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94% coverage

The screenshot displays the IntelliJ IDEA IDE interface. The main editor shows the `GameTest.java` file with the following code:

```
1 import Exceptions.InvalidMapException;
2 import Exceptions.InvalidMatchingOfCrateAndDestTile;
3 import Exceptions.UnknownElementException;
4 import org.junit.jupiter.api.BeforeEach;
5 import org.junit.jupiter.api.DisplayName;
6 import org.junit.jupiter.api.Test;
7
8 import static org.junit.jupiter.api.Assertions.*;
9
10 class GameTest {
11
12     Game g;
13
14     @BeforeEach
15     void setUp() throws InvalidMapException {
16         g = new Game();
17         g.loadMap( filename: "tests/goodmap.txt");
18     }
19
20     @Test
21     void loadMapFailure() throws InvalidMapException {
22         g.loadMap( filename: "badfileandk.txt"); //should not throw exception
23         assertThrows(InvalidMapException.class, () -> g.loadMap( filename: "tests/badmap.txt"));
24     }
25
26     @Test
27     @DisplayName("Load Map (with map2, map3, map4 and map5) - first char is not integer")
28     void loadMapFirstCharIsNotInteger() {
29         assertThrows(UnknownElementException.class, () -> g.loadMap( filename: "tests/badmap2.txt"));
30         assertThrows(UnknownElementException.class, () -> g.loadMap( filename: "tests/badmap3.txt"));
31         assertThrows(UnknownElementException.class, () -> g.loadMap( filename: "tests/badmap4.txt"));
32         assertThrows(UnknownElementException.class, () -> g.loadMap( filename: "tests/badmap5.txt"));
33     }
34 }
```

The left sidebar shows the Project view with the following structure:

- PA1 [P:\Downloads\real PA 1] - \real PA 1\PA1\PA1\PA1\PA1
- idea
- out
- src 93% classes, 93% lines covered
  - Exceptions 100% classes, 100% lines covered
    - InvalidMapException 100% methods, 100% lines covered
    - InvalidMatchingOfCrateAndDestTile 100% methods, 100% lines covered
    - InvalidNumberOfPlayersException 100% methods, 100% lines covered
    - UnknownElementException 100% methods, 100% lines covered
  - Map 100% classes, 100% lines covered
    - META-INF
    - Game 100% methods, 98% lines covered
  - Runner 0% methods, 0% lines covered
- tests
  - GameTest
  - setUp(): void
  - loadMapFailure(): void
  - loadMapFirstCharIsNotInteger(): void
  - testMakeMoveAndisWin(): void
  - testIsPlayer(): void
  - testIsDeadlock(): void
  - displayNullPointer(): void
  - g: Game

The right sidebar shows the Coverage view for all tests:

Element	Class, %	Method, %	Line, %
Exceptions	100% (4/4)	100% (4/4)	100% (8/8)
Map	100% (10/10)	100% (29/29)	100% (229/229)
META-INF	100% (0/0)	100% (0/0)	100% (0/0)
Game	100% (1/1)	100% (6/6)	98% (107/109)
Runner	0% (0/1)	0% (0/1)	0% (0/21)

The bottom status bar shows the Run view with the following output:

```
Tests passed: 47 of 47 tests - 168 ms
C:\Program Files\Java\jdk-10.0.2\bin\java.exe ...
IntelliJ IDEA coverage runner
sampling ...
include patterns:
exclude patterns:
10
5
10
5
10
5
10
7
```

Distinct crashes: 5

- 1) Different new line separator, which windows only recognize carriage return.
- 2) The game never ends with the ID of crates and destTiles doesn't match.

```
Windows PowerShell
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated> java -jar .\PA1_obfuscated.jar crashmap1.txt
Loading map: crashmap1.txt
9
10
Exception in thread "main" java.lang.StringIndexOutOfBoundsException: String index out of range: 0
    at java.base/java.lang.StringLatin1.charAt(Unknown Source)
    at java.base/java.lang.String.charAt(Unknown Source)
    at a.a(Unknown Source)
    at Runner.main(Unknown Source)
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated> java -jar .\PA1_obfuscated.jar crashmap2.txt
Loading map: crashmap2.txt
9
10
..##. ....
..#C# ....
..#.# .....
##c.d.D##
#B.a@#####
###a#....
...#.#....
...#A#....
...##. ....
Enter a valid move [wasdr]: 9
10
..##. ....
..#C# ....
..#.# .....
##c.d.D##
#B.b@#####
###a#....
...#.#....
...#A#....
Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: ...##. ....
10
..##. ....
..#C# ....
..#.# .....
##c.d.D##
#B.b@#####
###a#....
...#.#....
...#A#....
Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: ...##. ....
[wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: Enter a valid move [wasdr]: ...##. ....
```

- 3) The number of crates and destTile doesn't match
- 4) The first digit is a negative number

```
Windows PowerShell
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated> java -jar .\PA1_obfuscated.jar crashmap4.txt
Loading map: crashmap4.txt
-1
10
Exception in thread "main" java.lang.NegativeArraySizeException
    at a.a(Unknown Source)
    at Runner.main(Unknown Source)
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated> java -jar .\PA1_obfuscated.jar crashmap3.txt
Loading map: crashmap3.txt
9
10
..##. ....
..#C# ....
..#.# .....
##c.d.D##
#B.@#####
###a#....
...#.#....
...#A#....
...##. ....
Enter a valid move [wasdr]: _
```

## 5) The first digit is not an integer

```
Windows PowerShell
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated> java -jar .\PA1_obfuscated.jar crashmap5.txt
Loading map: crashmap5.txt
Exception in thread "main" java.util.InputMismatchException
    at java.base/java.util.Scanner.throwFor(Unknown Source)
    at java.base/java.util.Scanner.next(Unknown Source)
    at java.base/java.util.Scanner.nextInt(Unknown Source)
    at java.base/java.util.Scanner.nextInt(Unknown Source)
    at a.a(Unknown Source)
    at Runner.main(Unknown Source)
PS C:\Users\Kin Ip Mong\Downloads\Y3_2018 Fall\COMP3021\PA1\PA1 Obfuscated>
```

Crashmap1.txt

9

10

..###.....

..#C#.....

..#.#####

###c.d.D##

#B.b@#####

####a#....

...#.#....

...#A#....

...###.....

Crashmap2.txt

9

10

..###..... ..#C#..

...

..#.#####

###c.d.D##

#B.a@#####

####a#.... ..#.#

....

...#A#....

...###....

Crashmap3.txt

9

10

..###..... ..#C#..

...

..#.#####

###c.d.D##

#B..@#####

####a#....

...#.#....

...#A#....

...###....

Crashmap4.txt

-1

10

..####c#.. ..#Ca

b.... ..#.....#

###....D##

#B..@#####

####.#....

...#.#....

...#A#....

...###....

Crashmap5.txt

9.1

10

..####.#.. ..#C..

.... ..#.....#

###a..bD##

#Bc.@#####

####.#.... ..#d  
#.... ..#A#.... ..  
###....