Logic Coverage

http://mooctest.net

Logic in Program

((x>5) && (y>0))

Decision Condition

Decision Coverage

- Decision Coverage (DC):
  Executing *true* and *false* of decision.
- ((x>5) && (y>0)): *true* and *false*

```
// {(6, 1), (1,1)}--DC
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

Condition Coverage

- Condition Coverage (CC):
  Executing *true* and *false* of each condition
- (x>5) : *true* and *false*
- (y>0) : *true* and *false*

```
// {(6, 0), (0,1)}--CC
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

Subsume

- C1 subsumes C2, denoted by C1 $\geq$ C2
- DC $\geq$ SC
- CC not $\geq$ SC
- DC not $\geq$ CC， CC not $\geq$ DC

Condition/Decision Coverage

- Condition/Decision Coverage (C/DC): Combing DC and CC.
- C/DC ≥ CC
- C/DC ≥ DC

```
// ??
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

Multiple Condition Coverage

- Multiple condition coverage (MCC) reports whether every possible combination of Boolean sub-expressions occurs.
- The test cases required for full multiple condition coverage of a condition are essentially given by the logical operator truth table for the condition.

MCC

- ((x>5) && (y>0)) Decision

T	T	T
T	F	F
F	T	F
F	F	F

```
// ??
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

C/DC MC/DC MCC

MC/DC

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Modified Condition/Decision Coverage

- MC/DC or MCDC:
  Executing the independent *true* and
  false outcomes of each condition.
- MC/DC ≥ C/DC

MC/DC

- To test `if (A or B)`

:	T	F
:	F	T

- To test `if (A and B)`

:	F	T
:	T	F

- To test `if (A or B) and C`

MC/DC

- ((x>5) && (y>0)) Decision

T	T	T
T	F	F
F	T	F
F	F	F

```
// ??
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

MC/DC: Discussion

- Modified condition/decision coverage was designed for languages containing logical operators that do not short-circuit.
- The short circuit logical operators in C, C++ and Java only evaluate conditions when their result can affect the encompassing decision.
- MC/DC will be affected by the structures of decisions in program.

MC/DC

```
// ??
int foo(int x, int y) {
        int z = y;
        if ((x>5) && (y>0)) {
                z = x; }
        return x*z;
}
```

```
// ??
int foo(int x, int y) {
        int z = y;
        if (x>5) {
            if(y>0){
                z = x;} }
        return x*z;
}
```

Quiz

- Please construct a decision, in which a condition has no independent outcome.

Discussions

• DC	• 2
• CC	• 2*n
• C/DC	• 2*n+1
• MC/DC	• 2*n+1
• MCC	• 2^n

- To test `if (A xor B)`

A:	T	T	F	F
B:	T	F	T	F