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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

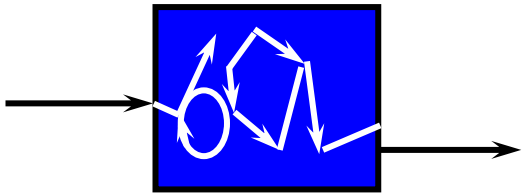
Types of Systematic Techniques

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

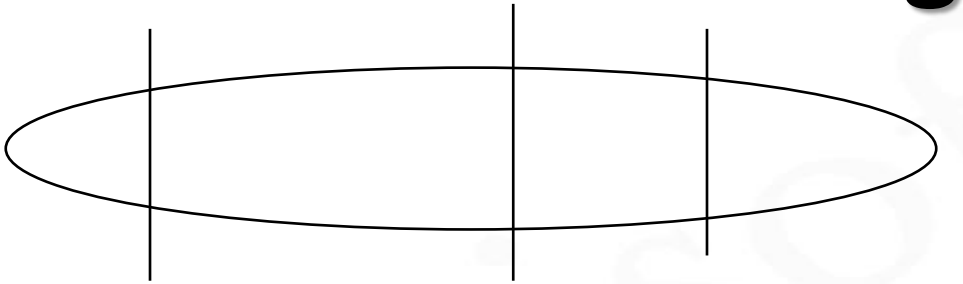
- **Techniques defined in BS 7925-2**
  - Equivalence partitioning ✓
  - Boundary value analysis ✓
  - State transition testing ✓
  - Cause-effect graphing ✓
  - Syntax testing ✗
  - Random testing ✗
- **Also defines how to specify other techniques**

Also a measurement technique?

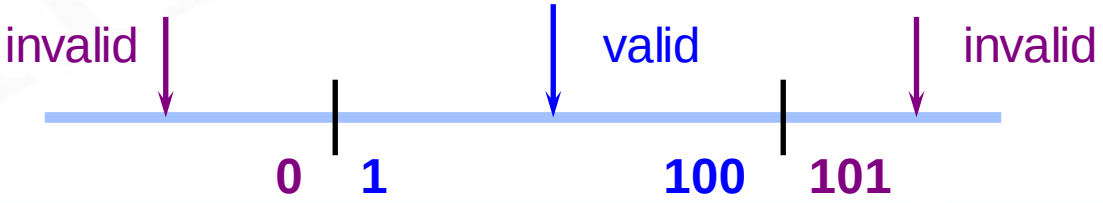
✓ = Yes

✗ = No

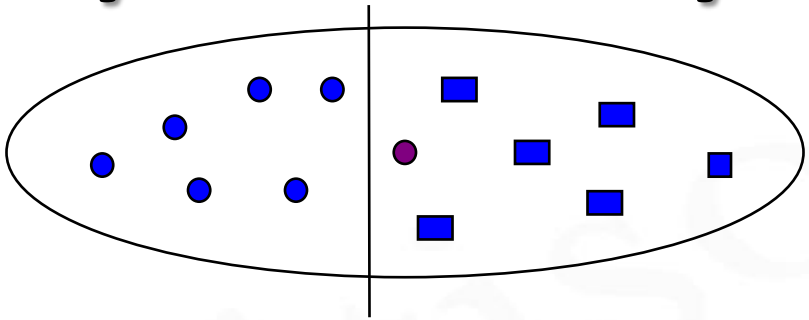
Equivalence Partitioning (EP)



- 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

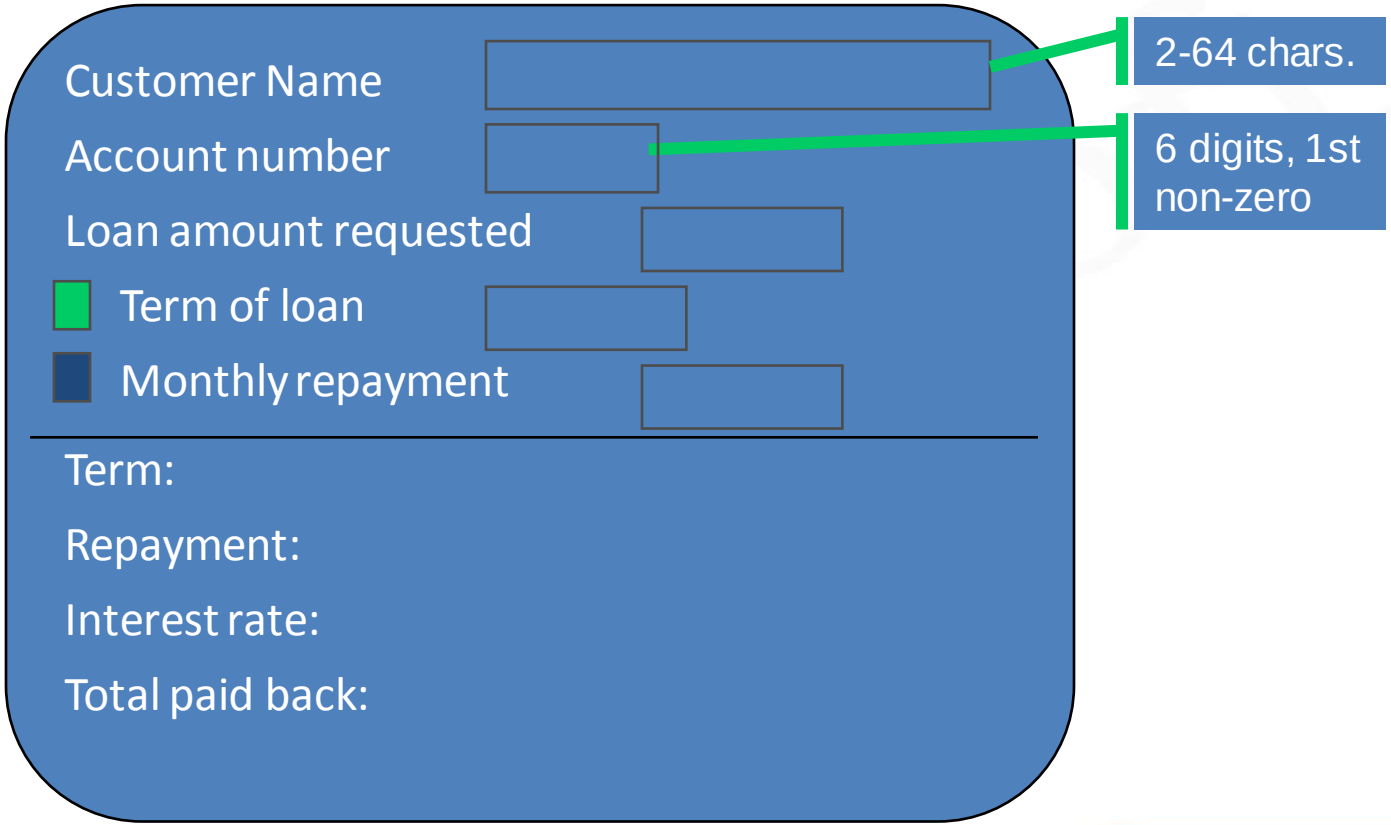


Boundary Value Analysis (BVA)



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

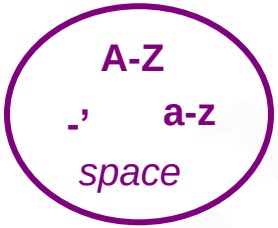
Example: Loan Application



Customer Name

Number of characters:

Valid characters:



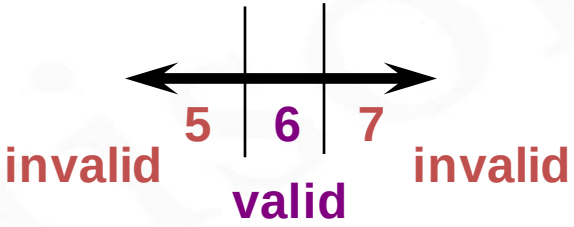
Conditions	Valid Partitions	Invalid Partitions	Valid Boundaries	Invalid Boundaries
Customer Name	2 to 64 characters	< 2 characters	2 characters	1 character
	Valid characters	> 64 characters	64 characters	65 characters
		Invalid characters		0 characters

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 Acc no: 123456 Loan: 2500 Term: 3 years	Term : 3 years Repayment : 79.86 Interest rate : 10% Total paid : 2874.96
2	Name: AB Acc no: 100000 Loan: 500 Term: 1 year	Term : 1 year Repayment: 44.80 Interest rate: 7.5% 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

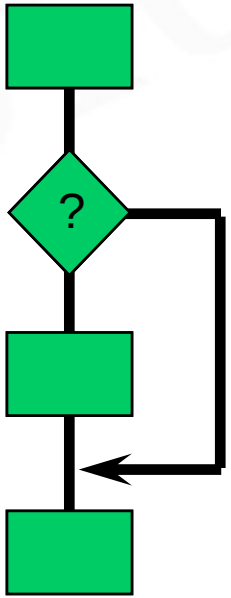
✗ = No

Statement Coverage

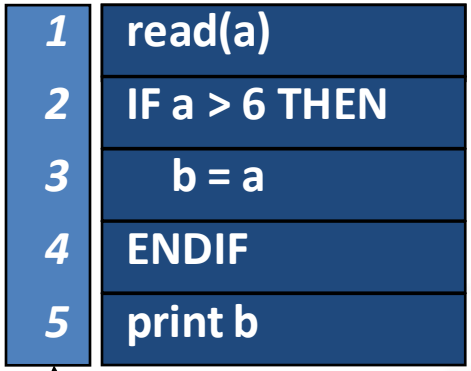
- percentage of executable statements exercised by a test suite

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

- 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

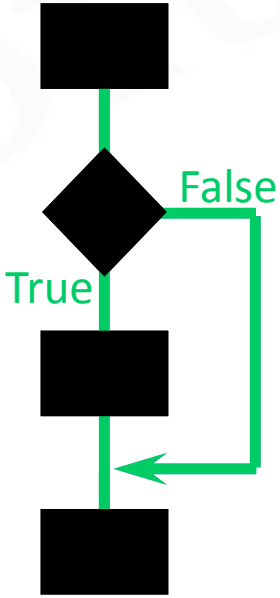
As all 5 statements are 'covered' by this test case, we have achieved 100% statement coverage

Decision coverage (Branch coverage)

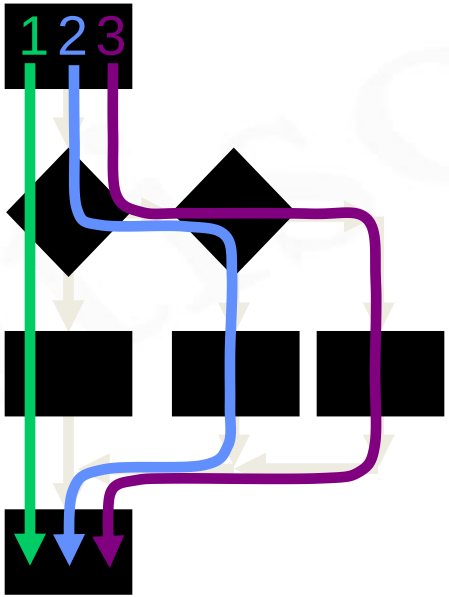
- percentage of decision outcomes exercised by a test suite

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

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



Decision outcomes through code



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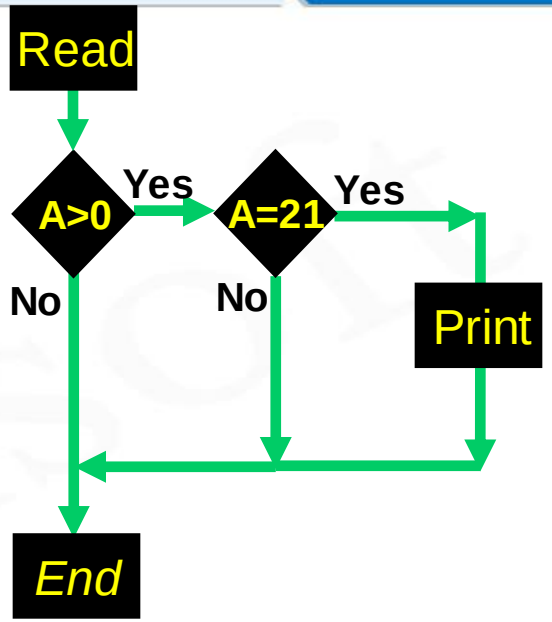
Example:

```
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

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Error Guessing: Deriving Test Cases

- **Consider:**

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

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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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