

# Pit Test Coverage Report

## Package Summary

us.ihmc.games.wordoku

Number of Classes	Line Coverage	Mutation Coverage
3	99% <div>105/106</div>	91% <div>315/345</div>

## Breakdown by Class

Name	Line Coverage	Mutation Coverage
<a href="#">CorrectPlayer.java</a>	100% <div>5/5</div>	100% <div>13/13</div>
<a href="#">WordokuGamePlay.java</a>	100% <div>10/10</div>	90% <div>18/20</div>
<a href="#">WordokuPuzzle.java</a>	99% <div>90/91</div>	91% <div>284/312</div>

# CorrectPlayer.java

```
1 package us.ihmc.games.wordoku;
2
3 public class CorrectPlayer implements WordokuPlayerInterface
4 {
5
6     private int numberOfMoves;
7
8     public char getLetter()
9     {
10 2     return correctLetters[numberOfMoves];
11     }
12
13     public int getRow()
14     {
15 3     return correctPositions[numberOfMoves][0]; //row number corresponding with input letter
16     }
17
18     public int getColumn()
19     {
20 3     numberOfMoves++;
21 5     return correctPositions[numberOfMoves - 1][1]; //column number corresponding with input letter
22     }
23 }
```

## Mutations

<a href="#">10</a>	1. replaced char return with 0 for us/ihmc/games/wordoku/CorrectPlayer::getLetter → KILLED 2. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">15</a>	1. Substituted 0 with 1 → KILLED 2. replaced int return with 0 for us/ihmc/games/wordoku/CorrectPlayer::getRow → KILLED 3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">20</a>	1. Substituted 1 with 0 → KILLED 2. Replaced integer addition with subtraction → KILLED 3. Removed assignment to member variable numberOfMoves → KILLED
<a href="#">21</a>	1. Substituted 1 with 0 → KILLED 2. Substituted 1 with 0 → KILLED 3. Replaced integer subtraction with addition → KILLED 4. replaced int return with 0 for us/ihmc/games/wordoku/CorrectPlayer::getColumn → KILLED 5. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED

## Active mutators

- RETURN\_VALS\_MUTATOR
- BOOLEAN\_TRUE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_61
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_60
- CONDITIONALS\_BOUNDARY\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_56
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_55
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_58
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_57
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_52
- VOID\_METHOD\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_51
- NULL\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_54
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_53
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_59
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_50
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_45
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_44

- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_47
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_46
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_41
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_40
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_43
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_42
- NEGATE\_CONDITIONALS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_49
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_48
- INLINE\_CONSTANT\_MUTATOR
- CONSTRUCTOR\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_34
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_33
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_36
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_35
- EXPERIMENTAL\_MEMBER\_VARIABLE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_30
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_32
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_31
- REMOVE\_CONDITIONALS\_ORDER\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_38
- BOOLEAN\_FALSE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_37
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_39
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_3
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_2
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_1
- INVERT\_NEGS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_0
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_23
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_22
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_25
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_9
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_24
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_8
- EMPTY\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_7
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_6
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_21
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_5
- NAKED\_RECEIVER
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_20
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_4
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_27
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_26
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_29
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_28
- PRIMITIVE\_RETURN\_VALS\_MUTATOR
- REMOVE\_INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_12
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_11
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_99
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_14
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_13
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_96
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_95
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_10
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_98
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_97
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_19
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_16
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_15
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_18
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_17
- EXPERIMENTAL\_SWITCH\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_92
- ARGUMENT\_PROPAGATION\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_91
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_94
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_93
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_90
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_89
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_88
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_85
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_84

- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_87
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_86
- MATH\_MUTATOR
- NON\_VOID\_METHOD\_CALL\_MUTATOR
- REMOVE\_CONDITIONALS\_EQUAL\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_81
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_80
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_83
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_82
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_78
- REMOVE\_CONDITIONALS\_EQUAL\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_77
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_79
- INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_74
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_73
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_76
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_75
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_70
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_72
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_71
- REMOVE\_CONDITIONALS\_ORDER\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_67
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_66
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_69
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_68
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_63
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_62
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_65
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_64

## Tests examined

- us.ihmc.games.wordoku.WordokuGamePlayTest.testPlayWithValid(us.ihmc.games.wordoku.WordokuGamePlayTest) (7 ms)

# WordokuGamePlay.java

```
1 package us.ihmc.games.wordoku;
2
3 public class WordokuGamePlay
4 {
5
6     boolean puzzleSolved;
7     boolean validMove = true;
8
9     public boolean play(WordokuPlayerInterface player, WordokuPuzzle puzzle)
10    {
11        while (!puzzleSolved && validMove)
12        {
13            System.out.println(puzzle.printBoard());
14
15            //NB: It is important that you getColumn LAST bc it increments numberOfMoves
16            char letter = player.getLetter();
17            int row = player.getRow();
18            int column = player.getColumn();
19
20            validMove = puzzle.modify(row, column, letter);
21            puzzleSolved = puzzle.completeBoard();
22        }
23        return puzzleSolved;
24    }
25 }
```

## Mutations

<a href="#">7</a>	1. Substituted 1 with 0 → KILLED 2. Removed assignment to member variable validMove → KILLED
<a href="#">11</a>	1. negated conditional → KILLED 2. negated conditional → KILLED 3. removed conditional - replaced equality check with false → KILLED 4. removed conditional - replaced equality check with false → KILLED 5. removed conditional - replaced equality check with true → KILLED 6. removed conditional - replaced equality check with true → KILLED
<a href="#">13</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::printBoard → SURVIVED 2. removed call to java/io/PrintStream::println → SURVIVED
<a href="#">16</a>	1. removed call to us/ihmc/games/wordoku/WordokuPlayerInterface::getLetter → KILLED
<a href="#">17</a>	1. removed call to us/ihmc/games/wordoku/WordokuPlayerInterface::getRow → KILLED
<a href="#">18</a>	1. removed call to us/ihmc/games/wordoku/WordokuPlayerInterface::getColumn → KILLED
<a href="#">20</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED 2. Removed assignment to member variable validMove → KILLED
<a href="#">21</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::completeBoard → KILLED 2. Removed assignment to member variable puzzleSolved → KILLED
<a href="#">23</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuGamePlay::play → KILLED 2. replaced boolean return with true for us/ihmc/games/wordoku/WordokuGamePlay::play → KILLED 3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED

# Active mutators

- RETURN\_VALS\_MUTATOR
- BOOLEAN\_TRUE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_61
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_60
- CONDITIONALS\_BOUNDARY\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_56
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_55
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_58
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_57
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_52
- VOID\_METHOD\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_51
- NULL\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_54
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_53
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_59
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_50
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_45
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_44
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_47
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_46
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_41
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_40
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_43
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_42
- NEGATE\_CONDITIONALS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_49
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_48
- INLINE\_CONSTANT\_MUTATOR
- CONSTRUCTOR\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_34
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_33
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_36
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_35
- EXPERIMENTAL\_MEMBER\_VARIABLE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_30
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_32
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_31
- REMOVE\_CONDITIONALS\_ORDER\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_38
- BOOLEAN\_FALSE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_37
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_39
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_3
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_2
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_1
- INVERT\_NEGS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_0
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_23
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_22
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_25
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_9
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_24
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_8
- EMPTY\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_7
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_6
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_21
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_5
- NAKED\_RECEIVER
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_20
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_4



- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_27
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_26
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_29
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_28
- PRIMITIVE\_RETURN\_VALS\_MUTATOR
- REMOVE\_INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_12
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_11
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_99
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_14
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_13
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_96
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_95
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_10
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_98
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_97
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_19
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_16
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_15
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_18
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_17
- EXPERIMENTAL\_SWITCH\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_92
- ARGUMENT\_PROPAGATION\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_91
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_94
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_93
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_90
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_89
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_88
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_85
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_84
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_87
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_86
- MATH\_MUTATOR
- NON\_VOID\_METHOD\_CALL\_MUTATOR
- REMOVE\_CONDITIONALS\_EQUAL\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_81
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_80
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_83
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_82
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_78
- REMOVE\_CONDITIONALS\_EQUAL\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_77
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_79
- INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_74
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_73
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_76
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_75
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_70
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_72
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_71
- REMOVE\_CONDITIONALS\_ORDER\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_67
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_66
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_69
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_68
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_63
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_62
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_65
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_64

**Tests examined**

- `us.ihmc.games.wordoku.WordokuGamePlayTest.testPlayWithValid(us.ihmc.games.wordoku.WordokuGamePlayTest)`  
(7 ms)
- `us.ihmc.games.wordoku.WordokuGamePlayTest.testPlayWithInvalid(us.ihmc.games.wordoku.WordokuGamePlayTest)`  
(170 ms)



# WordokuPuzzle.java

```
1 package us.ihmc.games.wordoku;
2
3 import java.util.HashSet;
4 import java.util.Set;
5
6 public class WordokuPuzzle
7 {
8     //game board
9     private char[][] board;
10
11     //Dimensions
12     private static final int ROWS = 4;
13     private static final int COLUMNS = 4;
14     private static final int MINIMUM_INDEX = 0;
15
16     //Boxes
17     public enum Boxes
18     {
19         TOP_LEFT, TOP_RIGHT, BOTTOM_LEFT, BOTTOM_RIGHT;
20
21         public static Boxes getBox(int row, int column)
22         {
23             if (row < 2 && column < 2)
24                 return TOP_LEFT;
25             else if (row < 2 && column > 2)
26                 return TOP_RIGHT;
27             else if (row > 2 && column < 2)
28                 return BOTTOM_LEFT;
29             else
30                 return BOTTOM_RIGHT;
31         }
32     }
33
34     //Original set of 4 distinct letters on the board
35     private Set<Character> originalLetters;
36
37     //Dimensions of original positions array
38     private static final int NUMBER_OF_POSITIONS = 16;
39     private static final int NUMBER_OF_DIMENSIONS = 2;
40
41     //Positions of letters that came with the original board
42     private int[][] originalPositions;
43
44     //Number of letters on the original board
45     private int numberOfOriginal;
46
47     //Dictionary of Valid Words
48 1 private String[] validWords = WordokuLibrary.WORDS;
49
50     public WordokuPuzzle(char[][] b)
51     {
52 1 board = b;
53 2 originalLetters = this.differentLetters();
54 2 originalPositions = getOriginalPositions();
55     }
56
57     //Gets the array of original positions that the user cannot edit
58     public int[][] getOriginalPositions()
59     {
60 2 numberOfOriginal = 0;
61 2 int[][] positions = new int[NUMBER_OF_POSITIONS][NUMBER_OF_DIMENSIONS];
62
63 8 for (int row = 0; row < ROWS; row++)
64     {
65 7 for (int column = 0; column < COLUMNS; column++)
66     {
67 3 if (board[row][column] != Character.MIN_VALUE)
68     {
69 1 positions[numberOfOriginal][0] = row;
```

```

70 1      positions[numberOfOriginal][1] = column;
71 3      numberOfOriginal++;
72      }
73      }
74      }
75 2      return positions;
76
77      }
78
79      //Gets all the distinct letters of the board
80      public Set<Character> differentLetters()
81      {
82 1      Set<Character> set = new HashSet<Character>();
83 8      for (int row = 0; row < ROWS; row++)
84      {
85 7      for (int column = 0; column < COLUMNS; column++)
86      {
87 2      set.add(board[row][column]);
88      }
89      }
90 3      set.remove(Character.MIN_VALUE);
91 2      return set;
92      }
93
94      //Returns true if the board has no more blank spaces
95      public boolean completeBoard()
96      {
97 8      for (int row = 0; row < ROWS; row++)
98      {
99 7      for (int column = 0; column < COLUMNS; column++)
100      {
101 3      if (board[row][column] == 0)
102      {
103 3      return false;
104      }
105      }
106      }
107 3      return true;
108
109      }
110
111      //Returns true if a given letter is a part of the original set of letters and thus valid
112      public boolean validLetter(char letter)
113      {
114 5      return originalLetters.contains(letter);
115      }
116
117      //Returns true if a given row does not have any repeating letters
118      public boolean validRow(int rowNumber)
119      {
120 1      Set<Character> lettersInRow = new HashSet<Character>();
121
122      //Checks for repeating letters
123      for (char currentLetter : board[rowNumber])
124      {
125      //char currentLetter = board[rowNumber][i];
126 3      if (currentLetter != 0)
127      {
128 5      if (lettersInRow.contains(currentLetter))
129      {
130 3      return false; //contains a repeating letter
131      }
132      else
133      {
134 2      lettersInRow.add(currentLetter);
135      }
136      }
137      }
138
139 3      return true;
140      }
141
142      //Tests if a given column does not have any repeating letters

```

```

143     public boolean validColumn(int columnNumber)
144     {
145         1         Set<Character> lettersInColumn = new HashSet<Character>();
146
147         //Checks for repeating letters
148         7         for (int i = 0; i < COLUMNS; i++)
149         {
150             char currentLetter = board[i][columnNumber];
151             3             if (currentLetter != 0)
152             {
153                 5                 if (lettersInColumn.contains(currentLetter))
154                 {
155                     3                     return false; //contains a repeating letter
156                 }
157                 else
158                 {
159                     2                     lettersInColumn.add(currentLetter);
160                 }
161             }
162         }
163
164         3         return true;
165     }
166
167     //Tests if a given box does not have any repeating letters
168     public boolean valid2x2Box(Boxes whichBox)
169     {
170         //Row and column numbers for topleft letter of each 2x2 box
171         int rowNumber;
172         int columnNumber;
173
174         7         switch (whichBox)
175         {
176             case TOP_LEFT:
177                 1                 rowNumber = columnNumber = 0;
178                 break;
179             case TOP_RIGHT:
180                 1                 rowNumber = 0;
181                 1                 columnNumber = 2;
182                 break;
183             case BOTTOM_LEFT:
184                 1                 rowNumber = 2;
185                 1                 columnNumber = 0;
186                 break;
187             case BOTTOM_RIGHT:
188                 1                 rowNumber = columnNumber = 2;
189                 break;
190             default:
191                 1                 throw new RuntimeException("Not a valid box type");
192         }
193
194         //Checks for repeating letters
195
196         1         Set<Character> set = new HashSet<Character>();
197         9         char[] boxLetters = {board[rowNumber][columnNumber], board[rowNumber][columnNumber + 1], board[rowNumber + 1][column
198         4             board[rowNumber + 1][columnNumber + 1]};
199         for (char letter : boxLetters)
200         {
201             3             if (letter != 0)
202             {
203                 5                 if (set.contains(letter))
204                 3                 return false;
205                 else
206                 2                 set.add(letter);
207             }
208         }
209
210         3         return true;
211     }
212
213     //Returns true if the main diagonal spells out a valid word
214     public boolean diagonalIsWord()
215     {

```

```

216 18 String word = "" + board[0][0] + board[1][1] + board[2][2] + board[3][3];
217 5 for (int i = 0; i < validWords.length; i++)
218 {
219 4 if (validWords[i].equals(word))
220 3 return true;
221 }
222 3 return false;
223 }
224
225 //Print the current state of the board
226 public String printBoard()
227 {
228 String boardString = "";
229
230 8 for (int row = 0; row < 4; row++)
231 {
232 7 for (int column = 0; column < 4; column++)
233 {
234 3 if (board[row][column] != 0)
235 5 boardString = boardString + board[row][column];
236 else
237 5 boardString = boardString + "_";
238 5 boardString = boardString + " ";
239 }
240 5 boardString = boardString + "\n";
241 }
242 2 return boardString;
243 }
244
245 //Method to modify a slot on the board (must not be any of the originally filled in slots)
246 //NOTE TO CHECK VALIDITY OF ROW AND COL NUMBER AND LETTER WHEREVER YOU CALL THIS METHOD
247 public boolean modify(int row, int column, char letter)
248 {
249 //Exits if the row or column is out of bounds
251 18 if (row < MINIMUM_INDEX || row >= ROWS || column < MINIMUM_INDEX || column >= COLUMNS)
252 3 return false;
253
254 //Exits if the letter is not a part of the 4 distinct ones given
255 4 if (!validLetter(letter))
256 3 return false;
257
258 //Exits if the slot to be modified is in a slot that was prefilled
259 6 for (int i = 0; i < numberOfOriginal; i++)
260 {
261 8 if (originalPositions[i][0] == row && originalPositions[i][1] == column)
262 3 return false;
263 }
264
265 //Modifies the board
266 board[row][column] = letter;
267
268 //Exits if this modification causes repeating letters in row, column, or box
269 13 if (!validRow(row) || !validColumn(column) || !valid2x2Box(Boxes.getBox(row, column)))
270 {
271 1 board[row][column] = Character.MIN_VALUE;
272 3 return false;
273 }
274 3 return true;
275 }
276
277 //Return the char array board
278 public char[][] getArray()
279 {
280 2 return board;
281 }
282
283 }

```

## Mutations

- 48 1. Removed assignment to member variable validWords → KILLED
- 52 1. Removed assignment to member variable board → KILLED



<a href="#">53</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::differentLetters → KILLED 2. Removed assignment to member variable originalLetters → KILLED
<a href="#">54</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::getOriginalPositions → SURVIVED 2. Removed assignment to member variable originalPositions → KILLED
<a href="#">60</a>	1. Substituted 0 with 1 → KILLED 2. Removed assignment to member variable numberOfOriginal → KILLED
<a href="#">61</a>	1. Substituted 16 with 17 → KILLED 2. Substituted 2 with 3 → KILLED
<a href="#">63</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → KILLED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED 8. Removed increment 1 → KILLED
<a href="#">65</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → KILLED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED
<a href="#">67</a>	1. negated conditional → KILLED 2. removed conditional - replaced equality check with false → KILLED 3. removed conditional - replaced equality check with true → KILLED
<a href="#">69</a>	1. Substituted 0 with 1 → KILLED
<a href="#">70</a>	1. Substituted 1 with 0 → KILLED
<a href="#">71</a>	1. Substituted 1 with 0 → KILLED 2. Replaced integer addition with subtraction → KILLED 3. Removed assignment to member variable numberOfOriginal → KILLED
<a href="#">75</a>	1. replaced return value with null for us/ihmc/games/wordoku/WordokuPuzzle::getOriginalPositions → KILLED 2. mutated return of Object value for us/ihmc/games/wordoku/WordokuPuzzle::getOriginalPositions to ( if (x != null) null else throw new RuntimeException ) → KILLED
<a href="#">82</a>	1. removed call to java/util/HashSet::<init> → KILLED
<a href="#">83</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → KILLED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED 8. Removed increment 1 → TIMED_OUT
<a href="#">85</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → KILLED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED
<a href="#">87</a>	1. removed call to java/lang/Character::valueOf → KILLED 2. removed call to java/util/Set::add → KILLED
<a href="#">90</a>	1. Substituted 0 with 1 → KILLED 2. removed call to java/lang/Character::valueOf → KILLED 3. removed call to java/util/Set::remove → KILLED
<a href="#">91</a>	1. replaced return value with Collections.emptyList for us/ihmc/games/wordoku/WordokuPuzzle::differentLetters → KILLED 2. mutated return of Object value for us/ihmc/games/wordoku/WordokuPuzzle::differentLetters to ( if (x != null) null else new RuntimeException ) → KILLED
<a href="#">97</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → SURVIVED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED 8. Removed increment 1 → TIMED_OUT
<a href="#">99</a>	1. changed conditional boundary → KILLED 2. Changed increment from 1 to -1 → KILLED 3. Substituted 0 with 1 → SURVIVED 4. Substituted 4 with 5 → KILLED 5. negated conditional → KILLED 6. removed conditional - replaced comparison check with false → KILLED 7. removed conditional - replaced comparison check with true → KILLED
<a href="#">101</a>	1. negated conditional → KILLED 2. removed conditional - replaced equality check with false → KILLED 3. removed conditional - replaced equality check with true → KILLED
<a href="#">103</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::completeBoard → KILLED 2. Substituted 0 with 1 → KILLED 3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">107</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::completeBoard → KILLED 2. Substituted 1 with 0 → KILLED 3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">114</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::validLetter → KILLED 2. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::validLetter → KILLED 3. removed call to java/lang/Character::valueOf → KILLED

	4. removed call to java/util/Set::contains → KILLED
	5. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">120</a>	1. removed call to java/util/HashSet::<init> → KILLED
	1. negated conditional → KILLED
<a href="#">126</a>	2. removed conditional - replaced equality check with false → KILLED
	3. removed conditional - replaced equality check with true → KILLED
	1. negated conditional → KILLED
<a href="#">128</a>	2. removed call to java/lang/Character::valueOf → KILLED
	3. removed call to java/util/Set::contains → KILLED
	4. removed conditional - replaced equality check with false → KILLED
	5. removed conditional - replaced equality check with true → KILLED
<a href="#">130</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::validRow → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">134</a>	1. removed call to java/lang/Character::valueOf → KILLED
	2. removed call to java/util/Set::add → KILLED
<a href="#">139</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::validRow → KILLED
	2. Substituted 1 with 0 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">145</a>	1. removed call to java/util/HashSet::<init> → KILLED
	1. changed conditional boundary → KILLED
	2. Changed increment from 1 to -1 → KILLED
<a href="#">148</a>	3. Substituted 0 with 1 → KILLED
	4. Substituted 4 with 5 → KILLED
	5. negated conditional → KILLED
	6. removed conditional - replaced comparison check with false → KILLED
	7. removed conditional - replaced comparison check with true → KILLED
<a href="#">151</a>	1. negated conditional → KILLED
	2. removed conditional - replaced equality check with false → KILLED
	3. removed conditional - replaced equality check with true → KILLED
	1. negated conditional → KILLED
<a href="#">153</a>	2. removed call to java/lang/Character::valueOf → KILLED
	3. removed call to java/util/Set::contains → KILLED
	4. removed conditional - replaced equality check with false → KILLED
	5. removed conditional - replaced equality check with true → KILLED
<a href="#">155</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::validColumn → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">159</a>	1. removed call to java/lang/Character::valueOf → KILLED
	2. removed call to java/util/Set::add → KILLED
<a href="#">164</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::validColumn → KILLED
	2. Substituted 1 with 0 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">174</a>	1. removed call to us/ihmc/games/wordoku/WordokuPuzzle::\$SWITCH_TABLE\$us\$ihmc\$games\$wordoku\$WordokuPuzzle\$Boxes → KILLED
	2. removed call to us/ihmc/games/wordoku/WordokuPuzzle\$Boxes::ordinal → KILLED
	3. RemoveSwitch 0 mutation → KILLED
	4. RemoveSwitch 1 mutation → KILLED
	5. RemoveSwitch 2 mutation → KILLED
	6. RemoveSwitch 3 mutation → KILLED
	7. Switch mutation → KILLED
<a href="#">177</a>	1. Substituted 0 with 1 → SURVIVED
<a href="#">180</a>	1. Substituted 0 with 1 → SURVIVED
<a href="#">181</a>	1. Substituted 2 with 3 → KILLED
<a href="#">184</a>	1. Substituted 2 with 3 → KILLED
<a href="#">185</a>	1. Substituted 0 with 1 → KILLED
<a href="#">188</a>	1. Substituted 2 with 3 → KILLED
<a href="#">191</a>	1. removed call to java/lang/RuntimeException::<init> → NO_COVERAGE
<a href="#">196</a>	1. removed call to java/util/HashSet::<init> → KILLED
	1. Substituted 4 with 5 → SURVIVED
	2. Substituted 0 with 1 → SURVIVED
	3. Substituted 1 with 0 → SURVIVED
<a href="#">197</a>	4. Substituted 1 with 0 → KILLED
	5. Substituted 2 with 3 → KILLED
	6. Substituted 1 with 0 → KILLED
	7. Substituted 3 with 4 → KILLED
	8. Replaced integer addition with subtraction → KILLED
	9. Replaced integer addition with subtraction → KILLED
<a href="#">198</a>	1. Substituted 1 with 0 → KILLED
	2. Substituted 1 with 0 → KILLED
	3. Replaced integer addition with subtraction → KILLED
	4. Replaced integer addition with subtraction → KILLED
<a href="#">201</a>	1. negated conditional → KILLED
	2. removed conditional - replaced equality check with false → KILLED
	3. removed conditional - replaced equality check with true → KILLED
	1. negated conditional → KILLED
<a href="#">203</a>	2. removed call to java/lang/Character::valueOf → KILLED
	3. removed call to java/util/Set::contains → KILLED
	4. removed conditional - replaced equality check with false → KILLED
	5. removed conditional - replaced equality check with true → KILLED
<a href="#">204</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::valid2x2Box → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">206</a>	1. removed call to java/lang/Character::valueOf → KILLED
	2. removed call to java/util/Set::add → KILLED



210	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::valid2x2Box → KILLED
	2. Substituted 1 with 0 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
	1. removed call to java/lang/StringBuilder::<init> → KILLED
	2. Substituted 0 with 1 → KILLED
	3. Substituted 0 with 1 → KILLED
	4. Substituted 1 with 0 → KILLED
	5. Substituted 1 with 0 → KILLED
	6. Substituted 2 with 3 → KILLED
	7. Substituted 2 with 3 → KILLED
	8. Substituted 3 with 4 → KILLED
	9. Substituted 3 with 4 → KILLED
216	10. removed call to java/lang/StringBuilder::append → KILLED
	11. removed call to java/lang/StringBuilder::append → KILLED
	12. removed call to java/lang/StringBuilder::append → KILLED
	13. removed call to java/lang/StringBuilder::append → KILLED
	14. removed call to java/lang/StringBuilder::toString → KILLED
	15. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	16. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	17. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	18. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	1. changed conditional boundary → KILLED
	2. Substituted 0 with 1 → KILLED
217	3. negated conditional → KILLED
	4. removed conditional - replaced comparison check with false → KILLED
	5. removed conditional - replaced comparison check with true → KILLED
	1. negated conditional → KILLED
	2. removed call to java/lang/String::equals → KILLED
219	3. removed conditional - replaced equality check with false → KILLED
	4. removed conditional - replaced equality check with true → KILLED
	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::diagonalIsWord → KILLED
	2. Substituted 1 with 0 → KILLED
220	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::diagonalIsWord → KILLED
	2. Substituted 0 with 1 → KILLED
222	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
	1. changed conditional boundary → KILLED
	2. Changed increment from 1 to -1 → KILLED
	3. Substituted 0 with 1 → KILLED
	4. Substituted 4 with 5 → KILLED
230	5. negated conditional → KILLED
	6. removed conditional - replaced comparison check with false → KILLED
	7. removed conditional - replaced comparison check with true → KILLED
	8. Removed increment 1 → TIMED_OUT
	1. changed conditional boundary → KILLED
	2. Changed increment from 1 to -1 → KILLED
	3. Substituted 0 with 1 → KILLED
	4. Substituted 4 with 5 → KILLED
232	5. negated conditional → KILLED
	6. removed conditional - replaced comparison check with false → KILLED
	7. removed conditional - replaced comparison check with true → KILLED
	1. negated conditional → KILLED
	2. removed conditional - replaced equality check with false → KILLED
234	3. removed conditional - replaced equality check with true → KILLED
	1. removed call to java/lang/StringBuilder::<init> → KILLED
	2. removed call to java/lang/String::valueOf → KILLED
235	3. removed call to java/lang/StringBuilder::append → KILLED
	4. removed call to java/lang/StringBuilder::toString → KILLED
	5. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	1. removed call to java/lang/StringBuilder::<init> → KILLED
	2. removed call to java/lang/String::valueOf → KILLED
	3. removed call to java/lang/StringBuilder::append → KILLED
237	4. removed call to java/lang/StringBuilder::toString → KILLED
	5. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	1. removed call to java/lang/StringBuilder::<init> → KILLED
	2. removed call to java/lang/String::valueOf → KILLED
238	3. removed call to java/lang/StringBuilder::append → KILLED
	4. removed call to java/lang/StringBuilder::toString → KILLED
	5. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	1. removed call to java/lang/StringBuilder::<init> → KILLED
	2. removed call to java/lang/String::valueOf → KILLED
	3. removed call to java/lang/StringBuilder::append → KILLED
240	4. removed call to java/lang/StringBuilder::toString → KILLED
	5. replaced call to java/lang/StringBuilder::append with receiver → KILLED
	1. replaced return value with "" for us/ihmc/games/wordoku/WordokuPuzzle::printBoard → KILLED
	2. mutated return of Object value for us/ihmc/games/wordoku/WordokuPuzzle::printBoard to ( if (x != null) null else throw RuntimeException ) → KILLED
	1. changed conditional boundary → KILLED
	2. changed conditional boundary → SURVIVED
	3. changed conditional boundary → KILLED
	4. changed conditional boundary → SURVIVED
	5. Substituted 4 with 5 → SURVIVED
	6. Substituted 4 with 5 → SURVIVED
	7. negated conditional → KILLED
	8. negated conditional → KILLED
	9. negated conditional → KILLED
	10. negated conditional → KILLED
251	11. removed conditional - replaced comparison check with false → KILLED



	12. removed conditional - replaced comparison check with false → KILLED
	13. removed conditional - replaced comparison check with false → KILLED
	14. removed conditional - replaced comparison check with false → SURVIVED
	15. removed conditional - replaced comparison check with true → SURVIVED
	16. removed conditional - replaced comparison check with true → SURVIVED
	17. removed conditional - replaced comparison check with true → SURVIVED
	18. removed conditional - replaced comparison check with true → KILLED
<a href="#">252</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">255</a>	1. negated conditional → KILLED
	2. removed call to us/ihmc/games/wordoku/WordokuPuzzle::validLetter → KILLED
	3. removed conditional - replaced equality check with false → KILLED
	4. removed conditional - replaced equality check with true → KILLED
<a href="#">256</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">259</a>	1. changed conditional boundary → SURVIVED
	2. Changed increment from 1 to -1 → KILLED
	3. Substituted 0 with 1 → SURVIVED
	4. negated conditional → SURVIVED
	5. removed conditional - replaced comparison check with false → KILLED
	6. removed conditional - replaced comparison check with true → SURVIVED
<a href="#">261</a>	1. Substituted 0 with 1 → SURVIVED
	2. Substituted 1 with 0 → KILLED
	3. negated conditional → KILLED
	4. negated conditional → KILLED
	5. removed conditional - replaced equality check with false → SURVIVED
	6. removed conditional - replaced equality check with false → SURVIVED
	7. removed conditional - replaced equality check with true → KILLED
	8. removed conditional - replaced equality check with true → KILLED
<a href="#">262</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">269</a>	1. negated conditional → KILLED
	2. negated conditional → KILLED
	3. negated conditional → KILLED
	4. removed call to us/ihmc/games/wordoku/WordokuPuzzle::validRow → KILLED
	5. removed call to us/ihmc/games/wordoku/WordokuPuzzle::validColumn → KILLED
	6. removed call to us/ihmc/games/wordoku/WordokuPuzzle\$Boxes::getBox → KILLED
	7. removed call to us/ihmc/games/wordoku/WordokuPuzzle::valid2x2Box → KILLED
	8. removed conditional - replaced equality check with false → KILLED
	9. removed conditional - replaced equality check with false → KILLED
	10. removed conditional - replaced equality check with false → SURVIVED
	11. removed conditional - replaced equality check with true → SURVIVED
	12. removed conditional - replaced equality check with true → SURVIVED
	13. removed conditional - replaced equality check with true → KILLED
<a href="#">271</a>	1. Substituted 0 with 1 → SURVIVED
<a href="#">272</a>	1. replaced boolean return with true for us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED
	2. Substituted 0 with 1 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">274</a>	1. replaced boolean return with false for us/ihmc/games/wordoku/WordokuPuzzle::modify → KILLED
	2. Substituted 1 with 0 → KILLED
	3. replaced return of integer sized value with (x == 0 ? 1 : 0) → KILLED
<a href="#">280</a>	1. replaced return value with null for us/ihmc/games/wordoku/WordokuPuzzle::getArray → KILLED
	2. mutated return of Object value for us/ihmc/games/wordoku/WordokuPuzzle::getArray to ( if (x != null) null else throw new RuntimeException ) → KILLED

## Active mutators

- RETURN\_VALS\_MUTATOR
- BOOLEAN\_TRUE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_61
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_60
- CONDITIONALS\_BOUNDARY\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_56
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_55
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_58
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_57
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_52
- VOID\_METHOD\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_51
- NULL\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_54
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_53
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_59
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_50
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_45
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_44
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_47
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_46
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_41
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_40
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_43
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_42
- NEGATE\_CONDITIONALS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_49

- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_48
- INLINE\_CONSTANT\_MUTATOR
- CONSTRUCTOR\_CALL\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_34
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_33
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_36
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_35
- EXPERIMENTAL\_MEMBER\_VARIABLE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_30
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_32
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_31
- REMOVE\_CONDITIONALS\_ORDER\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_38
- BOOLEAN\_FALSE\_RETURN
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_37
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_39
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_3
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_2
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_1
- INVERT\_NEGS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_0
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_23
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_22
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_25
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_9
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_24
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_8
- EMPTY\_RETURN\_VALUES
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_7
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_6
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_21
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_5
- NAKED\_RECEIVER
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_20
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_4
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_27
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_26
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_29
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_28
- PRIMITIVE\_RETURN\_VALS\_MUTATOR
- REMOVE\_INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_12
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_11
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_99
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_14
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_13
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_96
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_95
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_10
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_98
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_97
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_19
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_16
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_15
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_18
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_17
- EXPERIMENTAL\_SWITCH\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_92
- ARGUMENT\_PROPAGATION\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_91
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_94
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_93
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_90
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_89
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_88
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_85
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_84
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_87
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_86
- MATH\_MUTATOR
- NON\_VOID\_METHOD\_CALL\_MUTATOR
- REMOVE\_CONDITIONALS\_EQUAL\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_81
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_80
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_83
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_82
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_78
- REMOVE\_CONDITIONALS\_EQUAL\_ELSE\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_77
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_79
- INCREMENTS\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_74
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_73
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_76
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_75
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_70
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_72
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_71
- REMOVE\_CONDITIONALS\_ORDER\_IF\_MUTATOR
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_67
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_66

- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_69
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_68
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_63
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_62
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_65
- EXPERIMENTAL\_REMOVE\_SWITCH\_MUTATOR\_64

## Tests examined

- us.ihmc.games.wordoku.WordokuPuzzleTest.testGetOriginalPositionsWithValid(us.ihmc.games.wordoku.WordokuPuzzleTest) (4 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testInvalidBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (4 ms)
- us.ihmc.games.wordoku.WordokuGamePlayTest.testPlayWithValid(us.ihmc.games.wordoku.WordokuGamePlayTest) (7 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testModifyInvalidLetter(us.ihmc.games.wordoku.WordokuPuzzleTest) (12 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testDiffLettersWithBoardWith5Distinct(us.ihmc.games.wordoku.WordokuPuzzleTest) (3 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testModifyOutOfBounds(us.ihmc.games.wordoku.WordokuPuzzleTest) (5 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testModifyOriginalSlots(us.ihmc.games.wordoku.WordokuPuzzleTest) (11 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testPrintCompleteBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (3 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testValidModify(us.ihmc.games.wordoku.WordokuPuzzleTest) (2 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testDiffLettersWithValidIncomplete(us.ihmc.games.wordoku.WordokuPuzzleTest) (4 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testValidLetter(us.ihmc.games.wordoku.WordokuPuzzleTest) (2 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testValidIncompleteBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (2 ms)
- us.ihmc.games.wordoku.WordokuGamePlayTest.testPlayWithInvalid(us.ihmc.games.wordoku.WordokuGamePlayTest) (170 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testDiagonalIsWordWithInvalidBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (3 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testGetArray(us.ihmc.games.wordoku.WordokuPuzzleTest) (12 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testCompleteBoardWithIncomplete(us.ihmc.games.wordoku.WordokuPuzzleTest) (4 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testModifyRepeatingLetters(us.ihmc.games.wordoku.WordokuPuzzleTest) (9 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testCompleteBoardWithComplete(us.ihmc.games.wordoku.WordokuPuzzleTest) (5 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testDiagonalIsWordWithValidBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (3 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testInvalidLetter(us.ihmc.games.wordoku.WordokuPuzzleTest) (4 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testValidCompleteBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (3 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testPrintIncompleteBoard(us.ihmc.games.wordoku.WordokuPuzzleTest) (2 ms)
- us.ihmc.games.wordoku.WordokuPuzzleTest.testGetOriginalPositionsWithInvalid(us.ihmc.games.wordoku.WordokuPuzzleTest) (6 ms)