

CS 3250: Software Testing (Summer 2026)

POTD 8: Graph for source code (Structural) – numberOccurrence

Due 2-June-2026, 11:59pm EST

Purpose: Create graph representation for source code; apply structural graph coverage to source code; get ready for the learning portfolio

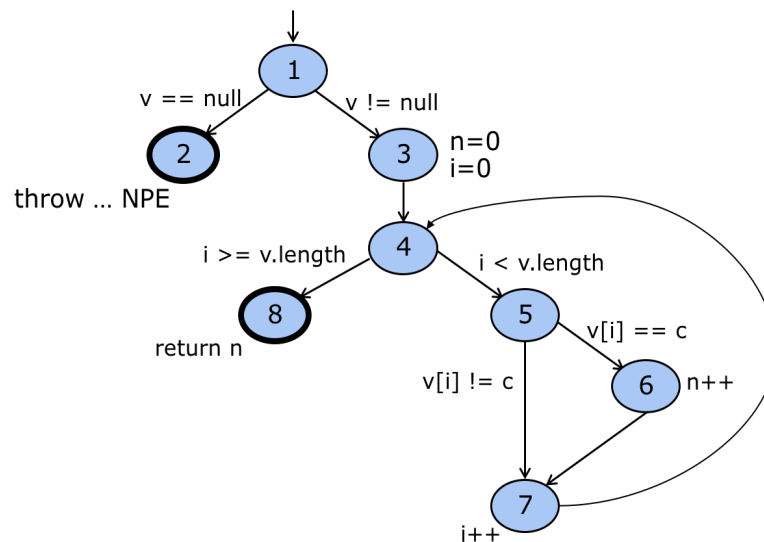
You may make a copy of a worksheet and complete this activity, or type your answers in any text editor. You may work alone or with another student in this course.

Consider the following Java method

```
public static int numberOccurrences(char[] v, char c)
{
    if (v == null)
        throw new NullPointerException();

    int n = 0;
    for (int i=0; i<v.length; i++)
    {
        if (v[i] == c)
            n++;
    }
    return n;
}
```

1. Draw a **Control Flow Graph** for the `numberOccurrences` method (You may draw the graph by hand, take a picture of your graph, and embed it in your write-up)



2. Apply **Node Coverage (NC)** to design tests

Test requirements	Test paths	Test cases (input values and expected output)
{ 1, 2, 3, 4, 5, 6, 7 }	{ [1,2], [1,3,4,5,6,7,4,8] }	input: (null, 'a'), expected output: NPE input: (['a'], 'a'), expected output: 1

3. Apply **Edge Coverage (EC)** to design tests

Test requirements	Test paths	Test cases (input values and expected output)
{ (1,2), (1,3), (3,4), (4,8), (4,5), (5,6), (5,7), (6,7), (7,4) }	{ [1,2], [1,3,4,5,7,4,8], [1,3,4,5,6,7,4,8] }	input: (null, 'a'), expected output: NPE input: (['b'], 'a'), expected output: 0 input: (['a'], 'a'), expected output: 1

4. Apply **Edge-Pair Coverage (EPC)** to design tests

Test requirements	Test paths	Test cases (input values and expected output)
{ (1,2), (1,3,4), (3,4,8), (3,4,5), (4,5,6), (4,5,7), (5,6,7), (5,7,4), (6,7,4), (7,4,8), (7,4,5) }	{ [1,2], [1,3,4,8], [1,3,4,5,6,7,4,8], [1,3,4,5,7,4,5,7,4,8] }	input: (null, 'a'), expected output: NPE input: ([], 'a'), expected output: 0 input: (['a'], 'a'), expected output: 1 input: (['a','a'], 'b'), expected output: 0

5. Derive prime paths

[1]	[1,2]!	[1,3,4]	[1,3,4,8]!	[1,3,4,5,6]	[1,3,4,5,6,7]!
[2]	[1,3]	[3,4,8]	[1,3,4,5]	[1,3,4,5,7]!	
[3]	[3,4]	[3,4,5]	[3,4,5,6]	[3,4,5,6,7]	
[4]	[4,8]	[4,5,6]	[3,4,5,7]	[4,5,6,7,4]*	
[5]	[4,5]	[4,5,7]	[4,5,6,7]	[5,6,7,4,5]*	
[6]	[5,6]	[5,6,7]	[4,5,7,4]*	[5,6,7,4,8]!	
[7]	[5,7]	[5,7,4]	[5,6,7,4]	[6,7,4,5,6]*	
[8]	[6,7]	[6,7,4]	[5,7,4,5]*	[7,4,5,6,7]*	
	[7,4]	[7,4,8]	[5,7,4,8]!		
		[7,4,5]	[6,7,4,8]		
			[6,7,4,5]		
			[7,4,5,7]*		
			[7,4,5,6]		

[1,3,4,5,6,7], [4,5,6,7,4], [1,3,4,5,7], [5,6,7,4,8], [7,4,5,6,7], [6,7,4,5,6], [5,6,7,4,5], [4,5,7,4], [1,3,4,8], [5,7,4,5], [7,4,5,7], [5,7,4,8], [1,2]

6. Apply Prime Path Coverage (PPC) to design tests

Test requirements	Test paths	Test cases (input values and expected output)
{ [1,3,4,5,6,7], [4,5,6,7,4], [5,6,7,4,5], [6,7,4,5,6], [7,4,5,6,7], [5,6,7,4,8],	{ [1,3,4,5,6,7,4,5,6,7,4,8], <i>Loop 2 times, match in both iterations</i>	input: (['a', 'a'], 'a'), expected output: 2
[1,3,4,5,7], [4,5,7,4], [5,7,4,8],	[1,3,4,5,7,4,8], <i>Loop 1 time, no match</i>	input: (['b'], 'a'), expected output: 0
[1,3,4,8],	[1,3,4,8], <i>Loop 0 time, no match</i>	input: ([], 'a'), expected output: 0
[5,7,4,5], [7,4,5,7],	[1,3,4,5,7,4,5,7,4,8]. <i>Loop 2 times, no match</i>	input: (['a', 'a'], 'b'), expected output: 0
[1,2] }	[1,2] } <i>NPE</i>	input: (null, 'a'), expected output: NPE

Grading rubric

[Total: 10 points]: Done (or provide evidence of your attempt, full or reasonable effort)

- (5 points) — Providing evidence of your attempt, minimal effort

(-2.5 points) for 24 hours late (submitted after 2-June-2026 11:59pm EST, by 3-June-2026 11:59pm EST)

(-5 points) for 48 hours late (submitted after 3-June-2026 11:59pm EST, by 4-June-2026 11:59pm EST)

Submission

- For this POTD, you may draw a graph on paper or an electronic device. Then, take a picture or screenshot of your graph and embed it in your report.
- Save your report as a .pdf file
- Upload your report (.pdf) to **POTD 8 on Gradescope**.
- Connect your partner to your group on Gradescope so that everyone receives credit
- Each team submits only **one** copy

Making your submission available to instructor and course staff is **your** responsibility; if we cannot access or open your file, you will not get credit. Be sure to test access to your file before the due date.

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