

# Introduction to Software Testing

## Chapter 3.4

### Logic Coverage for Specifications

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## Specifications in Software

- Specifications can be formal or informal
  - Formal specs are usually expressed mathematically
  - Informal specs are usually expressed in natural language
- Lots of formal languages and informal styles are available
- Most specification languages include explicit logical expressions, so it is very easy to apply logic coverage criteria
- Implicit logical expressions in natural-language specifications should be re-written as explicit logical expressions as part of test design
  - You will often find mistakes
- One of the most common is preconditions ...

## Preconditions

- Programmers often include preconditions for their methods
- The preconditions are often expressed in comments in method headers
- Preconditions can be in javadoc, “requires”, “pre”, ...

### Example – Saving addresses

```
// name must not be empty  
// state must be valid  
// zip must be 5 numeric digits  
// street must not be empty  
// city must not be empty
```

### Rewriting to logical expression

```
name != "" ^ state in stateList ^ zip >= 00000 ^ zip <= 99999 ^  
street != "" ^ city != ""
```

## Shortcut for Conjunctive Clauses

- Conjunctive clauses are connected only by the and operator
- Each major clause is made active by making all other clauses true
- The tests are “all true” and then a “diagonal” of false values:

	A	B	C	...
1	T	T	T	
2	F	T	T	...
3	T	F	T	
4	T	T	F	
		.		.
		.		.
		.		.

## Shortcut for Disjunctive Clauses

- Disjunctive clauses are connected only by the or operator
- Each major clause is made active by making all other clauses false
- The tests are “all false” and then a “diagonal” of true values:

	A	B	C	...
1	F	F	F	
2	T	F	F	...
3	F	T	F	
4	F	F	T	
		.		.
		.		.
		.		.

## Summary : Logic Coverage for Specs

- Logical specifications can come from lots of places :
  - Preconditions
  - Java asserts
  - Contracts (in design-by-contract development)
  - OCL conditions
  - Formal languages
- Logical specifications can describe behavior at many levels :
  - Methods and classes (unit and module testing)
  - Connections among classes and components
  - System-level behavior
- Many predicates in specifications are in disjunctive normal or conjunctive normal form – simplifying the computations