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## Dynamic Testing Techniques

# Dynamic Testing Techniques

WHAT IS A TESTING TECHNIQUE?

BLACK AND WHITE BOX TESTING

BLACK BOX TEST TECHNIQUES

WHITE BOX TEST TECHNIQUES

ERROR GUESSING

# Why Dynamic Test Techniques?

- **Exhaustive testing (use of all possible inputs and conditions) is impractical**
  - must use a subset of all possible test cases
  - must have high probability of detecting faults
- **Need thought processes that help us select test cases more intelligently**
  - test case design techniques are such thought processes

# What is a Testing Technique?

- A procedure for selecting or designing tests
- Based on a structural or functional model of the software
- Successful at finding faults

# Advantages of Techniques!

- **Effective testing: find more faults**
  - focus attention on specific types of fault
  - know you're testing the right thing
- **Efficient testing: find faults with less effort**
  - avoid duplication
  - systematic techniques are measurable

# Dynamic Testing Techniques

What is a testing technique?

**BLACK AND WHITE BOX TESTING**

Black box test techniques

White box test techniques

Error Guessing

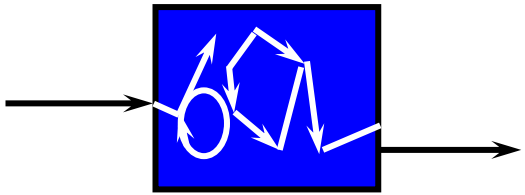
# Types of Systematic Techniques

## Functional (Black Box)

- based on behaviour / functionality of software

## Structural (White Box)

- based on structure of software



# Dynamic Testing Techniques

What is a testing technique?

Black and White box testing

**BLACK BOX TEST TECHNIQUES**

White box test techniques

Error Guessing

# Black Box Test Design Techniques

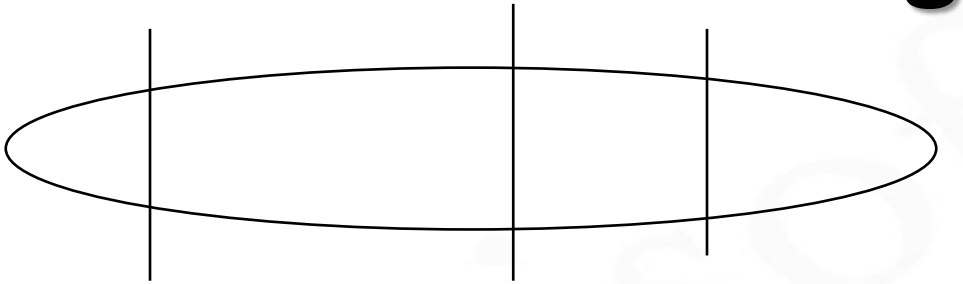
- **Techniques defined in BS 7925-2**
  - Equivalence partitioning ✓
  - Boundary value analysis ✓
  - State transition testing ✓
  - Cause-effect graphing ✓
  - Syntax testing ✗
  - Random testing ✗
- **Also defines how to specify other techniques**

**Also a measurement technique?**

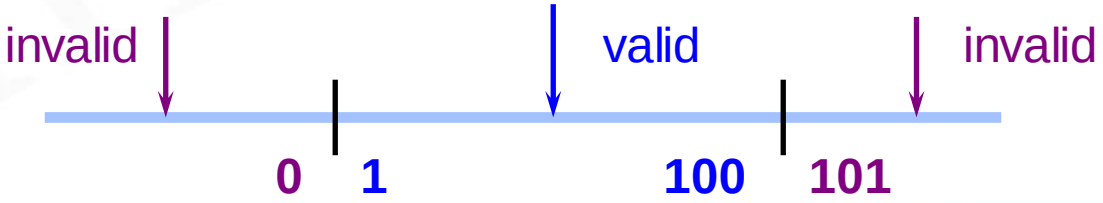
✓ = Yes

✗ = No

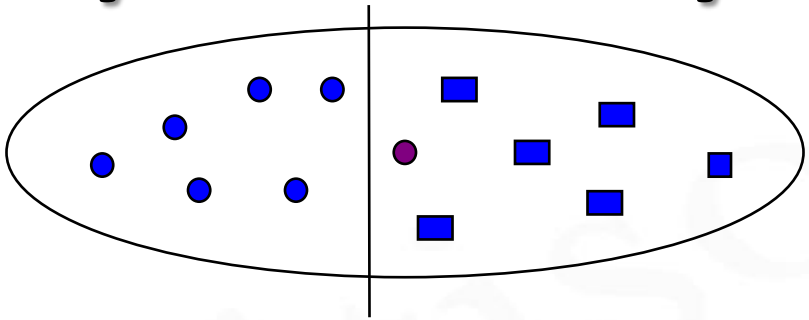
# Equivalence Partitioning (EP)



- divide (partition) the inputs, outputs, etc. into areas which are the same (equivalent)
- assumption: if one value works, all will work
- one from each partition better than all from one

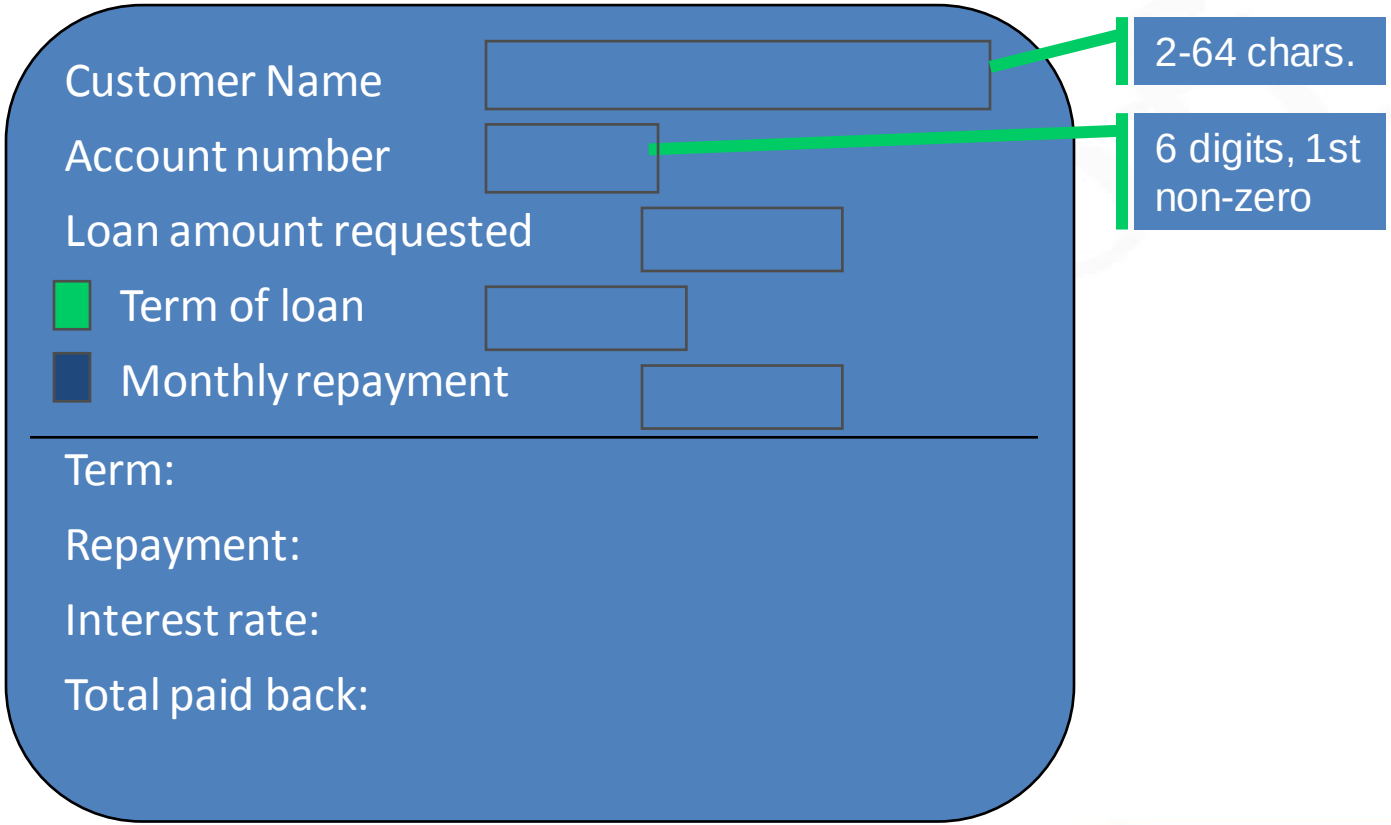


# Boundary Value Analysis (BVA)



- faults tend to lurk near boundaries
- good place to look for faults
- test values on both sides of boundaries

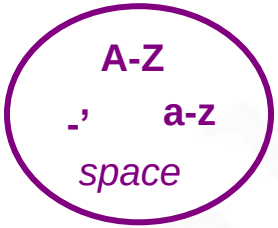
# Example: Loan Application



# Customer Name

Number of characters:


Valid characters:



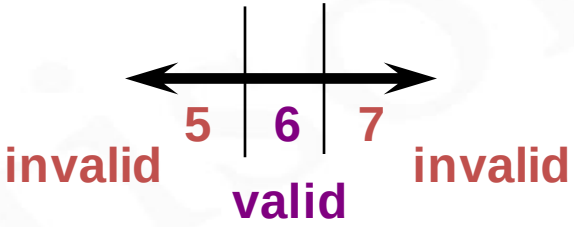

| Conditions | Valid Partitions | Invalid Partitions | Valid Boundaries | Invalid Boundaries |
|---|---|---|---|---|
| **Customer Name** | 2 to 64 characters | < 2 characters | 2 characters | 1 character |
| | Valid characters | > 64 characters | 64 characters | 65 characters |
| | | Invalid characters | | 0 characters |

# Account Number

**first character:** valid: non-zero

invalid: zero

**number of digits:**




| Conditions | Valid Partitions | Invalid Partitions | Valid Boundaries | Invalid Boundaries |
|---|---|---|---|---|
| **Account Number** | 6 digits | < 6 digits | 100000 | 5 digits |
| | 1st Non Zero | > 6 digits | 999999 | 7 digits |
| | | 1st digit = 0 | | 0 digits |

# Design Test Cases

| Test Case | Description | Expected Outcome |
|---|---|---|
| 1 | Name: John Smith<br>Acc no: 123456<br>Loan: 2500<br>Term: 3 years | Term : 3 years<br>Repayment : 79.86<br>Interest rate : 10%<br>Total paid : 2874.96 |
| 2 | Name: AB<br>Acc no: 100000<br>Loan: 500<br>Term: 1 year | Term : 1 year<br>Repayment: 44.80<br>Interest rate: 7.5%<br>Total paid : 537.60 |

# Dynamic Testing Techniques

What is a testing technique?

Black and White box testing

Black box test techniques

**WHITE BOX TEST TECHNIQUES**

Error Guessing

# White Box Test Design Techniques

- Techniques defined in BS 7925-2
  - Statement testing ✓
  - Branch / Decision testing ✓
  - Data flow testing ✓
  - LCSAJ testing ✓
- Also defines how to specify other techniques

**Also a measurement technique?**

✓ = Yes

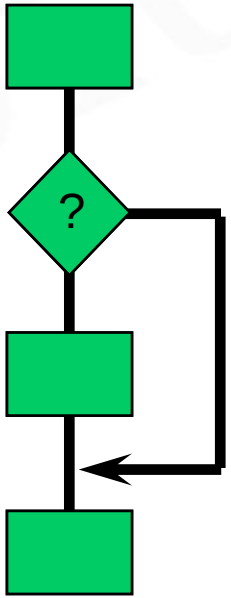
✗ = No

# Statement Coverage

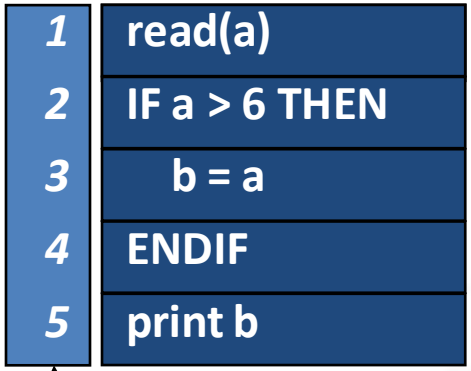
- percentage of executable statements exercised by a test suite

$$= \frac{\text{number of statements exercised}}{\text{total number of statements}}$$

- example:
  - program has 100 statements
  - tests exercise 87 statements
  - statement coverage = 87%



# Example of Statement Coverage




| Test case | Input | Expected output |
|---|---|---|
| 1 | 7 | 7 |

Statement numbers

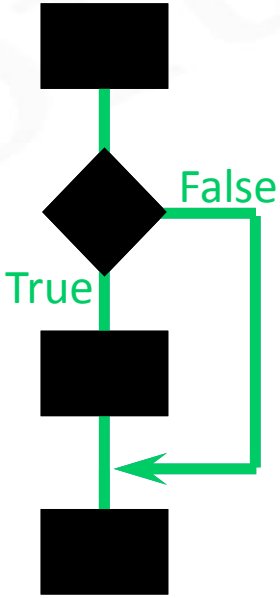
As all 5 statements are 'covered' by this test case, we have achieved 100% statement coverage

# Decision coverage (Branch coverage)

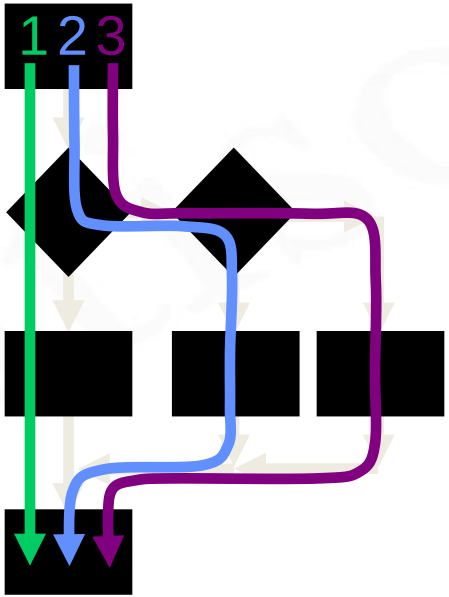
- percentage of decision outcomes exercised by a test suite

$$= \frac{\text{number of decisions outcomes exercised}}{\text{total number of decision outcomes}}$$

- example:
  - program has 120 decision outcomes
  - tests exercise 60 decision outcomes
  - decision coverage = 50%

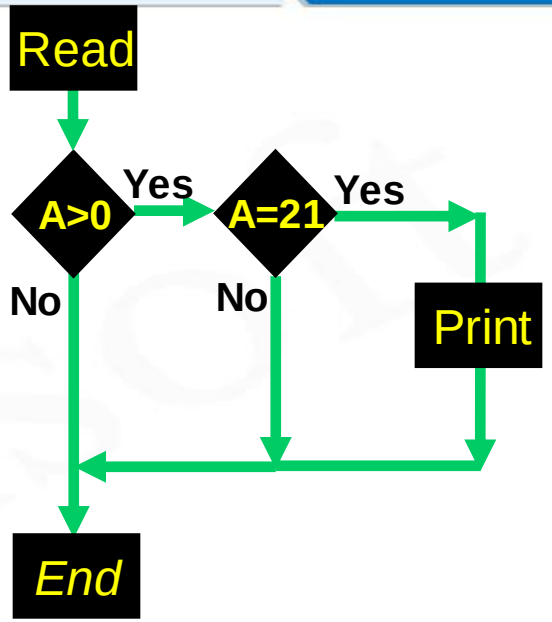


# Decision outcomes through code



# Example:

```
Read A
IF A > 0 THEN
    IF A  = 21 THEN
        Print “Key”
    ENDIF
ENDIF
```




– Minimum tests to achieve:
  - Statement coverage: 1
  - Branch coverage: 3

# Dynamic Testing Techniques

What is a testing technique?

Black and White box testing

Black box test techniques

White box test techniques

**ERROR GUESSING**

# Error-Guessing

- Always Worth Including
- After Systematic Techniques Have Been Used
- Can Find Some Faults That Systematic Techniques Can Miss
- Supplements Systematic Techniques

# Error Guessing: Deriving Test Cases

- **Consider:**

  - ✓Past failures
  - ✓Intuition / experience
  - ✓Brain storming

# Dynamic Testing Techniques

## Summary: Key Points

1. Test techniques are ‘best practice’: help to find faults
2. Black Box techniques are based on behaviour
3. White Box techniques are based on structure
4. Error Guessing supplements systematic techniques

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# Thank You

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