

Software Design (F28SD2): Exercises in Dynamic Analysis 1

Possible Solutions

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Exercise 1

Statement Coverage

Statements	(age < 25) && (wins > 0)	(lastrace > 3) firstrace	Test
lines 1, 2, 3	True	*	TC1
lines 1, 2, 4-9	False	True	TC2

Note that * denotes a wild card, i.e. no constraints on the input condition. An alternative representation of the cases is given below.

Statements	age	wins	lastrace	firstrace	Test
lines 1, 2, 3	< 25	> 0	*	*	TC1
lines 1, 2, 4-9	> 35 & < 45	*	> 3	*	TC2

From the above test case specifications the following test data can be derived.

Test	Test
TC1	age = 24, wins = 1, lastrace = 1, firstrace = false
TC2	age = 36, wins = 0, lastrace = 4, firstrace = false

Decision Coverage

Note that IF-1, IF-2 and IF-3 correspond to lines 2, 5 and 7 respectively.

Decision	(age < 25) && (wins > 0)	return delay	else ...	Test
IF-1	True	X		TC1
IF-1	False		X	TC2

Decision	(lastrace > 3) firstrace	delay = delay - 5	if ...	Test
IF-2	True	X		TC2
IF-2	False		X	TC3

Test	Data
TC3	age = 36, wins = 1, lastrace = 3, firstrace = false

Decision	(age > 35) && (age < 45)	delay = delay -5	return delay	Test
IF-3	True	X		TC3
IF-3	False		X	TC4

Test	Data
TC4	age = 45, wins = 1, lastrace = 4, firstrace = false

Condition/Decision Coverage

Condition/Decision	(age < 25)	(wins > 0)	return delay	else	Test
IF-1	False	False		X	TC2
IF-1	True	True	X		TC1

Condition/Decision	(lastrace > 3)	firstrace	delay = delay-5	if ...	Test
IF-2	False	False		X	TC3
IF-2	True	True	X		TC5

Test	Data
TC5	age = 35, wins = 0, lastrace = 4, firstrace = true

Condition/Decision	(age > 35)	(age < 45)	delay = delay-5	return delay	Test
IF-3	True	False		X	TC4
IF-3	False	True		X	TC5
IF-3	True	True	X		TC3

Note that both (age > 35) and (age < 45) can not be false.

Modified Condition/Decision Coverage (MC/DC)

MC/DC	(age < 25)	(wins > 0)	return delay	else	Test
IF-1	False	False		X	
IF-1	True	False		X	TC6
IF-1	False	True		X	TC3
IF-1	True	True	X		TC1

TC1 and TC3 show the independence of condition (age < 25).

TC1 and TC6 show the independence of condition (wins > 0).

Test	Data
TC6	age = 24, wins = 0, lastrace = 3, firstrace = false

MC/DC	(lastrace > 3)	firstrace	delay = delay-5	if ...	Test
IF-2	False	False		X	TC3
IF-2	True	False	X		TC2
IF-2	False	True	X		TC7
IF-2	True	True	X		

TC3 and TC2 show the independence of condition (`lastrace > 3`).

TC3 and TC7 show the independence of condition (`firsttrace`).

Test	Data
TC7	<code>age = 25, wins = 0, lastrace = 3, firsttrace = true</code>

MC/DC	(<code>age > 35</code>)	(<code>age < 45</code>)	<code>delay = delay-5</code>	<code>return delay</code>	Test
IF-3	False	False		X	
IF-3	True	False		X	TC4
IF-3	False	True		X	TC5
IF-3	True	True	X		TC3

TC3 and TC5 show the independence of condition (`age > 35`).

TC3 and TC4 show the independence of condition (`age < 45`).

Summary of test cases

Test	Data
TC1	<code>age = 24, wins = 1, lastrace = 1, firsttrace = false</code>
TC2	<code>age = 36, wins = 0, lastrace = 4, firsttrace = false</code>
TC3	<code>age = 36, wins = 1, lastrace = 3, firsttrace = false</code>
TC4	<code>age = 45, wins = 1, lastrace = 4, firsttrace = false</code>
TC5	<code>age = 35, wins = 0, lastrace = 4, firsttrace = true</code>
TC6	<code>age = 24, wins = 0, lastrace = 3, firsttrace = false</code>
TC7	<code>age = 25, wins = 0, lastrace = 3, firsttrace = true</code>

Exercise 2

Based upon the expected outputs from the Triangle Analyzer there are three valid equivalence classes, *i.e.* Scalene, Isosceles, and Equilateral. There are a number of invalid equivalence classes. The classes are described below along with example test data. Note that when generating test data to exercise for a output equivalence class one should explore input permutations if no constraints exist.

No	Description	First	Second	Third	Class	
1	Valid scalene	5	3	4	Scalene	
2		3	4	5	Scalene	
3		3	5	4	Scalene	
4		5	4	3	Scalene	
5		4	5	4	Scalene	
6		4	5	3	Scalene	
7	Valid equilateral	2	2	2	Equilateral	
8	Valid isosceles	5	5	2	Isosceles	
9		5	2	5	Isosceles	
10		2	5	5	Isosceles	
11		Three sides max	32767	32767	32767	Equilateral
12	Two sides max	1	32767	32767	Isosceles	
13		32767	32767	1	Isosceles	
14		32767	1	32767	Isosceles	
15	One side = 0	0	5	5	Invalid	
16		5	0	5	Invalid	
17	One side < 0	5	5	0	Invalid	
18		-1	5	5	Invalid	
19		5	-1	5	Invalid	
20		5	5	-1	Invalid	
21		Two equal sides	5	5	10	Invalid
22			5	10	5	Invalid
23	10		5	5	Invalid	
24	Three unequal sides	5	2	8	Invalid	
25		5	8	2	Invalid	
26		8	5	2	Invalid	
27		2	8	5	Invalid	
28		2	5	8	Invalid	
29		8	2	5	Invalid	
30		First missing		2	5	Invalid
31	Second missing	2		5	Invalid	
32	Third missing	2	5		Invalid	

Note that this set of test cases is not complete!