

A dark blue vertical bar is on the left. A blue arrow points right from it, containing the date.

6/12/2020

# Software Testing

## Assignment 4

Several thin, curved lines in dark blue and light grey originate from the bottom left and curve upwards and to the right.

Nabiya Fatima BSE173011  
Iqra Ishtiaq BSE173043

## Table of Contents

<b>Case Study .....</b>	<b>2</b>
<b>Flow Chart.....</b>	<b>2</b>
<b>Modified Condition / Decision Coverage .....</b>	<b>3</b>
<b>1. Decision Statement .....</b>	<b>3</b>
<b>1.1 Implementation.....</b>	<b>3</b>
<b>2. Decision Statement .....</b>	<b>3</b>
<b>2.1 Implementation.....</b>	<b>4</b>
<b>3. Decision Statement .....</b>	<b>4</b>
<b>3.1 Implementation.....</b>	<b>4</b>
<b>Path Predicate Expressions .....</b>	<b>5</b>
<b>Test Oracle.....</b>	<b>5</b>

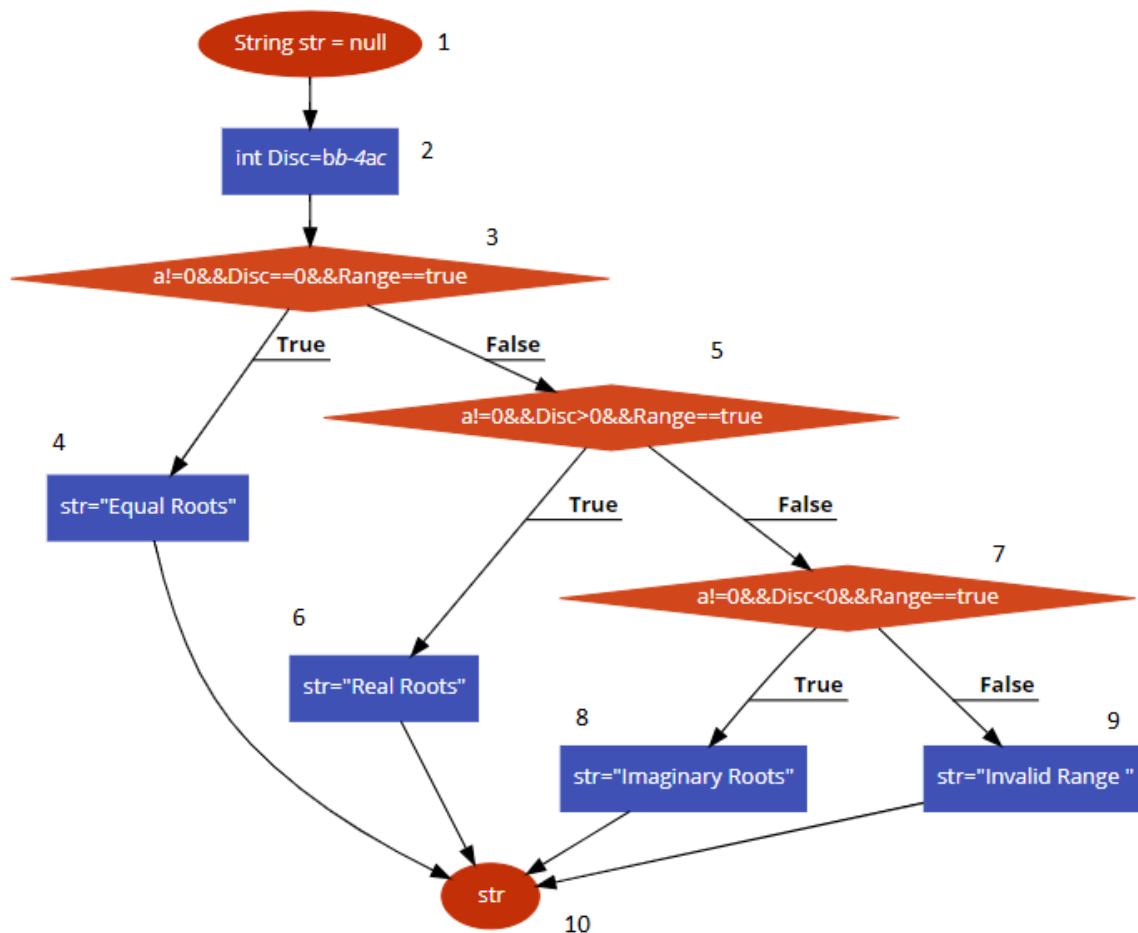
## Case Study

In a programming competition the students are required to design a program that takes three numbers (a, b, c) as inputs and determine whether the equation is Quadratic or not. The standard form of Quadratic Equation is  $ax^2+bx+c=0$ , where a, b, c are constants and "a" cannot be zero. The program should have a method that calculates the nature of the roots of the Quadratic equation whether the roots of the equation are Real, Equal or Imaginary using the discriminant  $b^2-4ac$ . Following are the conditions that should be meet:

- If  $b^2-4ac > 0$  the roots are Real and Unequal.
- If  $b^2-4ac = 0$  the roots are Real and Equal.
- If  $b^2-4ac < 0$  the roots are Imaginary.

The inputs for the constants a, b, c should be within the range form [0,200].

## Flow Chart



## Modified Condition / Decision Coverage

### 1. Decision Statement

$a \neq 0 \ \&\& \text{Disc} == 0 \ \&\& \text{Range} == \text{"true"}$

Sr.No	Conditions			Output
	a	Disc= $b^2-4ac$	Range	$a \neq 0 \ \&\& \text{Disc} == 0 \ \&\& \text{Range} == \text{true}$
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

### 1.1 Implementation

Sr.No	Conditions				Output
	a	b	c	Range	$a \neq 0 \ \&\& \text{Disc} == 0 \ \&\& \text{Range} == \text{true}$
1	0	100	201	False	Invalid Range
2	0	100	1	True	Invalid Range
3	0	0	201	False	Invalid Range
4	0	0	0	True	Invalid Range
5	-1	10	201	False	Invalid Range
6	1	1	0	True	Real Root
7	-1	2	-1	False	Invalid Range
8	1	0	0	True	Equal Roots

### 2. Decision Statement

$a \neq 0 \ \&\& \text{Disc} > 0 \ \&\& \text{Range} == \text{"true"}$

Sr.No	Conditions			Output
	a	Disc= $b^2-4ac$	Range	$a \neq 0 \ \&\& \text{Disc} > 0 \ \&\& \text{Range} == \text{True}$
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

## 2.1 Implementation

Sr.No	Conditions				Output
	a	b	c	Range	$a \neq 0 \ \&\& \ \text{Disc} > 0 \ \&\& \ a \leq -1$
1	0	0	201	False	Invalid Range
2	0	0	0	True	Invalid Range
3	0	100	201	False	Invalid Range
4	0	100	1	True	Invalid Range
5	1	0	201	False	Invalid Range
6	1	0	100	True	Imaginary Root
7	1	20	-1	False	Invalid Range
8	1	1	0	True	Real Root

## 3. Decision Statement

$a \neq 0 \ \&\& \ \text{Disc} < 0 \ \&\& \ \text{Range} == \text{true}$

Sr.No	Condition			Output
	a	$\text{Disc} = b^2 - 4ac$	Range	$a \neq 0 \ \&\& \ \text{Disc} < 0 \ \&\& \ \text{Range} == \text{True}$
1	F	F	F	F
2	F	F	T	F
3	F	T	F	F
4	F	T	T	F
5	T	F	F	F
6	T	F	T	F
7	T	T	F	F
8	T	T	T	T

## 3.1 Implementation

Sr.No	Conditions				Output
	a	b	c	Range	$a \neq 0 \ \&\& \ \text{Disc} < 0 \ \&\& \ \text{Range} == \text{True}$
1	0	1	202	False	Invalid Range
2	0	100	100	True	Invalid Range
3	0	0	202	False	Invalid Range
4	0	0	100	True	Invalid Range
5	1	30	201	False	Invalid Range
6	1	30	100	True	Real Root
7	1	1	201	False	Invalid Range
8	1	1	1	True	Imaginary Roots

### Note

The highlighted test cases 4,6,7,8 are sufficient for MD/DC and the test cases 1,2,3,5 are redundant.

## Path Predicate Expressions

SR.No	Path Predicate Expression	Path
1.	$a \neq 0 \ \&\& \text{Disc} = 0 \ \&\& \text{Range} == \text{true}$	1->2->3->4->10
2.	$a \neq 0 \ \&\& \text{Disc} > 0 \ \&\& \text{Range} == \text{true}$	1->2->3->5->6->10
3.	$a \neq 0 \ \&\& \text{Disc} < 0 \ \&\& \text{Range} == \text{true}$	1->2->3->5->7->8->10
4.	$a == 0 \    \ \text{Range} == \text{false}$	1->2->3->5->7->9->10

## Test Oracle

Sr.No	Inputs			Path	Actual Output	Expected Output
	a	b	c			
1	1	0	0	1->2->3->4->10	Equal Roots	Equal Roots.
2	1	1	0	1->2->3->5->6->10	Real Root.	Real Root.
3	1	1	1	1->2->3->5->7->8->10	Imaginary Root.	Imaginary Root.
4	1	2	0	1->2->3->5->7->9->10	Invalid Range	Invalid Range