CS 6340 – Spring 2013 – Assignment 8
Assigned: March 4, 2013
Due: March 13, 2013

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At the beginning of class on the due date, submit your neatly presented solution with this page stapled to the front (100 points).

Part 1

Your new position as Test Manager requires that you establish a set of requirements that developers will use for unit testing of the software that they write. Before you establish these requirements, you want to assess the fault-detection ability, expense, tool availability, etc. of various techniques that have been proposed in the literature. To do this, you will use a program, which we'll call **tritype**, that has the following requirements specification

> **tritype** takes as input three integer values. The three values are interpreted as representing the lengths of the sides of a triangle. The program prints a message that states whether the triangle is scalene, isosceles, or equilateral.

You are to do the following:

1. Use the specification to develop a set of test cases (a test suite) for **tritype** using two black box testing methods (both described in "EquivalencePartitioningBoundaryValue:"
   - Equivalence Partitioning
   - Boundary Value Analysis

2. Create a file of test cases (reason for test (in quotes), inputs, expected outputs) that consists of one test case per line; the number of the test case will be the line number in the file. For example, suppose I created two test cases:
   Test Case 1: isosceles 2 2 3 isosceles
   Test Case 2: equilateral 4 4 4 equilateral
   The file should contain
   "isosceles" 2 2 3 isosceles
   "equilateral" 4 4 4 equilateral

3. Send the test cases to Sangmin, and he'll send you the **tritype** program for the second part of the assignment. Let him know whether you want the C version or the Java version.

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Our test suite is shown in Table 1 below. We achieved 100 % statement coverage with this test suite; Table 2 shows which tests cover each statement.

Our test suite achieved 65.8 % multiple condition coverage.

The CFG for `tritype.c` can be seen in Figure 1.

Table 1: Test Suite

Test ID	Reason for test	Input: (i, j, k)	Expected Result
1	Violation of triangle inequality	$(10, 1, 1)$	invalid
2	Violation of triangle inequality	$(1, 10, 1)$	invalid
3	Violation of triangle inequality	$(1, 1, 10)$	invalid
4	Negative input	$(-1, 1, 1)$	invalid
5	Negative input	$(1, -1, 1)$	invalid
6	Negative input	$(1, 1, -1)$	invalid
7	Zero input	$(0, 1, 1)$	invalid
8	Zero input	$(1, 0, 1)$	invalid
9	Zero input	$(1, 1, 0)$	invalid
10	Invalid input	$(\mathtt{w}, 1, 1)$	invalid
11	Invalid input	$(1, \mathtt{w}, 1)$	invalid
12	Invalid input	$(1, 1, \mathtt{w})$	invalid
13	Equilateral	$(1, 1, 1)$	equilateral
14	Scalene	$(4, 3, 2)$	scalene
15	Isosceles	$(2, 2, 3)$	isosceles
16	Isosceles	$(2, 3, 2)$	isosceles
17	Isosceles	$(3, 2, 2)$	isosceles

Table 2: Statement Coverage per Test

Test ID	Statement line number																						
	33	41	43	47	48	49	50	51	52	53	55	63	64	66	74	75	76	77	78	79	80	81	83	86
1	✓	✓		✓	✓		✓		✓	✓	✓				✓		✓		✓		✓		✓	✓
2	✓	✓		✓	✓		✓	✓	✓		✓				✓		✓		✓		✓		✓	✓
3	✓	✓		✓	✓	✓	✓		✓		✓				✓		✓		✓		✓		✓	✓
4	✓	✓	✓																					✓
5	✓	✓	✓																					✓
6	✓	✓	✓																					✓
7	✓	✓	✓																					✓
8	✓	✓	✓																					✓
9	✓	✓		✓	✓	✓	✓		✓		✓				✓		✓	✓						✓
10	✓	✓	✓																					✓
11	✓	✓		✓	✓		✓		✓		✓	✓	✓											✓
12	✓	✓		✓	✓	✓	✓		✓		✓				✓		✓	✓						✓
13	✓	✓		✓	✓		✓	✓	✓	✓	✓				✓	✓								✓
14	✓	✓		✓	✓		✓		✓		✓	✓		✓										✓
15	✓	✓		✓	✓	✓	✓		✓		✓				✓		✓	✓						✓
16	✓	✓		✓	✓		✓	✓	✓		✓				✓		✓		✓	✓				✓
17	✓	✓		✓	✓		✓		✓	✓	✓				✓		✓		✓		✓	✓		✓

Table 3: Multiple Condition Coverage, per Condition

Decision (Covered?)	Conditions (Possible Evaluations)		
Line 41	`i <= 0`	`j <= 0`	`k < 0`
✓	F	F	F
✓	F	F	T
✓	F	T	F
	F	T	T
✓	T	F	F
	T	F	T
	T	T	F
	T	T	T

Line 48	`i == j`
✓	T
✓	F

Line 50	`i == k`
✓	T
✓	F

Line 52	`j == k`
✓	T
✓	F

Line 55	`triang == 0`
✓	T
✓	F

Decision (Covered?)	Conditions (Possible Evaluations)		
Line 63	`i+j <= k`	`j+k <= i`	`i+k < j`
✓	F	F	F
✓	F	F	T
	F	T	F
	F	T	T
	T	F	F
	T	F	T
	T	T	F
	T	T	T

Line 74	`triang > 3`
✓	T
✓	F

Line 76	`triang == 1`	`i+j > k`
	F	F
✓	F	T
✓	T	F
✓	T	T

Line 78	`triang == 2`	`i+k > j`
	F	F
✓	F	T
✓	T	F
✓	T	T

Line 80	`triang == 3`	`j+k > i`
	F	F
✓	F	T
✓	T	F
✓	T	T

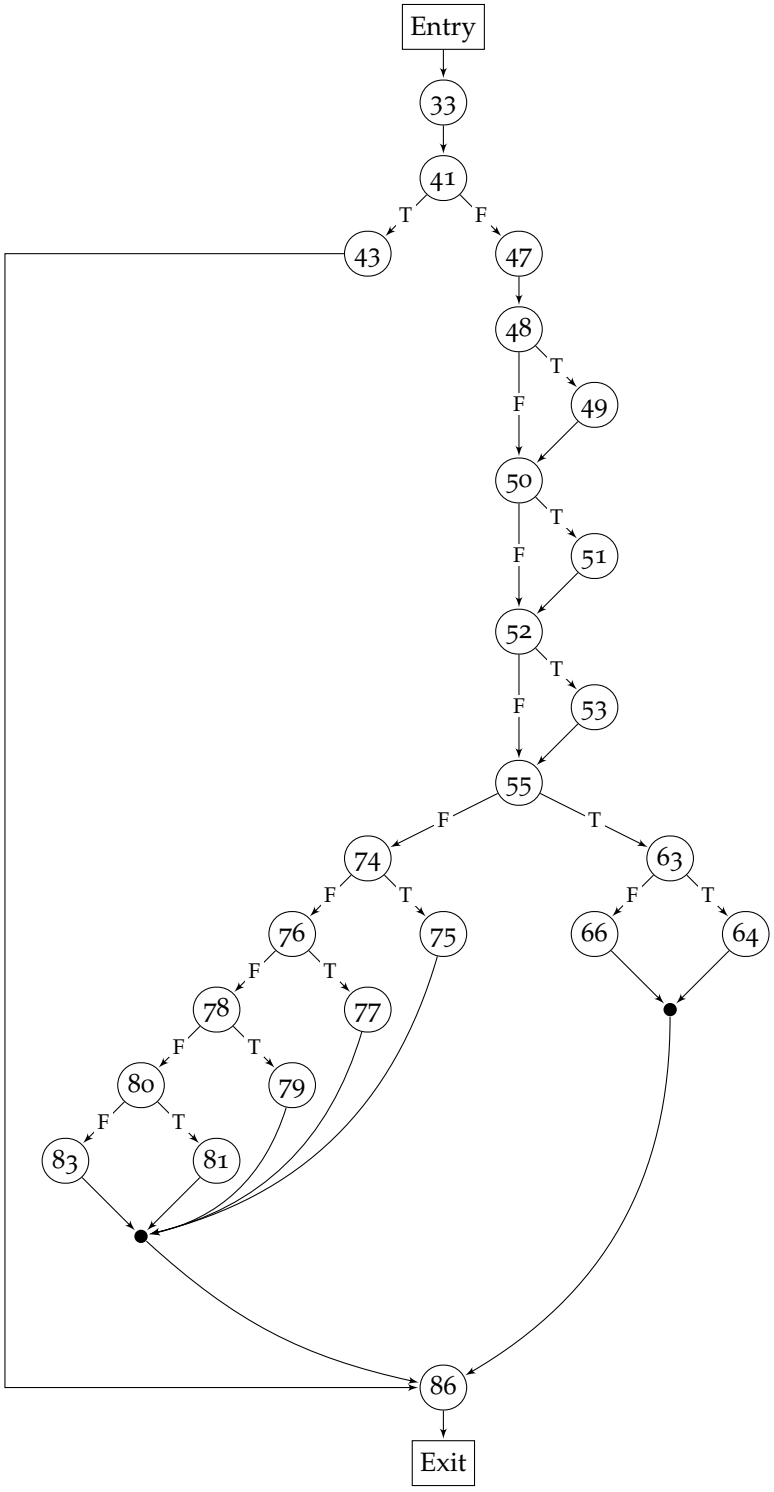

Figure 1: CFG for `tritype.c`