Testing Techniques

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Agenda

1. Recap
2. Testing technique
3. Why we need them?
4. Black box techniques
5. Equivalence partitioning
6. Boundary Value Analysis

Agenda

7. Decision table testing
8. State transition diagram
9. Cause – effect graph
10. Error guessing
11. White box techniques

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Agenda

12. Statement coverage
13. Decision coverage
14. Branch coverage
15. Path coverage
16. Data flow testing
17. Exercises and homework

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Recap

1. Why we need test cases?
2. Test case attributes
3. Test case execution statuses
4. Good practices

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Testing technique

- ✓ Approaches and methodologies used during the process of testing

- ✓ Based on the evolution of testing and experience of the quality assurance engineers

Why we need them?

- ✓ Be more effective when creating test cases
- ✓ Ensure we cover the software in correct way
- ✓ Manual testing is most popular method for validation of software

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Black box techniques

Known as specification based techniques

1. Equivalence Partitioning
2. Boundary Value Analysis
3. Decision table testing
4. State Transition
5. Cause–effect graph
6. Error guessing

Equivalence Partitioning

- Inputs to the application are divided into groups (partitions) that are expected to exhibit similar behavior
- Partitions can be valid and invalid
- One of the most popular black box technique
- Avoid redundancy and reducing the number of test cases

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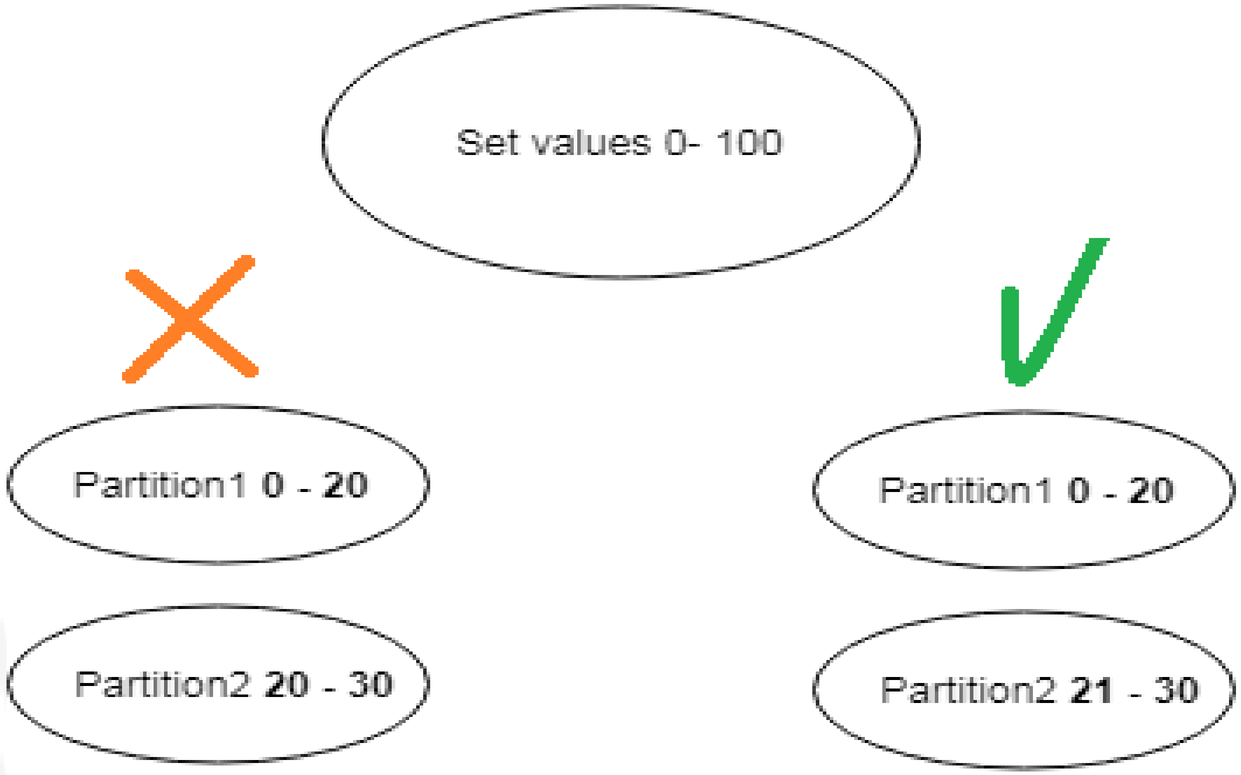
Equivalence Partitioning

Partitions should not overlap and should not be empty



Example

Online shoe store

Number of pairs	Discount
1	0 %
2 - 4	20%
5 - 7	30%
> 7	50%

Example

Online shoe store

Partitions (Classes)	Discount
Partition 1 (1)	0 %
Partition2 (2 – 4)	20%
Partition 3 (5 – 7)	30%
Partition 4 (> 7)	50%

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Boundary Value Analysis

- Focuses on determining boundaries for input values and testing at those chosen boundaries
- Most popular technique
- Usually software breaks on the edge values
- It is combined with equivalence partitioning
- Very effective to find bugs

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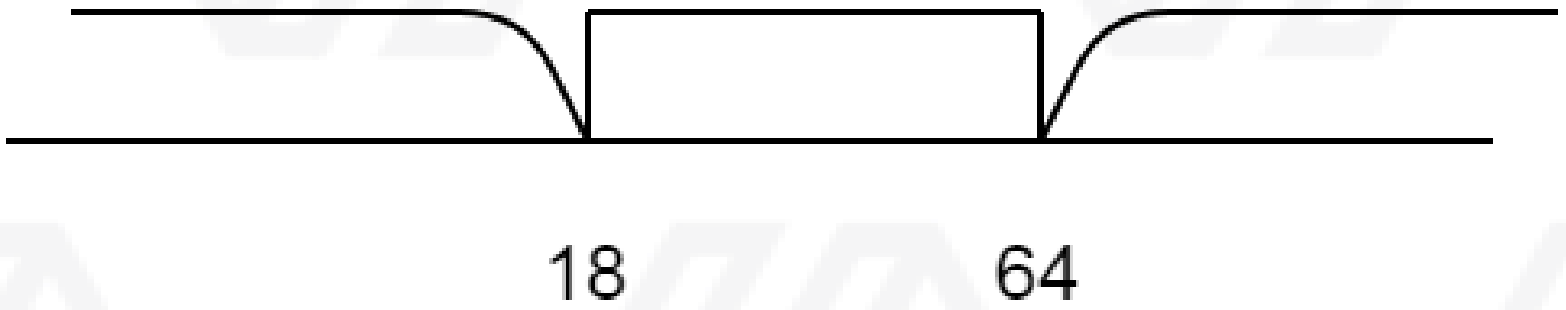
Boundary Value Analysis

One equivalence class could have 1 or 2 boundaries:

1. Class has only lower boundary
2. Class has lower and upper boundaries
3. Class has only upper boundary



Applying BVA

1. Lower boundary (if exists) of the class
2. Upper boundary (if exists) of the class
3. Any value inside the class (if the class consists of 3 or more values).
4. upper boundary of the class that precedes the tested class (if the preceding class exists).
5. Lower boundary of the class that follows the tested class (if the following class exists)

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Decision table testing

- Testing of a system behavior for different input combinations
- Different input combinations and their corresponding system behavior (Output) are captured in a tabular form
- A Decision Table is a tabular representation of inputs versus rules/cases/test conditions

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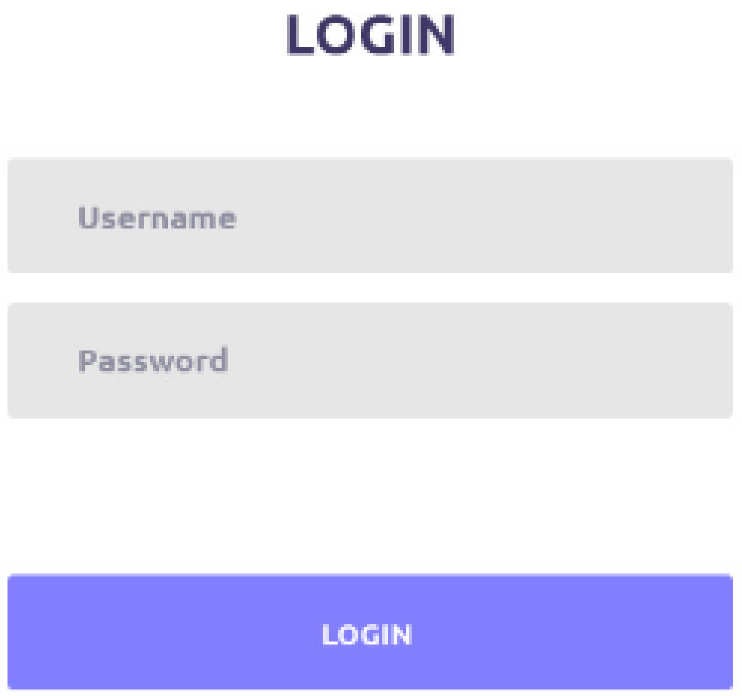
Example

If the user provides correct username and password the user will be redirected to the Homepage. If any of username/password is wrong, an error message appears.



Example

Condition	Rule 1 TC1	Rule 2 TC2	Rule 3 TC3	Rule 4 TC4
Username	Correct	Correct	Incorrect	Incorrect
Password	Correct	Incorrect	Correct	Incorrect
Output	Homepage	Error msg.	Error msg.	Error msg.

We can execute only 2 test cases - TC1 and any of TC2 – TC4

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Video resource

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State transition diagram

- Changes in input conditions cause state changes in software under test (SUT)
- Analyzing the behavior of SUT for different input conditions in a sequence
- It is a perfect for testing finite state systems (get a different output for the same input, depending on what has happened before)

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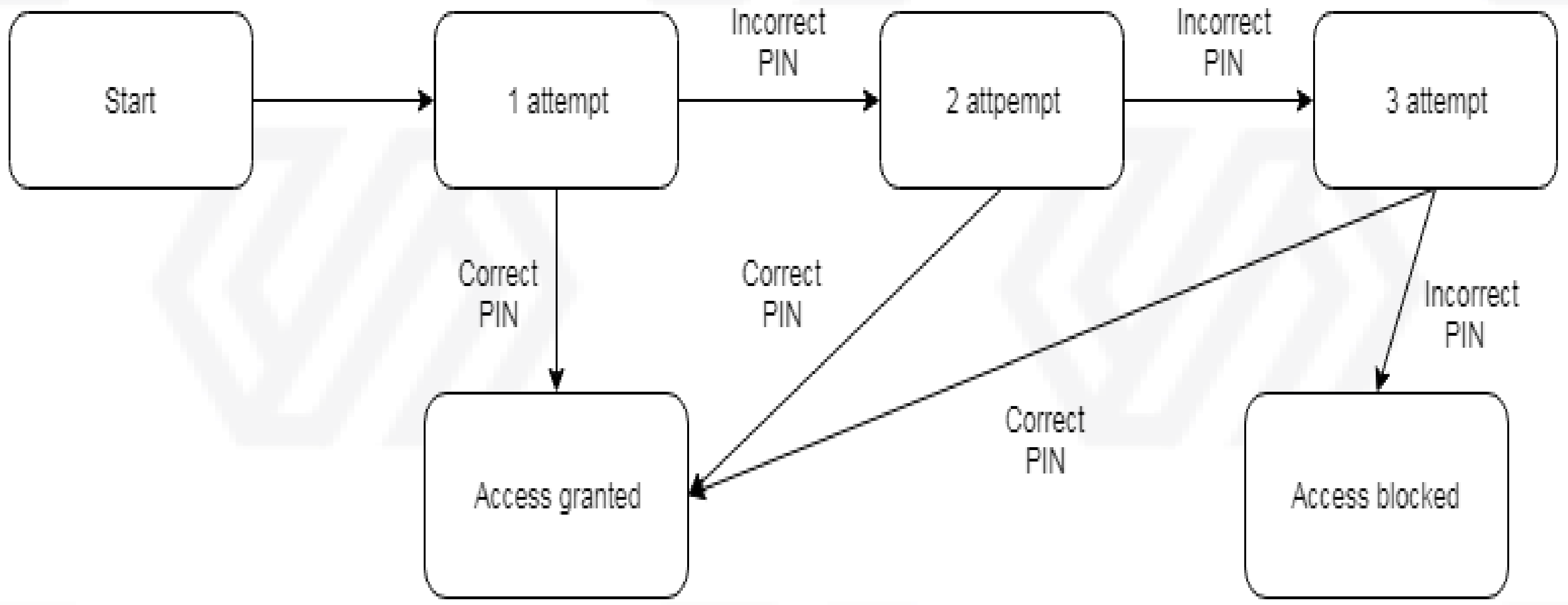
Example



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Example

State transition table

Start state	Event 1 (Correct PIN)	Event 2 (Incorrect PIN)
S1) Start – inserted card	-	-
S2) 1st attempt	S5	S3
S3) 2nd attempt	S5	S4
S4) 3rd attempt	S5	S6
S5) Access granted	-	-
S6) Access blocked	-	-

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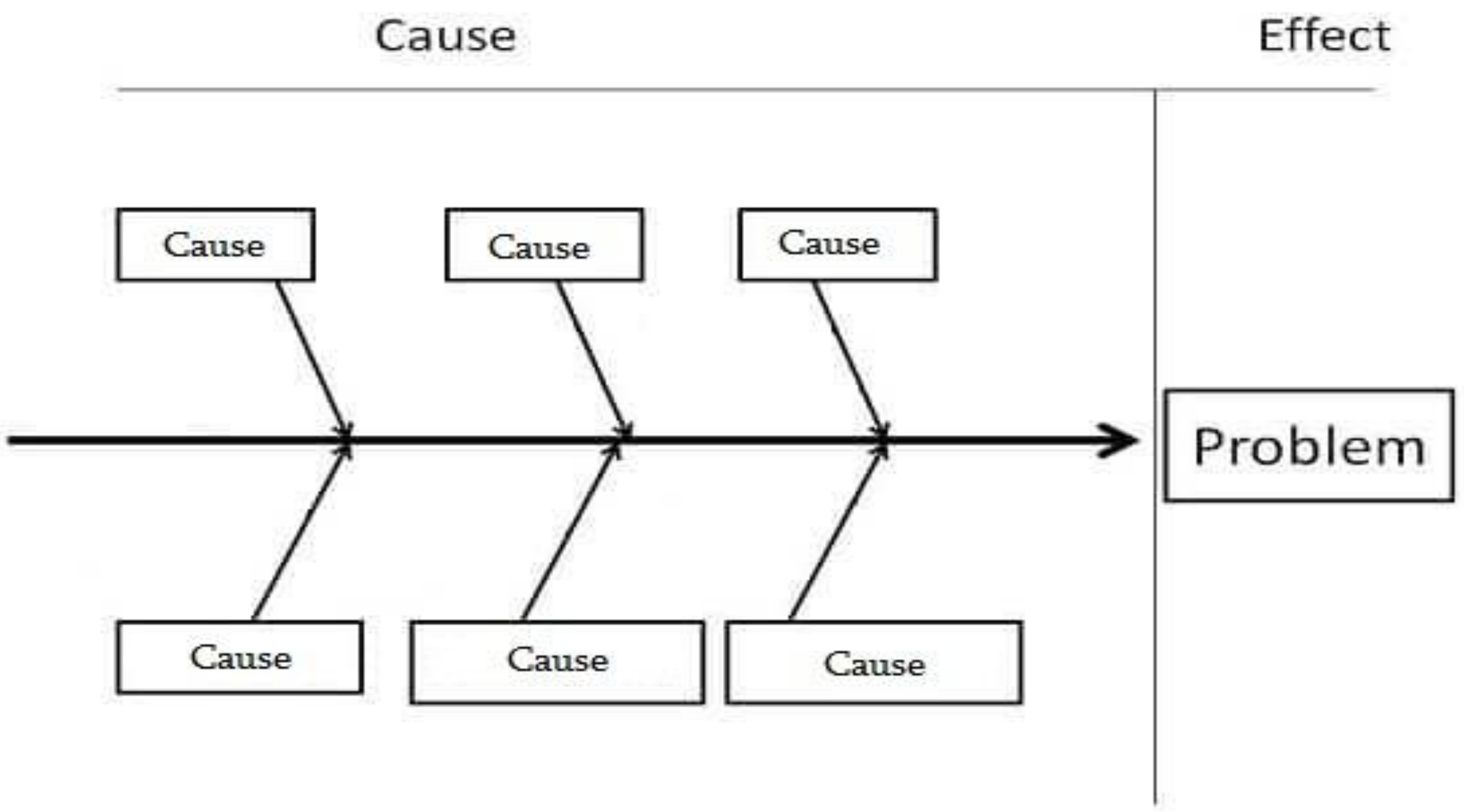
Cause – effect graph



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Cause – effect graph

When we use it:

- ✓ To identify root causes for a specific problem
- ✓ To analyze existing problems and take corrective actions

Error guessing

- Technique based on the experience in prior testing
- Rely on the experience of the QA
- Intuition to determine which situations cause software failure

White box techniques

1. Statement coverage
2. Decision coverage
3. Branch coverage
4. Path coverage
5. Data flow testing

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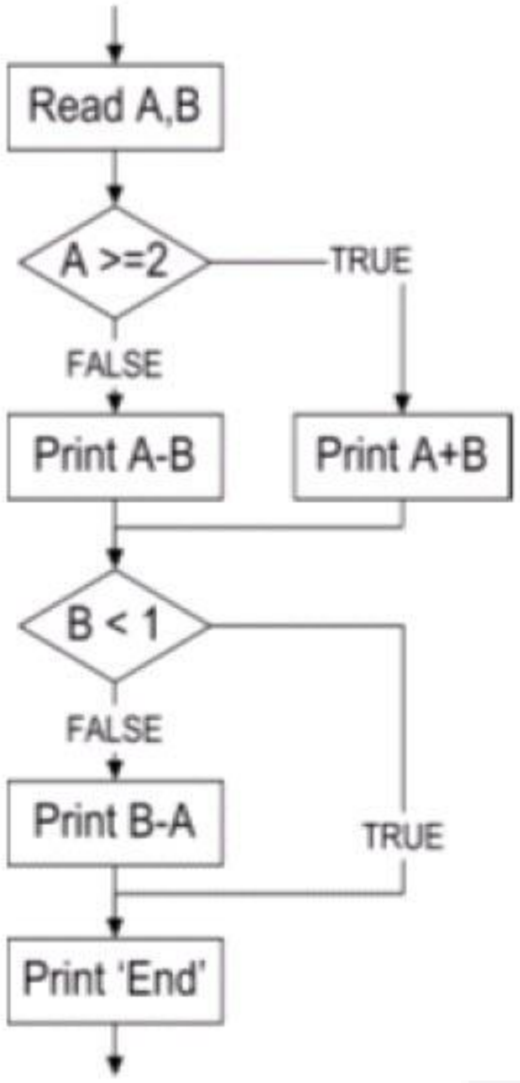
Statement coverage

- Statement coverage
  - execution of all the executable statements (rectangles) in the source code at least once



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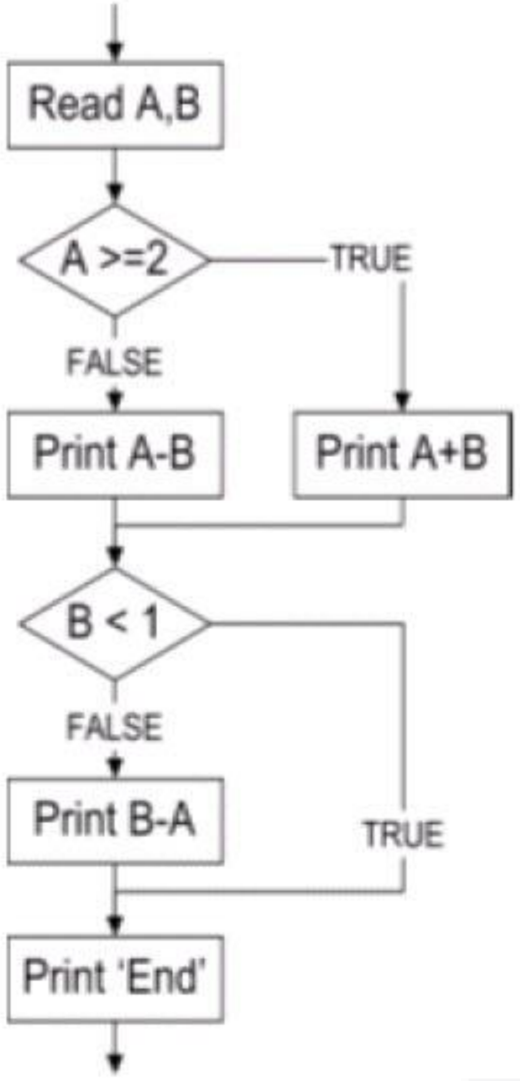
Decision (Branch) coverage

- Decision(Branch) coverage
  - Execute decision outcomes (rhomboid)
  - Every decision path should be covered
  - Conditional or non-conditional branches (line)
  - 100% decision coverage guarantees 100% statement coverage
  - 100% branch coverage guarantees 100% decision coverage



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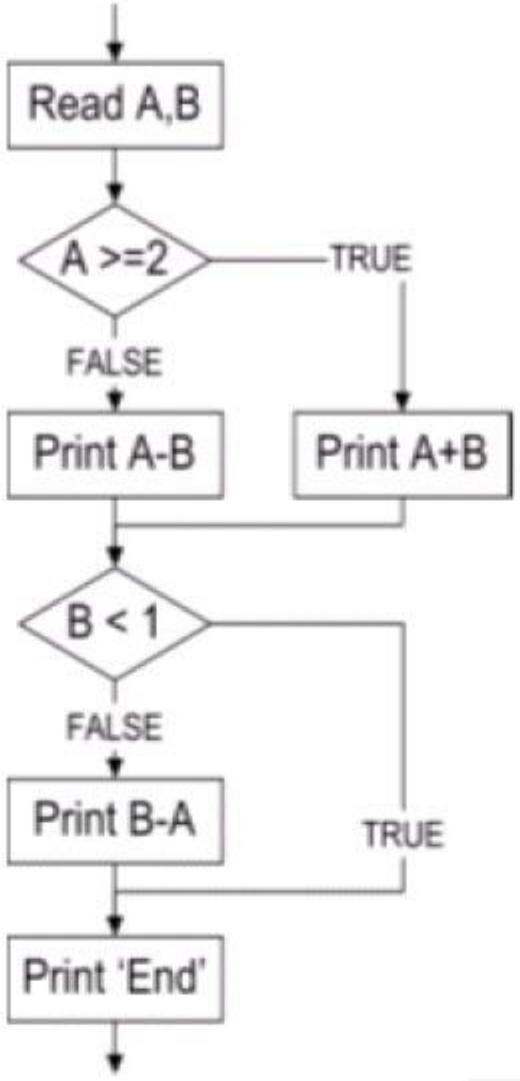
Path coverage

- Path coverage
  - Covers all possible paths in the code object of testing
  - 100% path coverage means 100% branch/decision coverage and 100% statement coverage



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Data flow testing

- Product uses the variables to make the data flow within the program
- These variables get some values from the user interface or sometimes from different sources
- Testing these variables data flow is data flow testing

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Data flow testing

Static data flow testing

Identifying potential defects within the program.

Analyzing code for defects

Code will not be executed

Dynamic data flow testing

We will execute the program

Looks like a control flow testing

List out the path need to be tested

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Exercises and homework

Exercises

1. Do the exercises from Testing Techniques - Exercises.pdf

Homework

1. Solve the tests in Moodle – Тест върху тестови техники – available right after the lecture

Q & A

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THANK YOU

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