code 0
       ×
       2
```

6. Change Board to use MovableGrid instead of Block.

```
*6
     public class Board implements Grid {
17
18
         private MovableGrid fallingBlock;
19
         private char[][] blocks:
20
1
         public Board(int rows, int columns) {
!2
              blocks = new char[rows][columns];
              for (char[] tmp : blocks) {
!3
                  Arrays.fill(tmp, EMPTY);
'4
25
         }
26
27
28
         public void tick() {
              MovableGrid test = fallingBlock.moveDown();
10
              if (conflictsWithBoard(test)) {
1
                  stopFallingBlock();
32
              } else {
13
                  fallingBlock = test;
34
35
36
37
         private boolean conflictsWithBoard(MovableGrid block) {
              return outsideBoard(block) || hitsAnotherBlock(block);
18
39
         }
40
          private boolean outsideBoard(MovableGrid block) {
41
-2
              return block.row() >= rows();
         }
43
44
45
         private boolean hitsAnotherBlock(MovableGrid block) {
-6
              return blocks[block.row()][block.col()] != EMPTY;
47
48
         public void drop(Grid block) {
49
              if (hasFalling()) {
*1
                  throw new IllegalStateException("Another block may not be dropped when one is already falling");
52
-3
              fallingBlock = new MovableGrid(block).moveTo(0, columns() / 2 - block.columns() / 2);
54
55
56
          public boolean hasFalling() {
-7
              return fallingBlock != null;
58
59
         private void stopFallingBlock() {
60
              assert hasFalling();
1
12
              copyToBoard(fallingBlock);
13
              fallingBlock = null;
64
         }
65
         private void copyToBoard(MovableGrid block) {
              for (int row = 0; row < blocks.length; row++) {</pre>
```

7a. Try running the first test. It fails.

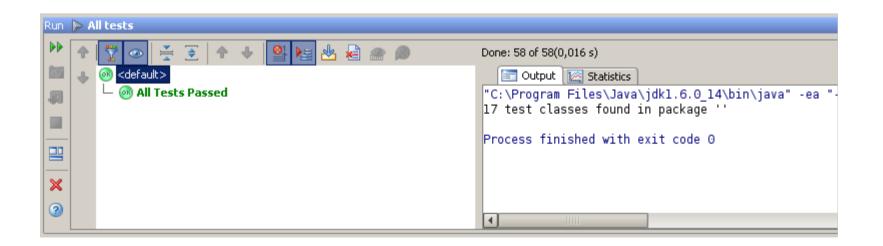
```
21
      ò
 22
             public static class When a piece is dropped extends TestCase {
 23
 24
                  private Board board;
 25
 26 of 🖨
                  protected void setUp() throws Exception {
* 27
                      board = new Board(6, 8):
* 28
                      board.drop(Tetrominoe.T SHAPE);
 29
 30
 31
                  public void test It starts from top middle() {
*32
                      assertEquals("" +
                                "....T...\n" +
 33
 34
                                "....III...\n" +
 35
                                ".....\n" +
 36
                                                                                                                             X
                          assertEquals(String, String) failed
 37
                          📔 🔍 💠 🔥 Ignore whitespace: Do not ignore 🔻
 38
                         Expected(Read-only)
                                                                              Actual(Read-only)
 40
                            ▲ . . . . T . . .
                              41
                                                                               6
                                                                                                                           \overline{\phantom{a}}
                         2 differences
                                                                  Deleted
                                                                                  Changed
                                                                                                 Inserted
                        Done: 58 of 58 Failed: 2(0,031 s)
                                                                                                                           🛅 Output 🛭
                                   Statistics
                        junit.framework.ComparisonFailure: null <<u><Click to see difference></u>
                                at tetris.FallingPiecesTest$When a piece is dropped.test It starts from top middle(FallingPiecesTest.jav
                                at sun.reflect.NativeMethodAccessorImpl.invokeO(Native Method)
                                at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:39)
                                at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
                                at com.intellij.rt.execution.junit.JUnitStarter.main(JUnitStarter.java:40)
                                at sun.reflect.NativeMethodAccessorImpl.invokeO(Native Method)
                                at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:39)
```

7b. Fix the row/column coordinate mismatch in Block.isAt(). Now FallingPiecesTest *almost* passes.

```
56 ॼऻ
                                                                                       public char cellAt(int row. int col) {
public char cellAt(int row. int col) {
    int innerRow = row - rowOffset;
                                                                                           int innerRow = row - rowOffset;
                                                                    57
                                                                            ٠7
    int innerCol = col - colOffset;
                                                                    58
                                                                            8
                                                                                           int innerCol = col - colOffset:
    return inner.cellAt(innerRow, innerCol);
                                                                    59
                                                                            9
                                                                                           return inner.cellAt(innerRow, innerCol);
                                                                    60
                                                                            60
                                                                    61
                                                                            61
public boolean isAt(int row. int col) {
                                                                    62
                                                                            62
                                                                                       public boolean isAt(int row, int col) {
    return row == this.rowOffset && col == this.colOffset;
                                                                 >> 63
                                                                            13
                                                                                           int innerRow = row - rowOffset;
                                                                            14
                                                                                           int innerCol = col - colOffset;
                                                                    64
                                                                    65
                                                                            5 X
                                                                                           return innerRow >= 0 && innerRow < inner.rows() &&
                                                                                                   innerCol >= 0 && innerCol < inner.columns():
public Block moveTo(int row, int col) {
                                                                    66
                                                                            66
    return new Block(row, col, style, inner);
                                                                    67
                                                                            67
                                                                            68
                                                                    68
                                                                            69
                                                                                      public Block moveTo(int row, int col) {
                                                                    69
public Block moveDown() {
                                                                    70
                                                                            '()
                                                                                           return new Block(row, col, style, inner);
    return new Block(rowOffset + 1, colOffset, style, inner
                                                                    71
                                                                            71
                                                                    72
                                                                            72
                                                                   73
                                                                            73
                                                                                       public Block moveDown() {
                                                                    74
                                                                            '4
                                                                                           return new Block(rowOffset + 1, colOffset, style, inner);
                                                                            75
                                                                                                                                              X
                                assertEquals(String, String) failed
                                                Ignore whitespace: Do not ignore 🔻
                                 Expected(Read-only)
                                                                                          Actual(Read-only)
                                    <u>-</u> . . . . Γ. . .
                                                                                                . . . . . T. .
                                      . . ПТ. .
                                                                                                . . . <del>.</del> TTT .
                                 2 differences
                                                                              Deleted
                                                                                               Changed
                                                                                                                Inserted
                                                                                                                                            Done: 58 of 58 Failed: 2(0,047 s)
                                  Output Make Statistics
                               junit.framework.ComparisonFailure: null <Click to see difference>
                                        at tetris.FallingPiecesTest$When a piece is dropped.test It starts from top middle(FallingPiecesTest.java:32)
                                        at sun.reflect.NativeMethodAccessorImpl.invokeO(Native Method)
                                        at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:39)
                                        at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:25)
```

7c. Fix the falling Grid's initial position in Board.drop(). Now FallingPiecesTest passes. (Wohoo!)

```
private boolean hitsAnotherBlock(Block block) {
lock(Block block) {
                                       45
                                               45
)][block.col()] != EMPTY;
                                       46
                                                              return blocks[block.row()][block.col()] != EMPTY;
                                                .6
                                       47
                                               47
                                       48
                                               48
                                       49
                                               49
                                                         public void drop(Grid block) {
                                       50
                                                             if (hasFalling()) {
                                                10
teException("Another block may not
                                       51
                                                *.1
                                                                  throw new IllegalStateException("Another block may not be dropped when one is alr
                                       52
                                               52
(block).moveTo(0, columns() / 2);
                                     » 53
                                                             fallingBlock = new Block(block).moveTo(0, columns() / 2 - block.columns() / 2);
                                                -3
                                       54
                                               54
                                       55
                                               55
                                       56
                                                         public boolean hasFalling() {
                                               56
                                       57
                                                .7
                                                              return fallingBlock != null;
ull:
                                       58
                                               58
                                       59
                                               59
                                       60
                                               60
                                                         private void stopFallingBlock() {
<() {
                                       61
                                                              assert hasFalling();
                                                              copyToBoard(fallingBlock);
                                       62
                                                12
                                       63
                                                13
                                                              fallingBlock = null;
                                       64
                                               64
                                                         }
```



7d. Remove the obvious code duplication.

```
52 🗊
                                                                                public int columns() {
public int rows() {
                                                                                     return inner.columns():
                                                                      -3
                                                              49
    return inner.rows():
                                                                      54
                                                              50
                                                                      55
                                                              51
                                                                      56 🗊
                                                                                 public char cellAt(int row, int col) {
public int columns() {
                                                              52
                                                                      57
                                                                                     int innerRow = toInnerRow(row);
    return inner.columns():
                                                              53
                                                                      58
                                                                                     int innerCol = toInnerCol(col):
                                                              54
                                                                       9
                                                                                     return inner.cellAt(innerRow, innerCol):
                                                              55
                                                                                }
                                                                      60
public char cellAt(int row, int col) {
                                                              56
                                                                      61
    int innerRow = row - rowOffset;
                                                            ≫ 57
                                                                                public boolean isAt(int row, int col) {
                                                                      62
    int innerCol = col - colOffset;
                                                            ≫ 58
                                                                      63
                                                                                     int innerRow = toInnerRow(row);
    return inner.cellAt(innerRow, innerCol):
                                                              59
                                                                      64
                                                                                     int innerCol = toInnerCol(col):
}
                                                              60
                                                                      :5
                                                                                     return innerRow >= 0 && innerRow < inner.rows() &&
                                                              61
                                                                                             innerCol >= 0 && innerCol < inner.columns():</pre>
                                                                      66
public boolean isAt(int row, int col) {
                                                              62
                                                                      67
                                                                                }
    int innerRow = row - rowOffset;
                                                            > 63
                                                                      68
    int innerCol = col - colOffset;
                                                            >> 64
                                                                                private int toInnerCol(int col) {
                                                                      69 X
    return innerRow >= 0 && innerRow < inner.rows() &&
                                                              65
                                                                                     return col - colOffset;
                                                                      70
            innerCol >= 0 && innerCol < inner.columns():
                                                              66
                                                                      71
}
                                                              67
                                                                      72
                                                              68
                                                                      73
                                                                                private int toInnerRow(int row) {
                                                              69
public Block moveTo(int row, int col) {
                                                                      74
                                                                                     return row - rowOffset:
    return new Block(row, col, style, inner);
                                                              70
                                                                      75
                                                              71
}
                                                                      76
                                                              72
                                                                      77
                                                                                public Block moveTo(int row, int col) {
                                                              73
public Block moveDown() {
                                                                       .8
                                                                                     return new Block(row, col, style, inner);
                                                              74
    return new Block(rowOffset + 1, colOffset, style, in
                                                                      79
                                                              75
                                                                      80
                                                              76
                                                                                public Block moveDown() {
                                                                      81
                                                              77
                                                                                     return new Block(rowOffset + 1, colOffset, style, inner);
                                                                      12
                                                                      83
                                                                      84
```