

1. What design principles does this code violate?
2. Refactor the code to improve its design.

#### Game.java

```
public class Game {
    public StringBuffer board;

    public Game(String s) {board = new StringBuffer(s);}

    public Game(StringBuffer s, int position, char player) {
        board = new StringBuffer();
        board.append(s);
        board.setCharAt(position, player);
    }

    public int move(char player) {
        for (int i = 0; i < 9; i++) {
            if (board.charAt(i) == '-') {
                Game game = play(i, player);
                if (game.winner() == player)
                    return i;
            }
        }
    }

    for (int i = 0; i < 9; i++) {
        if (board.charAt(i) == '-')
            return i;
    }
    return -1;
}

public Game play(int i, char player) {
    return new Game(this.board, i, player);
}

public char winner() {
    if (board.charAt(0) != '-')
        && board.charAt(0) == board.charAt(1)
        && board.charAt(1) == board.charAt(2))
        return board.charAt(0);
    if (board.charAt(3) != '-')
        && board.charAt(3) == board.charAt(4)
```

```

        && board.charAt(4) == board.charAt(5))
    return board.charAt(3);
    if (board.charAt(6) != '-')
        && board.charAt(6) == board.charAt(7)
        && board.charAt(7) == board.charAt(8))
    return board.charAt(6);
    return '-';
}
}

```

### GameTest.java

```

import junit.framework.*;

public class GameTest extends TestCase {

    public GameTest(String s) {super(s);}

    public void testDefaultMove() {
        Game game = new Game("XOXOX-OXO");
        assertEquals(5, game.move('X'));

        game = new Game("XOXOXOOX-");
        assertEquals(8, game.move('O'));

        game = new Game("-----");
        assertEquals(0, game.move('X'));

        game = new Game("XXXXXXXXXX");
        assertEquals(-1, game.move('X'));
    }

    public void testFindWinningMove() {
        Game game = new Game("XO-XX-OOX");
        assertEquals(5, game.move('X'));
    }

    public void testWinConditions() {
        Game game = new Game("---XXX---");
        assertEquals('X', game.winner());
    }
}

```