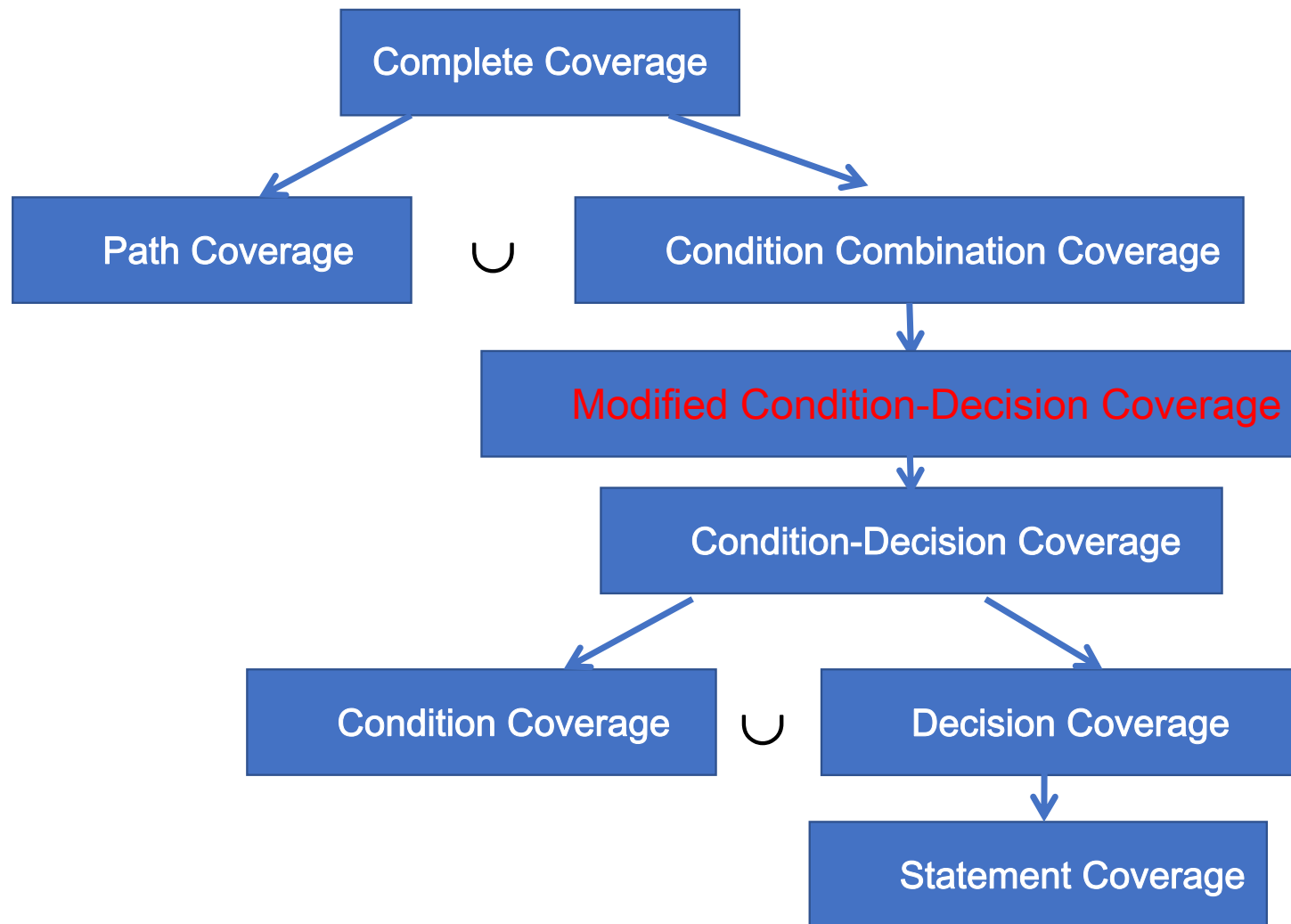


# Session 3

## Modified Condition/Decision Coverage (MC/DC)



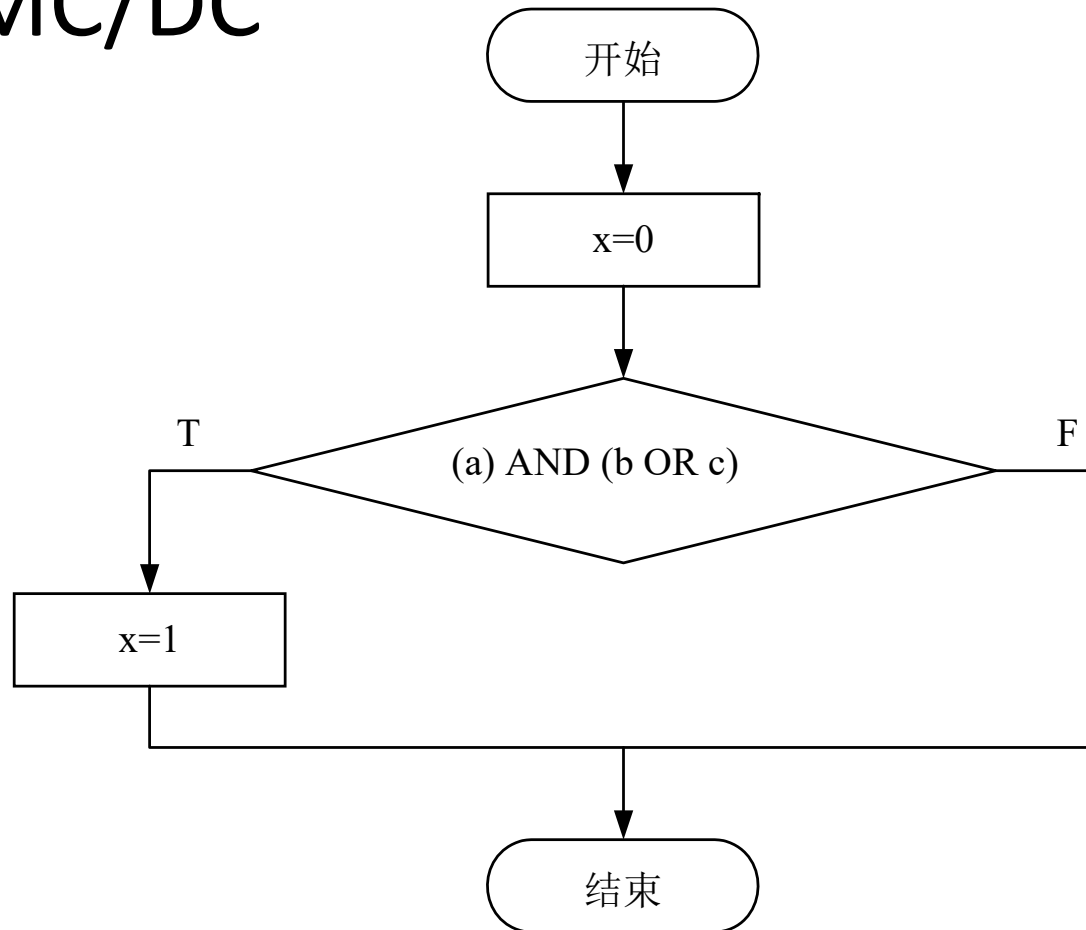
# Modified Condition/Decision Coverage (MC/DC)

- A code coverage criterion that requires:
  - Each entry and exit point is invoked
  - Each decision takes every possible outcome
  - Each condition in a decision takes every possible outcome
  - Each condition in a decision is shown to **independently affect** the outcome of the decision.

# MC/DC

- Independence of a condition is shown by proving that only one condition changes at a time.
- MC/DC is used in avionics software development guidance DO-178B and DO-178C to ensure adequate testing of the most critical (Level A) software.

# MC/DC



```
int function1 (bool a, bool b, bool c)
{
    int x=0;
    if(a&&(b || c))
        x=1;
    return x;
}
```

# Exercise

- Decision coverage
- Condition coverage
- Condition combination coverage

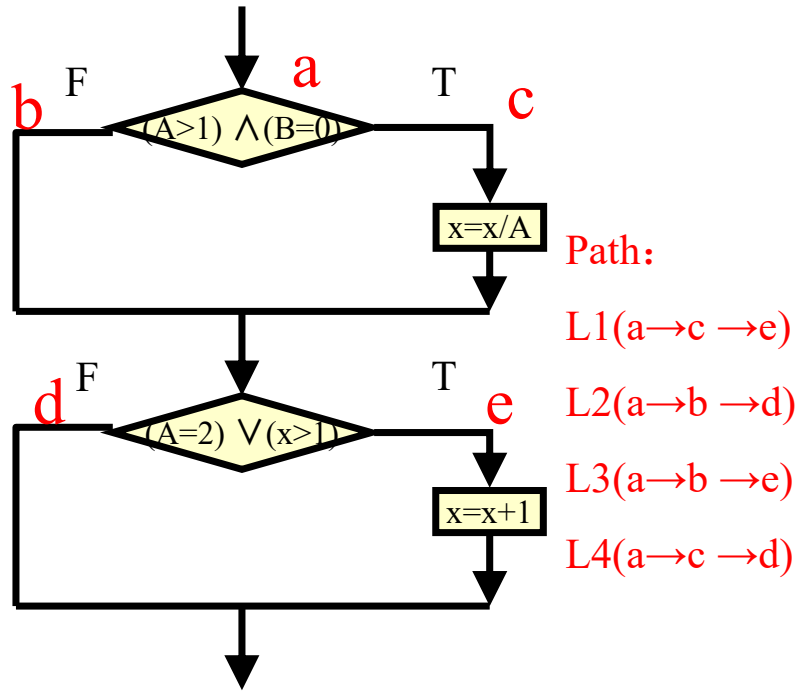
# MC/DC

序号	a	b	c	a&&(b  c)	a	b	c
1	T	T	T	T	5		
2	T	T	F	T	6	4	
3	T	F	T	T	7		4
4	T	F	F	F		2	3
5	F	T	T	F	1		
6	F	T	F	F	2		
7	F	F	T	F	3		
8	F	F	F	F			

n+1~2n

{1, 2, 3, 4, 5} / {2, 3, 4, 6}





Path:

L1( $a \rightarrow c \rightarrow e$ )

L2( $a \rightarrow b \rightarrow d$ )

L3( $a \rightarrow b \rightarrow e$ )

L4( $a \rightarrow c \rightarrow d$ )

- Design test cases to satisfy MC/DC of this example.

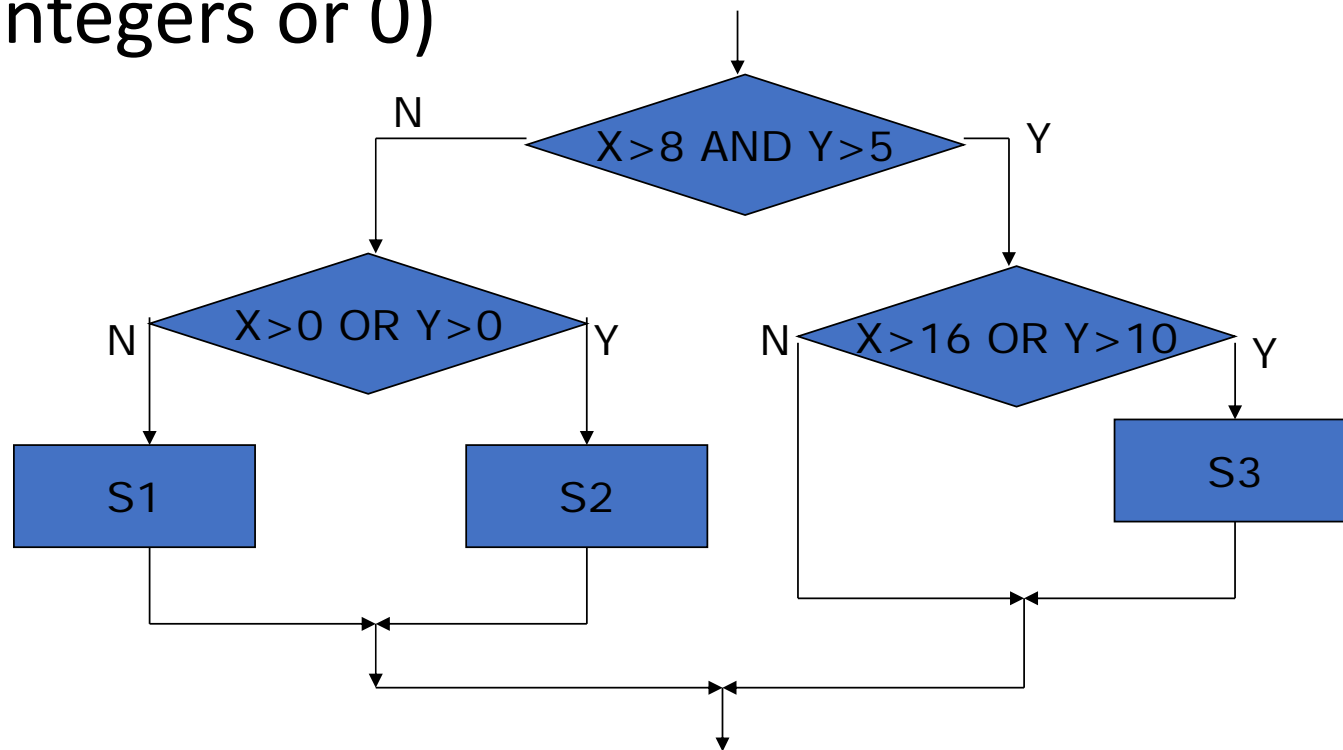
Test case	Path	Coverage condition	Combination coverage No.
(2, 0, 4)	ace(L1)	T1 T2 T3 T4	① ⑤
(2, 1, 1)	abe(L3)	T1 !T2 T3 !T4	② ⑥
(1, 0, 3)	abe(L3)	!T1 T2 !T3 T4	③ ⑦
(1, 1, 1)	abd(L2)	!T1 !T2 !T3 !T4	④ ⑧

# MC/DC

- The MC/DC criterion is much stronger than the condition/decision coverage.
- The MC/DC criterion is NOT stronger than Condition Combination Coverage.
- Update Exercise 5/6

## Exercise 5'

- Design test cases for the following flowchart to satisfy 8 types of coverage. (Note: X and Y are signed integers or 0)



## Exercise 6'

- Try to analyze the relationship among 8 different coverage strategies
  - Statement Coverage
  - Decision Coverage
  - Condition Coverage
  - Condition-Decision Coverage
  - Condition Combination Coverage
  - Path Coverage
  - Complete Coverage
  - Modified Condition/Decision Coverage